Reliable Disclosure Information for European Electricity Consumers

Final Report from the project "Reliable Disclosure Systems for Europe (RE-DISS)"

Supported by
INTELLIGENT ENERGY EUROPE

Supported by
INTELLIGENT ENERGY
EUROPE

This report summarises the results of the “Reliable Disclosure Systems for Europe (RE-DISS)” project, which was supported by the European Commission through the Intelligent Energy Europe (IEE) programme (contract no. IEE/09/761/SI2.558253), managed by the Executive Agency for Competitiveness and Innovation (EACI).

The RE-DISS project had no formal mandate from the European Commission to develop official recommendations to member states and to assess the national implementation of tracking-related policies in Europe. Nevertheless the project consortium aimed at giving sensible and reliable guidance to European governments, competent bodies and the Commission based on its own expertise and intensive discussion with experts from the Commission and national experts.

Written by
Christof Timpe, Dominik Seebach (Öko-Institut)
Markus Klimscheffskij, Marko Lehtovaara (Grexel Systems)
Claudia Raimundo (IT Power)
Diane Lescot (Observ’ER)
Angela Puchbauer-Schnabel (E-Control)
Thierry Van Craenenbroeck (VREG)

With support from
Anja Sachs, Liv Becker, Vanessa Cook (Öko-Institut)

Project website: www.reliable-disclosure.org

Summary

In liberalised electricity markets, consumers have a choice not only of their energy supplier, but also of the energy product they wish to buy. As a result, they can choose among different offers in terms of price, but also in terms of company profile and the sources of energy and technologies used for electricity production. In order to make visible to consumers what is happening “behind the socket”, the European Union has introduced a requirement for electricity suppliers to disclose to their consumers the origin of the energy they have delivered. The objective of this regulation is to enable consumers to make an informed choice about the energy they buy, taking into account both price and criteria related to the type of electricity generation (fuel mix used, CO_2 emissions and radioactive waste production).

While issues related to the “front side” of disclosure (the information to be displayed to consumers and the format of this display) have been addressed in earlier projects, this report analyses the details of how the tracking of the generation attributes should be implemented in the electricity market. In the context of electricity disclosure, tracking denotes a methodology for the accounting of generation attributes in the electricity market, such as fuel mix and the environmental indicators mentioned above, and their allocation to final consumption of electricity.

The work of the RE-DISS project builds upon the results of the previous E-TRACK project, and focused on the further development of a set of “Best Practice Recommendations” for tracking and on supporting the actual implementation of major elements of these recommendations in European countries. The final version of the Best Practice Recommendations can be found in Annex 1 to this report, while Annex 2 contains high-level summaries of the progress made in selected countries in the course of the project.

A major finding of the RE-DISS project is that a lack of stringent rules on which tracking mechanisms may be used in a domain and how they are defined and coordinated across borders results in a significant error in the disclosure information given to consumers in Europe. The project was able to estimate the measureable error at 243 TWh/a of wrongly disclosed electricity at the time when the project was launched. This figure includes about 105 TWh/a of electricity from renewable energy sources which were double counted. This corresponds to 18 % of all RES electricity generated in the countries covered by the analysis. Towards the end of the project, the measureable error was reduced to about 75 TWh/a due to a number of improvements implemented by the competent bodies in the different countries. The RE-DISS Best Practice Recommendations was used as a point of orientation for many of these measures and will help to further reduce the remaining errors during the next years, including those errors which are not easily measurable and therefore are not included in the figures mentioned above. The RE-DISS project has also developed a proposal for new guide-

lines for the implementation of electricity disclosure by the EU member states, which the Commission could publish in order to further promote the coordination and reliability of electricity disclosure.[1]

The most important tool for explicit tracking is the Guarantee of Origin (GO), which is defined in Article 15 of the Renewable Energy Directive 2009/28/EC. Based on this article, the GO has become a powerful and reliable tool for the tracking of electricity from RES. On a voluntary basis, 12 countries have joined the European Energy Certificate System (EECS) with their GO systems, which provides a standard for the coordinated implementation of GOs and their electronic exchange across borders. Based on the EECS, a strong cross-border market for "green power" has emerged, which had a volume of 181 TWh in 2011. However, not all countries have already implemented GOs according to the 2009 directive, and not all GO systems established on a national basis allow for cross-border transfers.

European legislation is also providing for GO for electricity generated from high-efficient cogeneration of heat and power. However, this instrument was less successful than the RES-GO, probably because cogeneration is more difficult to understand and is less attractive to consumers than renewable energy. Austria, the Netherlands, Sweden and Switzerland have already extended the concept of GOs to electricity generation from fossil and nuclear generation, which allows this type of generation also to be tracked in a reliable and internationally coordinated way.

In order to create a tracking system for electricity disclosure, GOs must usually be supplemented by an implicit tracking mechanism. This is usually done by defining a default data set of disclosure attributes, which suppliers in a country can use in case that they are not able to cover their electricity sales to final consumers based on explicit tracking mechanisms, such as GOs.

One of the most widespread reasons why errors in disclosure information occur is that competent bodies do not provide such default data in a proper way: If suppliers are using plain generation statistics from a country or region which are not corrected by the attributes covered by, for example, GOs, it will result in double counting of those attributes. The RE-DISS project has identified five other categories of problems in tracking systems, including double counting between GOs and other explicit tracking mechanisms, such as private certificates or labels, and inconsistent provision of product-related information to consumers. Based on the data available, only the errors related to implicit tracking could be quantified on a European scale.

The Best Practice Recommendations developed by the RE-DISS project give detailed guidance to competent bodies on how these disclosure problems can be avoided and thus how electricity disclosure can be made reliable, as required by Directive

[1] This draft can be downloaded from the RE-DISS project website: http://www.reliable-disclosure.org/documents

2009/72/EC.[2] The recommendations are based on intensive discussions with competent bodies from 19 countries in the course of a series of workshops. They address issues such as how GOs should be implemented in detail, including a proposal for how the lifetime of GOs should be defined and how they should be handled at their expiry. An annex to the Best Practice Recommendations sets out in detail how a residual mix should be calculated in each country, which effectively prevents the implicit double counting of generation attributes and the corresponding loss of other disclosure information. The recommendations also cover options to implement a third category of tracking mechanisms besides GOs and the residual mix, which are called "other Reliable Tracking Systems". They can be used for example in order to cover the attributes of renewable energy supported by a feed-in tariff. The rules for such systems should be defined clearly and implemented in a reliable and transparent way. A third section of the Best Practice Recommendations contains more general recommendations on how disclosure should be implemented, which go beyond the tracking systems used. This addresses, for example, the timing of the steps in calculating electricity disclosure information, which should be coordinated across Europe.

Regarding the residual mix calculation, the RE-DISS project has developed a detailed methodology, collected data and performed calculations whose results were published, ready to be used for the disclosure information in all major countries in Europe. Due to the international transfer of both electricity and generation attributes (through GOs), it is necessary to harmonise the calculation of residual mixes across Europe. In order to balance out deficits and surpluses of disclosure information in comparison to the electricity consumed in the individual countries, the calculations have introduced a European Attribute Mix. By using data from this attribute mix, countries which have exported more GOs than physical electricity can avoid the need to disclose shares of electricity with "unknown" origin. The most striking example for this improvement was Norway, which uses the data provided by RE-DISS since the disclosure year 2011 and thus has significantly improved the quality and reliability of disclosure information given to domestic consumers.

The respective chapter in this report and the Annex to the Best Practice Recommendations describe the four steps which should be followed in order to determine reliable residual mix information, which are data collection, determination of domestic residual mixes, determination of the European Attribute Mix and the determination of the final residual mix in each country or domain.

[2] It must be noted that the Best Practice Recommendations are not an official recommendation from the Commission or any other appointed official body. However, given the expertise of the project team and the representatives of competent bodies involved in their development, they are certainly a good reference for the future development of tracking systems in Europe and should thus be followed by all countries as closely as possible in order to fulfil their responsibility of ensuring the reliability of disclosure information provided to consumers.

The project has assessed in detail the implementation of electricity disclosure in 17 domains. This comprises 11 "participating domains", which contributed to the discussions in the project (Austria, Belgium-Flanders, Belgium-Wallonia, Denmark, Finland, Italy, Luxembourg, Netherlands, Sweden, Norway and Switzerland), and 6 other domains which were also considered relevant (France, Germany, Ireland, Portugal, Slovenia and Spain). The assessment was carried out once at the beginning of the RE-DISS project (spring 2010) and for a second time towards the end of the project (at the close of 2012). The analysis shows that in 2010 not all of these countries had implemented electricity disclosure and GOs for RES and for HE cogeneration as required by the respective directives. This situation had improved considerably by the end of 2012. Compared to the RE-DISS Best Practice Recommendations, the 17 domains have made considerable progress, especially with regard to the strengthening of RES-GOs, the recognition of imported GOs, the calculation of residual mixes and the treatment of contract-based tracking.[3] The countries covered by this analysis also made considerable progress in relation to the six typical problems in implementing disclosure, which the project has identified. Some of these improvements resulted from the transposition of the 2009 RES Directive in the respective country, while others were inspired by the RE-DISS project. As already mentioned, the measureable error in disclosure information provided to consumers was reduced through these improvements from 243 TWh/a at the time of the project launch to 75 TWh/a towards the end of the project period. Correlated with this, the underestimation of CO_2 emissions reported to consumers was reduced from some 103 million tons per year at the beginning of the project to 55 million tons per year towards the end of 2012.

The analysis also shows that there is still a need for significant further improvements in order to make the disclosure systems really reliable and to further reduce disclosure errors. This relates to further improvements in relation to the cross-border transferability of GOs, the coordination of the lifetime rules for GOs, the coordinated calculations of residual mixes and the further recommendations given by RE-DISS on implementing reliable disclosure systems. Thus it is important that the 17 domains covered by the analysis and also other European countries continue to develop their disclosure systems further in line with the RE-DISS Best Practice Recommendations.

The RE-DISS project has also looked into the feasibility of expanding the instrument of Guarantees of Origin from the electricity sector to the sector of heat and cooling from renewable energy sources. This is provided for in the 2009 RES Directive as an option for member states. Chapter 5 of this report assesses the potential use of such GOs and the potential design of a GO system for heat and cooling from RES. Given the absence of connected grids for heat and cooling from RES and related opportunities for trading attributes related to the generation of heat and cooling, it is difficult to see a

[3] Contract-based tracking denotes the allocation of disclosure attributes based on the contracts concluded by market participants in the electricity market.

useful application for GO in this market segment in the near future. Consequently, only two countries (Austria and Portugal) have made first preparations for the implementation of GO systems for thermal energy from RES, but due to a lack of demand for this instrument none of the two systems are actually in operation. The RE-DISS project provides a set of recommendations which should be followed if a country intends to actually launch such GO systems. However, this would only make sense if a market environment is created which supports the development of voluntary demand for heat and cooling from RES traded across different local systems for thermal energy.

In summary, the RE-DISS project has developed a detailed methodology for the implementation of reliable tracking systems for disclosure and has supported the improvement of existing tracking procedures in many countries. However, much work still remains to be done to further improve the information of the origin of electricity which is given to European consumers. Follow-up activities to the project should include the provision of further guidance for countries with advanced tracking systems as well as specific support for countries with less advanced tracking systems, continued maintenance of the Best Practice Recommendations and further improving and managing qualitative and quantitative data. This of course includes the provision of annual data on the European Attribute Mix for use by national competent bodies.

The project team has applied for funding for a “RE-DISS II” project under the 2012 call for proposals of the Intelligent Energy Europe programme, and it is likely that a grant for such a follow-up project will be provided as of spring 2013. In the medium term, an appropriate organisational structure should be established, which is able to ensure that the relevant tasks for making sure reliable disclosure data for European electricity consumers are carried out continuously. Such a structure could involve bodies such as the European Commission, ACER and CEER as European bodies of energy regulators, ENTSO-E as the association of transmission system operators and the Association of Issuing Bodies, which is administering the European Energy Certificate System.

Content

List of Tables

List of Figures

Glossary

Association of Issuing Bodies:
The European organisation which governs the European Energy Certificate System (EECS). See http://www.aib-net.org.

(Electricity Generation / Disclosure) Attributes:
Pieces of information, which are tracked in order to disclose information to consumers under electricity disclosure. Most important attributes for disclosure are the energy source and the associated CO_2 emissions and radioactive waste.

Available attributes:
Attributes that are not explicitly tracked in order to disclose certain consumption. The pool of yearly available attributes in a domain constitutes the domestic residual mix.

Cancellation:
The realisation of the value of a certificate. A certificate can be cancelled only once. Upon cancellation a certificate ceases to be transferable.

Certificate:
An evidence which represents the attributes of an instance of electricity generation for a certain tracking purpose and which can be transferred between different owners. Certificates are usually held as electronic records in a database (registry) and their typical life cycle is issuing, transfer and cancellation. It is quite common to issue certificates in units related to 1 MWh of electricity.

Cogeneration Directive:
EU Directive 2004/8/EC of the European Parliament and of the Council on the promotion of cogeneration based on a useful heat demand in the internal energy market.

Cogeneration GO (CHP-GO):
A Guarantee of Origin issued for electricity produced from high efficient cogeneration as defined by the Cogeneration Directive.

Competent Body:
A person or a body appointed by legislation to supervise systems of electricity disclosure or the issuance, transfer and cancellation of Guarantees of Origin. There can be only one competent body per tracking mechanism in a domain. The competent bodies for RES-GOs, cogeneration GOs, and Disclosure in a domain can be identical; this supports the coordination of these instruments.

Contract-based tracking:
Allocation of disclosure attributes based on the contracts concluded by market participants in the electricity market.

Directive 2003/54/EC:
Directive 2003/54/EC of the European Parliament and of the Council concerning common rules for the internal market in electricity and repealing Directive 96/92/EC. This Directive has been replaced by Directive 2009/72/EC.

Directive 2009/28/EC:
Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

Directive 2009/72/EC:
Directive 2009/72/EC of the European Parliament and of the Council concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC.

Directive 2012/27/EC:
Directive 2012/27/EC of the European Parliament and of the Council on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC.

(Electricity) Disclosure:
Based on Directive 2009/72/EC electricity suppliers are required to disclose to their customers certain average attributes of the electricity which they have supplied in the previous year. This comprises all products which a supplier offers to its customers. Sometimes suppliers are also allowed to add specific information about the specific product bought by a customer.

Disclosure period:
The period of time which is used as the accounting period for energy consumption and the attributes which suppliers of electricity have acquired for disclosure purposes. Directive 2009/72/EC defines that the disclosure period is one year. The RE-DISS recommendation is that this should be the calendar year.

Domain:
A single administrative region in which the rules for a tracking system are defined consistently and are supervised by a competent body. Usually each country in Europe forms one domain. However, there may be several domains in one country, like it is the case in Belgium, and in the future it might also be that several countries jointly form a single domain.

Double counting:
The attributes from an instance of electricity generation should only be used once for disclosure. If for example a MWh of RES-E is allocated to two or more different consumers or their suppliers, then this denotes a case of double counting. Double counting mostly occurs due to improper design of tracking systems, but it might also be caused by errors or fraud.

Electricity from renewable energy sources (RES-E):
Electricity from renewable energy sources as defined in Directive 2009/28/EC.

Environmental indicators:
Environmental information to be displayed to consumers under electricity disclosure in addition to the energy sources used for electricity generation. Typically this is CO_2 emissions and production of radioactive waste.

European Attribute Mix (EAM):
A calculatory pool of available attributes in residual mix calculations. It results from surpluses of available attributes compared to the volume of untracked consumption in surplus domains. The EAM is used to cover deficits of available attributes compared to untracked consumption in deficit domains.

European Energy Certificate System (EECS):
A harmonised European system for the handling of Guarantees of Origin and other energy certificates, which is operated by the Association of Issuing Bodies. EECS is the only standardised system for implementing Guarantees of Origin in Europe.

Explicit tracking:
A mechanism which allows the bilateral allocation of electricity attributes from a generator to a final consumer or its supplier. The allocation might also involve traders as intermediaries. Explicit tracking is usually implemented based on Guarantees of Origin, but there may also be other explicit tracking mechanisms.

External domain:
Domains outside the area for which the calculation of residual mixes is implemented in a coordinated way.

Guarantee of Origin (GO):
A unique means of proving the origin of an instance of electricity for purposes of electricity disclosure. Most usual are RES-GOs and cogeneration GOs, but the concept has already been extended to all other types of electricity generation.

Implicit tracking:
A mechanism which allows allocating electricity attributes from a group of generators to usually a large group of suppliers or final consumers for purposes of electricity disclosure. Implicit tracking is typically used if the origin of electricity is not known based on explicit tracking mechanisms. For this case most domains have defined a default set of attributes which can be used by suppliers. RE-DISS recommends the use of a residual mix for this purpose, which avoids double counting.

Registry:
An electronic database in which certificates such as electronic GO can be issued, transferred and cancelled. Typically there is one registry per domain. In order to allow transfers of certificates between domains, the registries must be connected and the definition of the information content of the certificates needs to be harmonised.

(Other) Reliable Tracking Systems (RTS):
Explicit tracking systems other than Guarantees of Origin which are used for purposes of electricity disclosure and which fulfil the criteria of added value, reliability and transparency as defined in the E-TRACK recommendations. Typical examples of Reliable Tracking Systems are allocation mechanisms for electricity which has been supported under a feed-in support system.

Residual mix:
A pool of available generation attributes which are not explicitly tracked in order to disclose certain consumption.

Residual mix calculation:
An implicit tracking mechanism in which shares of energy sources and environmental indicators of untracked consumption are determined by the statistical mix of available attributes.

(Individual) Supplier mix:
The total of all products sold to final consumers by an individual supplier, expressed in fuel mix and environmental indicators as required for electricity disclosure.

Supplier's remaining mix:
The difference between the individual supplier mix of a supplier and the attributes of all the products, which the supplier sells with claims regarding the origin of the electricity (e.g. "green" products). The volume of the remaining mix is equal to the electricity sales to final consumers under a "residual" or default product of the supplier, which is not advertised with ex-ante claims regarding the origin of the electricity.

Total supplier mix:
The total volume of attributes disclosed in a domain, both explicitly tracked and those disclosed through the residual mix, expressed in fuel mix and environmental indicators as required for electricity disclosure.

Tracking:
A methodology for the accounting of generation attributes in the electricity market and their allocation to final consumption of electricity, mostly for purposes of electricity disclosure. There are explicit and implicit tracking mechanisms.

Untracked consumption:
Electricity consumption that is not disclosed by using explicit tracking mechanisms such as GOs. Untracked consumption should be disclosed based on the residual mix.

List of Abbreviations

AIB	Association of Issuing Bodies (see http://www.aib-net.org)
CHP	Combined heat and power (cogeneration)
CHP-GO	Guarantee of Origin for high-efficient cogeneration, issued under the CHP Directive
EAM	see “European Attribute Mix” in the glossary
E-TRACK	The European project “A European Tracking System for Electricity” which was carried out in two phases (I and II), see http://www.e-track-project.org
EU	European Union
EU27 countries	The 27 EU member states as of 2012
EU29 countries	EU27 countries plus Switzerland and Norway
FOS	Electricity from fossil energy, as a category of energy sources under disclosure
GO	Guarantee of Origin
HE cogeneration	High efficient cogeneration as defined by the Cogeneration Directive
kWh	Kilowatt-hour (unit of (electric) energy)
MWh	Megawatt-hour (unit of (electric) energy which equals 1.000 kWh)
NUC	Electricity from nuclear energy, as a category of energy sources under disclosure
PYBM	Production year-based method for the calculation of residual mix
RECS	Renewable Energy Certificate System
RES Directive	see “Directive 2009/28/EC” in the glossary
RES	Renewable energy sources, also used for electricity from fossil energy as a category of energy sources under disclosure
RES-E	Electricity from renewable energy sources
RES-GO	Guarantee of Origin for (electricity from) renewable energy sources
RTS	see “Reliable Tracking Systems” in the glossary
TBM	Transaction-based method for the calculation of residual mix
TWh	Terawatt-hour (unit of (electric) energy which equals 1.000.000.000 kWh)

1 Challenges of implementing electricity disclosure

In liberalised electricity markets, consumers have a choice not only of their energy supplier, but also of the energy product they wish to buy. As a result, they can choose among different offers in terms of price, but also in terms of company profile and the sources of energy and technologies used for electricity production.

While transparency about the prices of electricity offers can be achieved relatively easy and company profiles are visible in public media and through the internet, it is much more difficult for consumers to find out what is actually happening "behind the socket". Consumers cannot see automatically from which sources a supplier has purchased or produced its electricity. In order to overcome this, electricity suppliers in Europe have been required since 2004 to disclose to their consumers the origin of the energy they have delivered. The objective of this regulation is to support the development of an electricity market which is not based on price alone, but also criteria related to the type of electricity generation and the related environmental effects. Electricity disclosure is thus meant to enable consumers to make an informed choice about the energy they buy, taking into account different parameters (Boardman et al. 2003, Boardman, Palmer 2007).

The disclosure requirement was implemented for the first time by the Internal Energy Market Directive 2003/54/EC. The regulations on electricity disclosure have been taken over in Article 3 (9) of the revised Energy Market Directive 2009/72/EC, which had to be implemented by EU member states by March 2011.

Based on both directives, electricity suppliers have to specify the fuel mix used for the production of electricity and the CO_2 emissions and production of radioactive waste related to power generation. This information must relate to the "supplier mix", i.e. all energy sold by a supplier to final consumers of energy, and must be determined retrospectively for the previous year. The fuel mix information must be sent to consumers as part of the electricity bills or as a supplement to these bills, and must also be specified on promotional materials, whereas for the environmental indicators a reference to a website or similar publicly available information sources can be sufficient. Member states can specify further details on the environmental indicators, such as whether additional indicators must be provided or whether this information must also be communicated on or with the bills.

Compared to the regulations from 2003, the 2009 Directive added a clarification that the energy regulator in each country or another competent national body must supervise the fulfilment of the disclosure regulation, and ensure that the information provided to consumers is reliable. The 2009 Directive also added the requirement that the disclosure information must be provided to consumers in a comprehensible and clearly comparable manner. The comparability on at least a national level must be ensured.

If a supplier offers different products, e.g. a "green" offer and a standard product, the requirement to disclose the supplier mix comprises all products sold to final consumers. However, when implementing the European Directives, many countries have added the

possibility of providing information about individual products in addition to the supplier mix.

Based on the 2003 Directive, the European Commission has issued a note to the member states in 2004, which sets out recommendations for how the electricity disclosure requirement should be implemented. This note addresses the general concept of disclosure, the way how disclosure information should be presented and the procedures how the information about the origin of electricity should be determined by the suppliers. The RE-DISS project has developed a proposal for revised Commission guidelines for disclosure as one of its deliverables.[4]

Issues related to the "front side" of disclosure, such as which categories of energy sources should be used for the fuel mix display and how the fuel mix data and the environmental indicators could be displayed to consumers in a harmonised way, have been addressed by previous projects, such as the "4C electricity project" (Boardman et al. 2003). The RE-DISS project and its predecessor E-TRACK focus on the question how information on the generation of electricity can be "tracked" in the electricity market from the generators to the consumers.

"Tracking" generally means a methodology for the accounting of generation attributes in the electricity market, such as fuel mix and the environmental indicators mentioned above, and their allocation to final consumption of electricity. As Figure 1 shows, there are three options for how tracking could be implemented:

- along the physical flows in the electricity grid;
- along the trading arrangements ("contracts") in the electricity market; or
- as a separate accounting mechanism, which is independent from the physical flows and from electricity contracts.

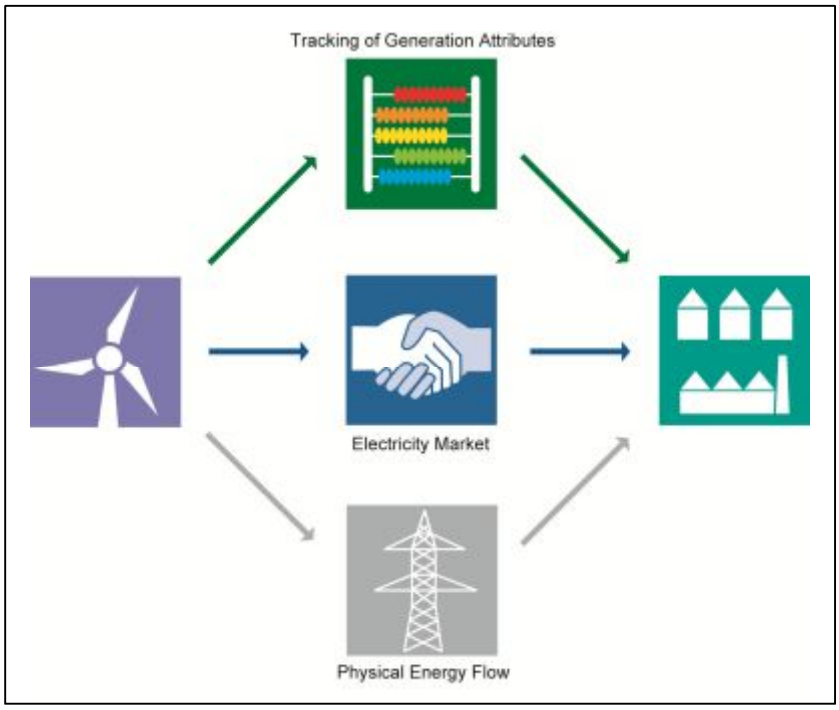
The energy flows in the grid are following physical laws rather than individual market activities and thus cannot provide a good basis for the tracking of attributes. It is also not possible to base the tracking on electricity contracts on a large scale because the trading arrangements in liberalised electricity markets are too complex for this purpose. Furthermore, if the disclosure attributes would have to be traded together with the electricity, it would severely damage the liquidity of the electricity markets.[5] Therefore the tracking of attributes should in principle be separated from physical flows and from electricity contracts, thus forming a separate level of interaction between generators and suppliers of final customers, as shown in Figure 1. However, some linkages between tracking and the electricity contracts may be retained under certain conditions (see chapter 2 for related recommendations).

---

[4] This draft can be downloaded from the RE-DISS project website: http://www.reliable-disclosure.org/documents

[5] See the reports from the E-TRACK project for further details on this discussion.

Figure 1: Interaction levels in the electricity market



Source: Timpe 2009

The Renewable Energy Directive 2009/28/EC provides a very important tool for tracking, the Guarantee of Origin (GO). Based on Article 15 of this Directive, member states must provide the possibility to producers of RES-E to receive a GO which can serve as a proof of the generation of 1 MWh of renewable energy for purposes of electricity disclosure. In order to clarify this purpose of the GO, the RES Directive explicitly refers to the Internal Energy Market Directive.

Such GOs must be issued by a national competent body on request of the producer, which means that under the RES Directive the use of GOs is voluntary. The Directive requires that the GOs must be unique (only one GO may be issued for a single MWh of electricity produced and a GO may not be duplicated) and that they are accurate, reliable and fraud-resistant. As far as these conditions are met, member states are required to accept GO issued by other member states (and other countries which have implemented GO based on the RES Directive such as Norway and Switzerland) for disclosure purposes.

As stated in Article 15 and Recital 52 of the RES Directive, disclosure is the only purpose of the GO. The GO has no function in relation to the national targets for renewable energy, which are set out in Article 3 of the directive. They should also not be used for purposes of administering a national support scheme. Some countries which are using a purchase obligation as their public support scheme have introduced separate "support certificates", such as the ROC in the United Kingdom and the "Elcert" in Sweden and Norway.

The system of GOs is well established in many, but not yet all, European countries. Competent bodies from 12 countries, including the non-EU members Norway, Switzerland and Iceland, have joined a voluntary system of coordinated implementation of GO, the European Energy Certificate System (EECS).[6] The EECS supports the issuing, transfer and cancellation of electricity GOs for RES-E and also for other types of electricity generation and has established an electronic hub, through which national registries can easily perform cross-border transfers of GOs.

Within the EECS system, GOs representing 208 TWh of RES-E generation were issued for production in 2011. This is equivalent to 28 % of total RES-E generation in EU29 countries and 49 % in relation to the RES generation in the countries which had joined EECS by 2011. The volume of GOs transferred through EECS across country borders was 181 TWh in 2011. This shows that the GO systems implemented by EECS members have already created an international market with a significant volume.

There is no other mechanism of cross-border coordination and transfer of electronic GOs in Europe besides EECS. However, the analysis carried out in the RE-DISS project shows that a number of countries are lagging behind in implementing GOs for RES-E or in modifying outdated existing schemes according to the requirements of Directive 2009/28/EC. Thus a number of countries are not yet active in issuing GOs under this directive, while a few countries have established only domestic GO schemes so far and do not accept electronic imports of GOs.

European legislation also provides for GOs for electricity generated from high-efficient cogeneration of heat and power (HE cogeneration). The respective regulations were originally contained in Directive 2004/8/EC and have recently been included in Article 14 (10) of the new Energy Efficiency Directive 2012/27/EC. In contrast to the RES-GO in Directive 2009/28/EC, the definition of the cogeneration GO does not establish a clear link to the disclosure requirement of the Internal Energy Market Directive. Furthermore, the concept of fossil-based cogeneration is more difficult to understand and is less favoured by consumers than renewable energy. This seems to be the main reason why the cogeneration GO has barely developed a relevant meaning in electricity disclosure on the European level to date.[7]

The E-TRACK project recommended expanding the concept of GOs from electricity generated on the basis of RES and HE cogeneration to all forms of electricity in order to support a reliable and explicit allocation of the attributes of any type of power generation for disclosure purposes. Still, the actual use of GOs would be voluntary for generators and suppliers of electricity and thus GOs would mostly be used for products which are specified towards the customers in the electricity market with regard to their

---

6 For details on EECS, see the EECS website http://www.aib-net.org.

7 For more information please see the related report from the E-TRACK II project, which can be downloaded from the E-TRACK project website: http://www.e-track-project.org/docs/final/WP4_D5_CHP%20GO%20Report_final2.pdf

origin. So far, only few countries are issuing GOs for electricity generation from fossil and nuclear generation, such as Austria, the Netherlands, Sweden and Switzerland.

In summary, the concept of voluntary GOs as defined by European legislation can be a powerful tool for the tracking of electricity. So far, its use is mostly limited to the "green" power market. This implies that the current concept of GOs is not sufficient for establishing a comprehensive tracking system which enables suppliers to determine the disclosure information in a reliable way.

In practice, a variety of tracking mechanisms are being used in Europe in addition to GOs. In some countries, competent bodies have clearly defined the acceptable mechanisms, while in others the details of how electricity disclosure information is determined are left to the market actors. In some of the latter cases, recommendations have been developed, e.g. by a branch organisation of the electricity industry, but such recommendations are usually not binding and therefore cannot ensure a consistent implementation of tracking in a domain.

A major finding of the RE-DISS project is that a lack of stringent rules on which tracking mechanisms may be used in a domain and how they are defined and coordinated across borders results in a significant error in the disclosure information given to consumers in Europe. As shown in more detail in chapter 4.3, the project was able to estimate the measureable error at 243 TWh of wrongly disclosed electricity at the time of the project launch. This corresponds to 11 % of the total electricity consumption in the countries examined. The figure contains a double counting of 105 TWh of electricity from RES (18 % of all RES electricity generated), disclosure of 102 TWh of electricity as energy of "unknown" origin (without attributes) and 36 TWh of fossil and nuclear energy which was double counted. Since not all errors identified by the project could be quantified, it is very likely that the actual error was even higher.

For the further discussion of the reasons for such errors, it is important to introduce the terms "explicit tracking" and "implicit tracking".

- Explicit tracking denotes mechanisms such as GOs, which allocate the generation attributes of a given power plant to the supplier mix of a supplier, or to one of the products offered by a supplier. An important characteristic of explicit tracking is that it is used deliberately: For example, a supplier purchases electricity and certain attributes and pays a price which reflects the specific attributes asked for. Besides GOs there can be other certificate systems with a similar functionality, such as RECS certificates or private tracking schemes. Another form of explicit tracking is the so-called "ex ante contract-based tracking" in which generators, traders and suppliers add attribute information to contracts in the electricity market.
- In contrast, implicit tracking means mechanisms which allocate the generation attributes of a (potentially large) group of power plants to a supplier for disclosure purposes. Implicit tracking does not mean a deliberate allocation of certain attributes. Instead, the supplier will receive a certain attribute mix which it does

not know beforehand. The most important method of implicit tracking is the definition of a default data set of disclosure attributes, which suppliers in a country can use in case that they are not able to cover their electricity sales to final consumers based on explicit tracking mechanisms alone. (Chapter 2.2 will introduce the residual mix as the recommended tool for this purpose.)

In a simplified sense, it should be easy to account for all the attributes of electricity generation correctly in a given year, without double counting of attributes or losing information. If losses as well as imports and exports to other parts of the world are properly dealt with, then the volume of electricity consumption should match the volume of all attributes available for disclosure purposes. However, in reality this is often not the case.

During the research performed in the RE-DISS project, the following types of problems have been identified in the implementation of electricity disclosure in Europe:

- Double counting in different explicit tracking instruments: This error occurs if the same unit of electricity is tracked by two separate explicit tracking mechanisms; for example, if two GOs are issued and used separately for the same unit of electricity, or if a GO and a different explicit tracking mechanism are used.
- Double counting of attributes in implicit tracking system: This type of error can occur for a number of reasons, which all are related to insufficient coordination of implicit tracking mechanisms with explicit tracking and with the mechanisms used in other countries. The most prominent error occurs if suppliers are using generation statistics from a country or region, which are not corrected by the attributes covered by explicit tracking.
- Double counting within an individual supplier's mix: This error can easily occur if disclosure of the supplier mix (as required by European legislation) is supplemented with a possibility for suppliers to also disclose individual products. If a supplier offers a "green" product based on renewables to part of its customers and discloses the related attributes to them, and discloses only the supplier mix to its other customers, the second customer group will not understand that part of the renewable energy share in this mix is exclusively allocated to the "green" customers. Thus the other customers will overestimate their renewable energy share.
- Loss of disclosure information and intransparency for consumers: There are several reasons which can lead to this type of error. For example, some countries allow suppliers to disclose a share of electricity as "unknown origin". If this option is used, it means that some attribute information has been lost. Furthermore, not all countries have yet implemented full disclosure, including CO_2 emissions and radioactive waste.
- Leakage of attributes and/or arbitrage: This type of error occurs if different countries have not coordinated their practices of handling GOs or other parts of the tracking system. For example, if GOs related to a certain production period

expire in one country at a certain point in time, but could continue to exist and be used in another country for a longer time, it will create incentives for the owners of GOs to move their GOs from the first to the second country, independently from the demand for the respective attributes. Also, if a country issues or imports GOs, but allows them to be cancelled without using the attributes for disclosure purposes, then a loss of attributes will occur.

- Unintended market barriers: Such barriers can be the result of incomplete implementation of tracking systems. Most prominently, it was not possible at the beginning of the RE-DISS project to import and export GOs between all countries in Europe, although this was required by the "old" RES Directive since 2003.

The next chapter describes the recommendations which have been developed by the RE-DISS project in order to overcome these problems.

2 Major recommendations for reliable disclosure systems

The RE-DISS project has developed a set of Best Practice Recommendations (BPR) for competent bodies which are responsible for implementing the systems of Guarantees of Origin and electricity disclosure on a national level. This set of recommendations is based on intensive discussions between experts from the project team and representatives of competent bodies from 19 countries during six workshops between May 2010 and June 2012. Nevertheless, the responsibility for the content of the BPR remains with the project team and they cannot be more than recommendations to member states and to competent bodies, as the project has no mandate from the Commission or any other official body to develop binding requirements. Notwithstanding this, the BPR are certainly the best available reference for the future development of tracking systems in Europe and should thus be followed by all countries as closely as possible in order to discharge their responsibility to ensure the reliability of disclosure information provided to consumers.

The recommendations address implementation details for Guarantees of Origin, different issues related to reliable tracking systems, the calculation of Residual Mixes and proposals for the coordination of the processes around disclosure between member states. The latest version 2.1 of the Best Practice Recommendations is reproduced as Annex 1 to this report. The following sections of this chapter summarise the contents of the BPR, with the exception of issues related to Residual Mix calculations, which are addressed in chapter 3 of this report.

2.1 Implementation of Guarantees of Origin

The BPR suggests that the concept of Guarantees of Origin is extended beyond RES-E and high-efficient cogeneration (HE cogeneration) to all types of power generation. Thus, member states should implement “disclosure GOs” for electricity from fossil and nuclear generation under similar rules as those defined by European legislation for GOs issued for RES-E and HE cogeneration.

No more than one GO should be issued for each MWh of electricity and all GOs should be clearly linked to electricity disclosure. This keeps the role of all GOs consistent with the definitions for RES-GO in the RES Directive. In case that other transferable evidence is used, e.g. for administering a certificate-based support mechanism, then such support certificates should be separate instruments to the GO. In case of biomass-fired cogeneration plants, only one GO should be issued per unit of electricity, which should combine the functionalities of a RES-GO and a cogeneration GO.

In order to simplify the management of GOs for RES-E and HE cogeneration as well as disclosure GOs in a domain, all types of GOs should be handled in a single registry per domain. This can be implemented in the most efficient way if the same competent body is nominated for the different types of GOs.

The BPR also recommends that all European countries should implement their GO systems based on the European Energy Certificate System (EECS) operated by the Association of Issuing Bodies (AIB). EECS is a ready-to-use standard for the implementation of electronic GO systems in Europe, which reflects the requirements of European Directives and coordinates the details of GO systems, including the electronic interfaces for transferring GOs between registries in different countries. Membership in EECS is not required by European legislation, but the AIB is working closely together with the Commission and the EECS thus represents an important means for voluntary coordination and harmonisation of national GO systems.[8]

The most important infrastructure provided by EECS is an electronic Hub, which facilitates the transfer of GOs between registries in different countries. By using the Hub, each registry has to maintain only one electronic interface, instead of large a number of individual, peer-to-peer interfaces with all registries to which imports or exports of GOs are taking place. This significantly reduces the complexity of operating the software systems.[9]

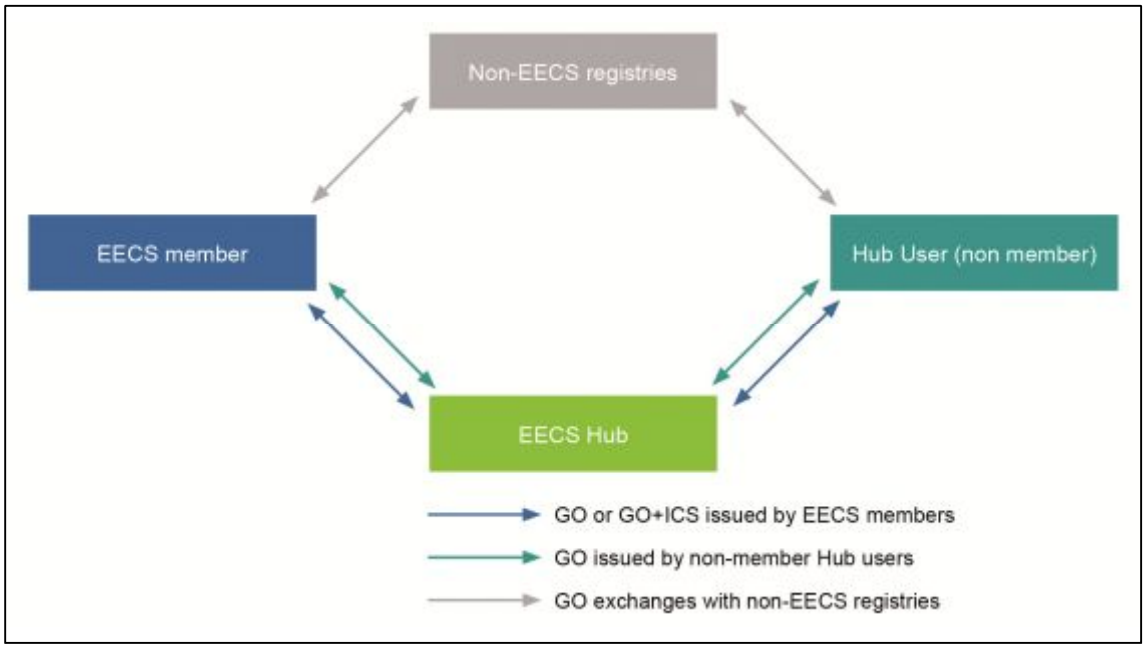
Until end of 2012, membership in EECS was a prerequisite for using the EECS Hub. However, reflecting the fact that not all competent bodies are able or willing to become members of an association such as AIB, access to the EECS Hub will be opened also to non-members of EECS during 2013, under the condition that certain harmonisation measures are implemented and a contract is concluded with the AIB. As shown in Figure 2, EECS members and non-member "Hub Users" will be able to exchange their GOs through the Hub in future. At the same time both are also allowed to exchange GOs with other non-EECS domains. However, it will not be possible to transfer GOs issued by a non-EECS registry through the Hub.

The issuing of GOs should always be based on the net electricity generation of a power plant (i.e. gross generation minus the consumption of all auxiliaries related to the process of power production). For hydro power plants involving pumped storage, this means that GOs should be issued only for the net generation which can be attributed to the natural inflow into the reservoir.

[8] For more information on EECS, see chapter 1.

[9] However, in the case that not all European countries are connected to the EECS Hub, bilateral interfaces might still be needed for transfers to and from the non-connected countries.

Figure 2: Interaction of EECS members and non-EECS members with the EECS Hub



Note: ICS (Independent Criteria Schemes) is a term used within EECS for labels which can be added to a GO, which denote that the underlying electricity complied with eligibility criteria of certain quality schemes, such as sustainability schemes for biomass or green power quality labels.

Source: Authors' own compilation, based on documents from the AIB

The directives on renewable energy and energy efficiency require member states to recognise GOs issued by other member states for the purposes of disclosure. This recognition may only be rejected in the case that there are well-founded doubts about the accuracy, reliability or veracity of the GOs in question. The BPR recommends that each country sets up clear criteria for the recognition of imported GOs. First of all, these criteria should define the accepted electronic interfaces for import (including the EECS Hub) and the required data format and content of the GOs.

The BPR proposes that besides these fundamental, "technical" requirements, a check of further conditions for the recognition of an imported GO should only be made at the time when the GO is going to be cancelled. This means that transfers of GOs should be possible between registries in different countries without checking the acceptability of a GO for each transfer. This supports a liquid market for GO trade.

The BPR suggests that mutual recognition of GOs should not be limited to EU member states, but should also encompass other members of the European Economic Area (EEA),[10] Switzerland, and in the future also the parties to the Energy Community Trea-

[10] The EEA comprises the member states of the EU, Norway, Iceland and Liechtenstein.

ty.[11] A condition for recognition should be that the GOs were issued in one of these countries based on the RES Directive or compatible national legislation, and that they meet the explicit requirements set in the Directive, e.g. regarding the information content of the GO.

The BPR recommends that GOs should be rejected if the country which has issued the GOs or the country which is exporting the GOs have not implemented appropriate measures which effectively avoid double counting of the attributes represented by the GOs. Such appropriate measures should:

- ensure the exclusivity of the GO for representing the attributes of the underlying electricity generation;
- implement clear rules for disclosure; and
- establish a proper Residual Mix (see chapter 3) or equivalent measures, and ensure their actual use.

Furthermore, the issuing and the exporting country should ensure that attributes of exported GOs cannot be used for disclosure at any time in their domains, unless the GOs are re-imported and cancelled there.

Based on the BPR, GOs should also be rejected in case that the issuing country has not implemented an electricity disclosure system.

The BPR suggests that cancellations of GOs should always take place in the registry of the domain where the attributes will be used for disclosure purposes. So-called "ex-domain cancellations", where the GOs are cancelled in a different domain, should only be accepted if a secure electronic transfer of the GOs to the domain in question is not possible and if there is an agreement on such ex-domain cancellations between the competent bodies involved. This recommendation is in line with the practices within the EECS system.

While the RES Directive defines GOs primarily as a tracking tool for purposes of electricity disclosure by suppliers, some European countries have chosen to also allow final consumers of electricity to use GOs in order to influence the attributes of their energy consumption. This is acceptable under the BPR, as long as the conditions for the use of GOs by end consumers are clearly defined and a correction is implemented in the disclosure scheme of that country, which compensates for any "double disclosure" of energy consumed.

The RES Directive also specifies that *"any use of a GO shall take place within 12 months of production of the corresponding energy unit."* During the RE-DISS project, an intensive discussion took place on how this rule should be implemented in detail. As a result, the BPR recommends that the lifetime of GOs should be limited to

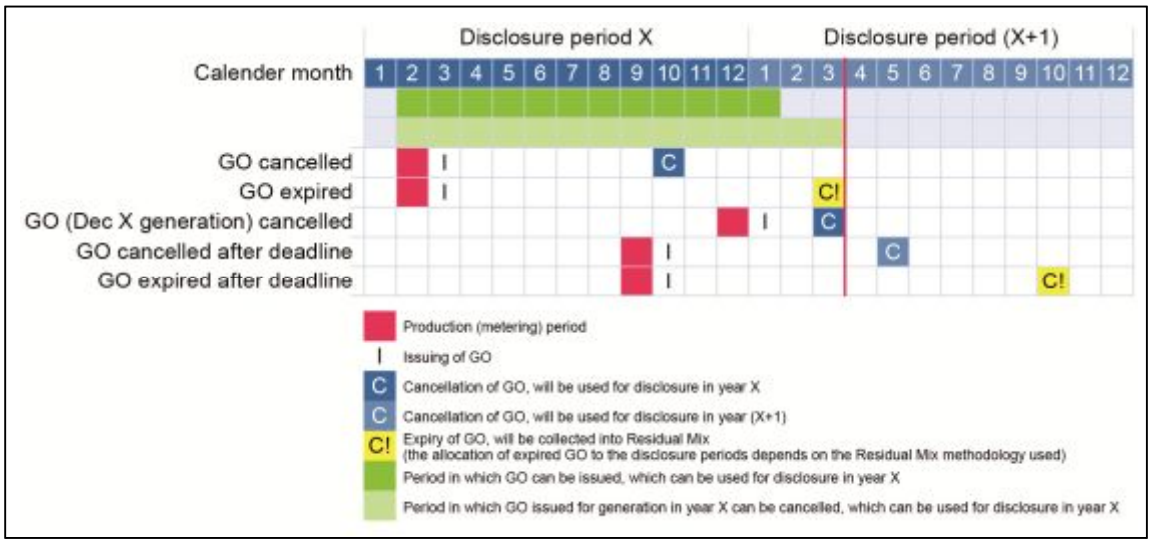
[11] For details, see http://www.energy-community.org.

12 months after the end of the production period. GOs which have reached this lifetime should expire and their attributes should be collected into the Residual Mix (see chapter 3). The production periods used for issuing GOs should be no longer than a calendar month. Longer intervals of up to one year are acceptable, e.g. for very small plants. Furthermore, the issuing of GOs should take place as soon as possible after the end of each production period. With these rules, a pragmatic and consistent approach to the lifetime of a GO has been determined.

A limited extension to a 12 month lifetime as defined in the BPR should only be granted if a GO could not be issued for more than six months after the end of the production period for reasons which were not fully under the control of the plant operator.

As mentioned in chapter 2.3 below, electricity disclosure should always be performed with reference to a calendar year. Following from the rules above on the lifetime of a GO, it is necessary to clarify how the attributes of cancelled and expired GOs should be allocated to the disclosure periods. As shown in Figure 3, the cancellation of GOs issued for production in calendar year X can take place until late in year X+1. The BPR recommends introducing a deadline for cancellations of GOs for purposes of electricity disclosure for year X, which should be set at 31 March of year X+1 in all countries. Cancellations of GOs relating to production periods in year X which occur by this deadline should be counted in disclosure for the year X. Later cancellations should be counted in disclosure for the year X+1. The attributes of expired GOs, which relate to production periods in year X, can be allocated either to the residual mix of year X or to that of year X+1. This should be decided as part of the Residual Mix calculation methodology used in the respective domain (see chapter 3).

Figure 3: Recommended implementation of the 12 month lifetime rule for GOs



Source: Authors' own compilation

It should be noted that the rules for the lifetime of GOs set by the BPR might require suppliers of renewable energy to perform cancellations of GOs more than once a year: The first round of cancellations have to take place no later than in January of year X+1, otherwise GOs relating to production in January X would expire. In the case that not all GOs relating to production in December X are already issued and transferred at this point in time, a second round of cancellations will have to take place in February or March of year X+1.

As an alternative to the approach chosen in the BPR, this procedure and the allocation of GOs to disclosure periods could be simplified if the lifetime of GOs would be limited to the disclosure deadline of the corresponding year. In this case all GOs relating to production in year X would expire after 31 March X+1. However, this would restrict the lifetime of GOs for production after March X to less than 12 months, and GOs for production in December X would live only up to three months. This is the reason why this stricter approach was not adopted in the BPR.

2.2 Reliable tracking systems for disclosure

The GO, as supported by European legislation, is the most robust and standardised tracking tool in Europe. It is commonly used in order to create reliable electricity products, e.g. “green power” which is only using RES-E.

In principle, electricity disclosure towards all energy consumers could be supported by a tracking system which is exclusively based on GOs and does not accept any other means of tracking. However, given the complexity of the electricity market, even in this case it can happen that a certain share of the energy mix of suppliers cannot be covered by cancelled GOs, and thus the suppliers must either be allowed to disclose a share of energy with “unknown” origin (this is the case in Switzerland, for example), or to use a default set of disclosure data (a residual mix, see chapter 3).

Most countries do not restrict the accepted tracking mechanisms to GOs. Actually, many countries leave the choice as to which tracking mechanisms can be used for disclosure to the market participants. On the one hand, this is in line with the voluntary character of the GOs as defined in the RES and Cogeneration Directives. On the other hand, member states and their regulatory authorities are responsible for the reliability of the disclosure information provided to consumers. This entails a need to verify the accuracy and completeness of the tracking mechanisms used by market participants. Based on the results of the E-TRACK project, the BPR recommends that the tracking mechanisms which are acceptable in a domain should be clearly defined by a competent body and should meet the criteria set out in the remainder of this chapter.

First of all, the GOs, implemented according to the recommendations in chapter 2.1, should be the only “tracking certificate” used in a domain. This means that any other tracking systems, which have a similar purpose and function as GOs, should be con-

verted to GOs. For example, this applies to many tracking systems operated by private organisations and labelling bodies. Accordingly, all green power quality labels should use GOs as the unique tracking mechanism.[12]

Besides GOs, all countries should provide a residual mix as a default set of data for disclosure of energy volumes for which no attributes are available based on other accepted tracking mechanisms. Chapter 3 provides details of the proposed methodology for the determination of the residual mix. The use of uncorrected generation statistics (e.g. on a national or regional level, such as the Nordel or former UCTE regions) should be avoided because they are not corrected by those parts of power generation which are covered by other tracking mechanisms; thus their use for disclosure inevitably leads to double counting of attributes and incorrect disclosure information.

In certain cases, it can be advisable to implement a third category of tracking mechanisms besides GOs and the residual mix. The BPR has defined three cases in which such "other Reliable Tracking Systems (RTS)" could be used:

- If there are non-competitive market segments in a country in which consumers have no choice of supplier or different products, homogenous disclosure mixes might be determined by a competent body. However, given the need under European legislation to fully open up the electricity markets for competition, such non-competitive segments will gradually disappear.
- Some types of support systems (e.g. feed-in tariffs for RES-E) may require a defined allocation of the attributes of supported generation to consumers for disclosure purposes, which cannot be reasonably implemented based on GOs. In this case a pro-rata allocation of the attributes to all consumers which are paying for the support system can be the adequate solution.
- Thirdly, an allocation of disclosure attributes based on the contracts concluded by market participants in the electricity market (also known as "contract-based tracking") may be implemented under certain conditions.

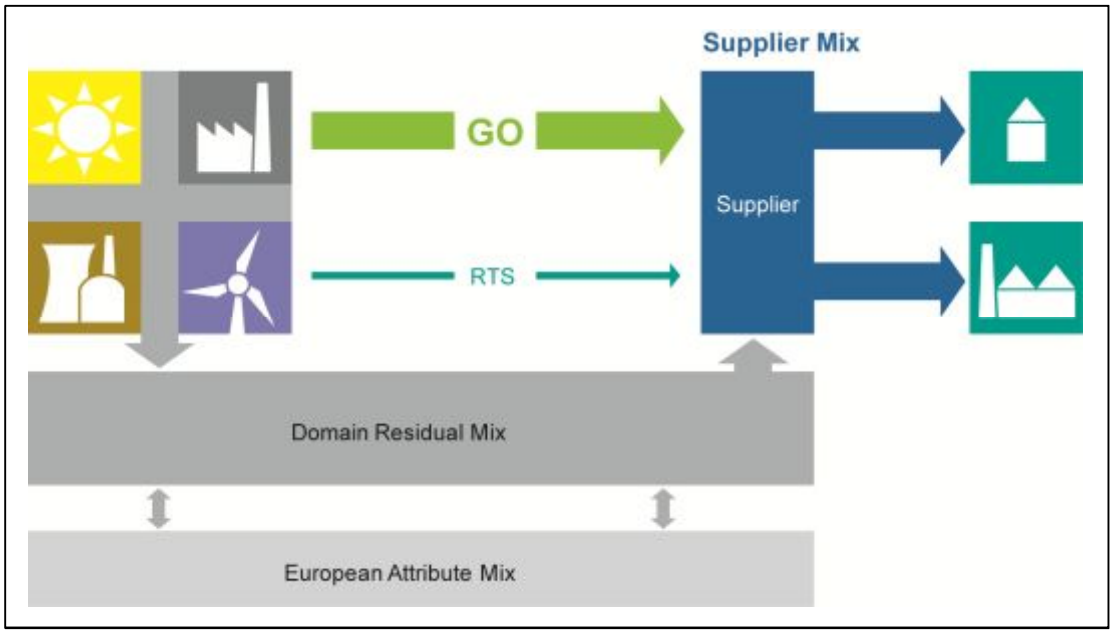
Such other Reliable Tracking Systems should only be introduced if they provide added value to the tracking system (in addition to GOs and the residual mix) and if they are implemented in a reliable and transparent way and thus do not endanger the reliability of disclosure information provided to consumers. For example, it must be possible to determine the attributes covered by each of the other Reliable Tracking Systems in order to remove them from the residual mix,[13] and the other Reliable Tracking Systems may not overlap with energy covered by GOs.

---

[12] Examples of such labels are the Swedish "Bra Miljöval", the Finnish "ECOenergy", the Swiss "naturemade" and the German "ok-power" and TÜV labels.

[13] This means that comprehensive statistics about the volumes and types of electricity attributes which are tracked through the Reliable Tracking System must be available on an annual basis and in time for the calculations of residual mixes as described in chapter 3.

Figure 4: Concept of a generic tracking system



Source: Timpe 2009

Besides GOs, the residual mix and other Reliable Tracking Systems as defined above, no other tracking mechanisms should be accepted. Figure 4 shows the concept of a tracking system based on GOs and a residual mix, which are possibly supplemented by other Reliable Tracking Systems (RTS).

In the case that a country decides to allow the use of contract-based tracking, the methodology for this mechanism should be regulated clearly by the competent body. These regulations should be transparent, comprehensive and clearly understood by all market participants. The regulations should avoid double counting of attributes and loss of disclosure information within the contract-based tracking scheme and also in the interaction of this scheme with GOs and other Reliable Tracking Systems (if applicable).

2.3 Other recommendations on disclosure

While the previous two chapters have focused on the tracking systems used, this chapter addresses the recommendations of the BPR with regard to the overall electricity disclosure system in a country.

First of all, it is necessary that all European countries implement full disclosure schemes, as required by Directive 2009/72/EC, which include the disclosure of CO_2 emissions and radioactive waste. As the analysis of the situation in selected countries in chapter 3.7 shows, there are still several countries in which such full disclosure has not yet implemented. It is also necessary to ensure that the disclosure information, at least the information relating to the fuel mixes of consumed energy, is brought directly

to the attention of the consumers, as part of the electricity bill or as an annex to this bill and in all promotional material made available to consumers.

The BPR also recommends that all countries should clarify the relation between their support schemes (e.g. for RES and HE cogeneration) and the tracking systems used for purposes of disclosure. Where necessary, a Reliable Tracking System should be defined for the attributes of supported generation (see chapter 2.2). If support schemes in a country are using transferable certificates, these "support certificates" should be separated from GO and should not be used for disclosure purposes.

The timing of the steps in calculating electricity disclosure information should be coordinated across Europe. This is needed because the calculations in the individual countries are interrelated: a consistent result in one country often depends on the timely availability of data provided by another country. The BPR recommends that:

- electricity disclosure should be based on calendar years (and for example not on financial years, which can differ from country to country),
- as already mentioned in chapter 2.1, a deadline for the cancellation of GOs for purposes of electricity disclosure for year X should be set at 31 March of year X+1 in all countries, and
- the timing of the steps for the calculation of the residual mix (see chapter 3) should be coordinated across Europe in a way which ensures that the disclosure figures relating to year X can be published and used by suppliers no later than as of 1 July X+1.

Whereas European legislation only requires that electricity suppliers disclose their overall fuel mix (the supplier mix) to their consumers, the BPR recommends allowing for an additional disclosure of the electricity products which certain consumer groups are buying. Thus the disclosure statement should always include information relating to the supplier mix, which is equal to the total of all products sold to final consumers, but suppliers can add product specific information to this statement. In all these cases, both fuel mix and environmental indicators should both be given.

However, if a supplier is offering two or more products which differ in terms of the origin of the energy, the supplier should be required to give product-related disclosure information. Such information should not only be given to those customers who are buying a product with a specific claim, but to all customers of the supplier. This means that even those customers buying a default remaining product of the supplier should receive information regarding this product.[14] With these recommendations, an implicit double counting can be avoided which would occur if the customers using the "residu-

[14] Many suppliers provide information on all their products in a single disclosure statement, which is made available to all their customers, using tables or graphs.

al" product of the supplier were to see only the supplier mix information, which includes the attributes of specific (e.g. "green") products supplied to other consumers.

For all products with claims regarding the origin of the energy (e.g. "green" or low-carbon power), the tracking of the origin of the energy should be based on cancelled GOs. No other tracking systems should be allowed for such products, with the exception of mechanisms required by law.[15] If such products are based on a contractual path in the electricity market, then GOs should be used in addition to the contract path (i.e. contract-based tracking and GOs should be bundled).

The BPR also recommends that there should be clear rules for the claims which suppliers of, for example, "green" power can make towards their consumers. Competent bodies should define rules for how the "additionality" of such products can be measured (the effect which the product has on actually reducing the environmental impact of power generation), and suppliers should be required to provide to consumers the rating of each product based on these rules. Claims made by suppliers and consumers of such "green" energy relating to carbon emissions and carbon emission reductions should also be regulated clearly. These regulations should avoid double counting of low-carbon energy in such claims. In this context a decision should be taken whether such claims should adequately reflect whether the energy purchased was "additional" or not.

For suppliers which are serving final consumers in several countries, rules should be developed and implemented consistently in the countries involved on whether the supplier mix of these suppliers should relate to all consumers or only to those in a single country.

Finally, the BPR has also set up some general recommendations with respect to the relation of disclosure to the cooperation mechanisms defined in Art. 6 – 11 of Directive 2009/28/EC. They advise that European countries should clarify the allocation of attributes of RES-E for disclosure purposes, which was generated by Joint Projects or by plants supported by Joint Support Schemes.

The full text of the BPR, as reproduced in Annex 1 to this report, also provides for an outline of the recommended steps for determining the disclosure figures of a supplier.

[15] This can include for example a pro-rata allocation of generation attributes to all consumers, which is related to a support scheme (see section 2.2).

3 Methodology of Residual Mix calculations

This section provides an overview of the residual mix calculation methodology. To view the full length description, please see the residual mix calculation methodology paper, which is published as an annex to the RE-DISS Best Practice Recommendations (see Annex 1 to this report).

3.1 Introduction

The need for residual mix calculations arises from the combined effect of Directives 2009/28/EC and 2009/72/EC but, interestingly enough, it is not mentioned in either of them and is still a rarity among national legislations and regulations transposing those Directives. Residual mix is an implicit disclosure mechanism in which volumes and shares of energy sources and environmental indicators of untracked electricity consumption are determined by the statistical mix of a domain's yearly generation attributes, available after explicit tracking.

Since not all production attributes are explicitly tracked using certificates or other reliable mechanisms, the residual mix provides a default fuel mix for electricity that is not explicitly tracked. The main purpose of the residual mix is to balance the production and consumption of production attributes; most importantly to make sure that sales and consumption of green electricity is not greater than its production.

Residual mix is defined on a domain level[16] and calculated based on a calendar year by accumulating data on electricity generation and consumption as well as explicit tracking of generation attributes. Figure 4 presents the idea of residual mix calculation as described in the final report of the E-TRACK II project (Timpe 2009).[17] Green attributes are removed from the production mix through explicit tracking (GOs and other reliable tracking systems (RTS)), and the leftover constitutes the residual mix.

Due to the international transfer of both electricity and generation attributes (through GOs), the calculation of residual mixes needs to be harmonised across Europe. The reason for this is that, for example, domains which are exporting GOs but are not exporting a corresponding amount of physical energy will result in a lack of disclosure information for their domestic consumption. More generally, hardly any country which is embedded in European markets for electricity and for GOs will be able to reach equilibrium between its trading balances of physical energy and of GOs and therefore all or

[16] With the exception that the three domains in Belgium only have a single residual mix. Under unified power markets (e.g. the Nordic countries) a broader approach can be taken as long as all associated domains agree upon it.

[17] See the E-TRACK project website: http://www.e-track-project.org.

nearly all European countries will need to balance their disclosure systems with other countries through the "European Attribute Mix".[18]

This means that domains themselves can calculate the domestic residual mix, but have to coordinate to form the European Attribute Mix, which is needed to counter-balance attribute deficits and surpluses caused by cross-border transfers of physical electricity and generation attributes. The data for such coordination in 2010 to 2012 was provided by the RE-DISS project.

The residual mix calculation process for a given domain and a given calendar year X divides into four phases, which are described in the following chapters:

1. Data collection
2. Determination of the domestic residual mix
3. Determination of the European Attribute Mix (EAM)
4. Determination of the final residual mix.

3.2 Data Collection

The relevant data for the calculation of the domestic residual mix of a domain includes:

- Net electricity production in the domain during year X by fuel type including tracked externalities such as CO_2 emissions and produced radioactive waste
- Electricity consumption in the domain during year X
- Net electricity export to and import from domains outside the residual mix calculation area[19] (external domains):
    - In the case of import, volume by fuel type including tracked externalities such as CO_2 emissions and produced radioactive waste
    - Information on electricity transfers between the domains within the residual mix calculation area is not needed for the calculations.
- Data on explicitly tracked attributes through GOs, other EECS certificates and certificate-based RTSs[20] within the domain and with other domains in the residual mix calculation area:
    - Volume of imports, exports and cancellations during 1.04. of year X – 31.03. of year X+1[21] per fuel type.

[18] For more details, see the E-TRACK II report. An alternative solution to the introduction of a European Attribute Mix would be to balance out differences between physical exchanges and GO transfers between countries on a bilateral basis. However, given the complex trading arrangements in Europe, this would be very complex in practice.

[19] For the calculations within RE-DISS, the area in which the Residual Mix methodology is applied was assumed to include EU27+CH+IS+NO.

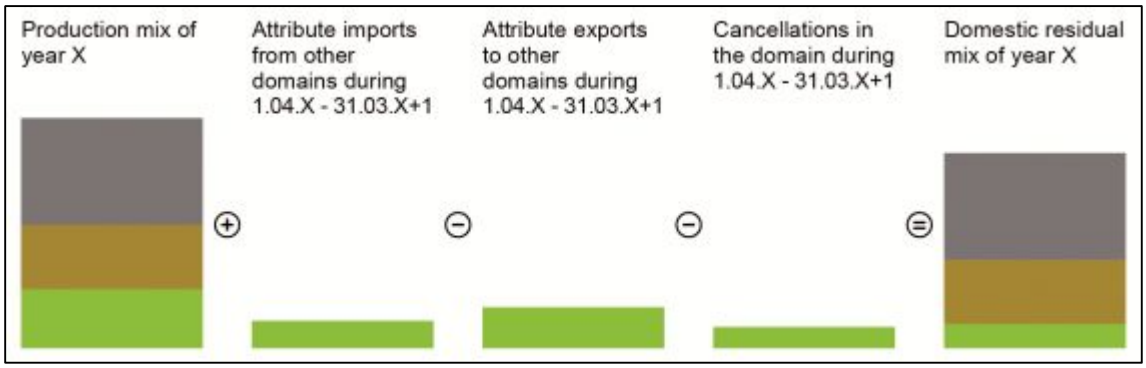
[20] Certificate-based RTSs can be, for example, national GO systems or other tracking certificate systems.

- Data on explicitly tracked attributes through non-certificate-based RTSs (e.g. contract-based tracking or specific mechanisms for allocating energy supported by a feed-in tariff under disclosure):
    - Explicit tracking by non-certificate-based RTSs should be treated similar as cancellations of certificate-based tracking systems.

3.3 Determination of the Domestic Residual Mix

After the necessary data has been collected, the first step of the calculation is to determine the yearly available generation attributes of the domain (available after explicit tracking and implicit RTSs). Attribute imports are added to the production mix, and attribute exports and cancellations are subtracted from it (Figure 5). This pool of available attributes is called the domestic residual mix. The time references of Figure 5 relate to the so-called transaction-based method for residual mix calculation as opposed to the production year-based method (see the residual mix methodology description in Annex 1 to this report).

Figure 5: Determining available attributes for the domestic residual mix



Source: Authors' own compilation

After the domestic residual mix has been determined, its volume is compared to the volume of untracked consumption in the domain. Untracked consumption is such consumption, which is not disclosed with explicit tracking instruments or implicit RTSs. Therefore it can be obtained simply by deducting all cancellations and also volumes covered by RTSs from the domain's electricity consumption.

The difference between the volumes of the untracked consumption and the domestic residual mix shows the deficit or surplus of attributes in the domain. In the case that the untracked consumption is larger than the volume of the domestic residual mix, the domain has an attribute deficit and this deficit needs to be filled up with attributes from the

[21] According to RE-DISS BPR [32] this is the time period during which cancellations for year X electricity disclosure need to be made.

European Attribute Mix (Figure 6). In the case that the domain has an attribute surplus, the surplus needs to be transferred to the European Attribute Mix.

- *Available Attributes – Untracked Consumption = Surplus(+) or Deficit (-)*

Additional notes:

- The calculation for environmental attributes of power production in the residual mix follows the calculation methodology of energy source attributes (see the residual mix methodology described in the Best Practice Recommendations in Annex 1 of this report).
- Net electricity import attributes from an external domain are added to the domestic residual mix of the importing internal domain. The share of different attributes in the import is determined by the production mix (or the residual mix, if applicable) of the external domain.
- Net electricity export attributes to an external domain are deducted from the domestic residual mix of the exporting internal domain. The share of different attributes in the export is determined by the residual mix of the internal domain.

3.4 Determination of the European Attribute Mix

It is important to outline first that electricity production in Europe in a given year X always equals electricity consumption during the same year as long as physical electricity transfer with external domains is accounted for. Consequently, in the residual mix calculation of year X, the amount of attribute surplus (as outlined in Chapter 3.3) equals the amount of attribute deficit at European level.

One fundamental feature of the RE-DISS residual mix calculation methodology is the concept of a common attribute pool, commonly known as European Attribute Mix (EAM), and the interaction of national residual mixes via the common attribute pool. Instead of different domains interacting with each other on a bilateral basis, they all interact with this common pool, which interconnects domestic residual mixes in a similar way as the EECS Hub interconnects GO registries.

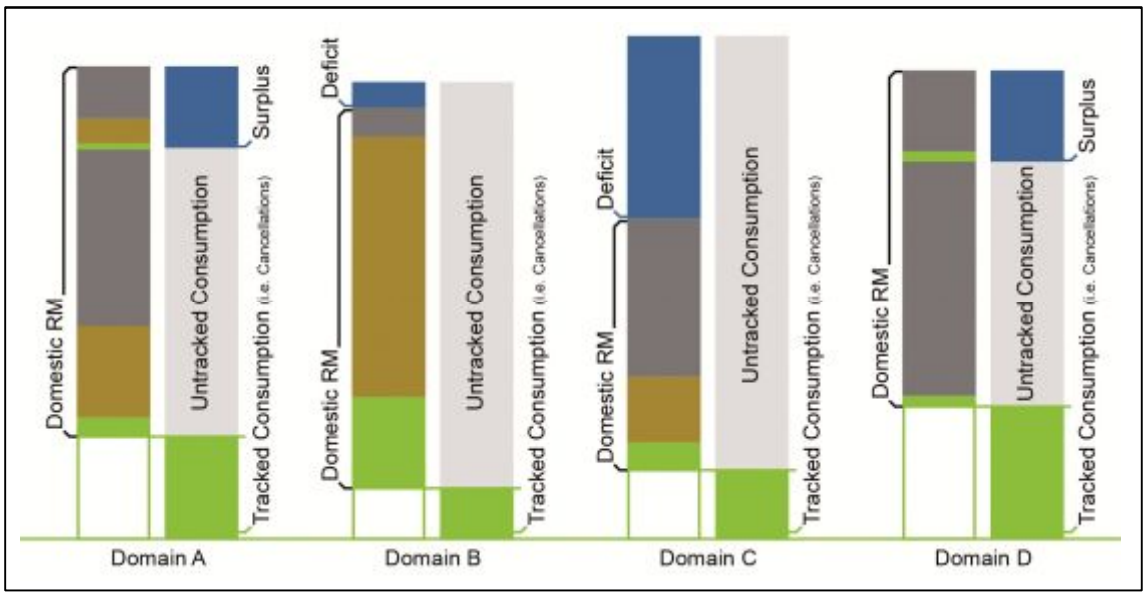
In practice the operation of the EAM “Hub” is simply a balancing of available generation attributes between calculation domains. Domains which have a surplus of available attributes compared to untracked consumption, give attributes to the common pool and vice versa (Figure 6). Hence, the share of different attributes in the EAM is determined by the combined surpluses of all surplus domains. Once the EAM is established, it can be used to fill in deficits in deficit domains.

The following illustrates how the RES share of the EAM is determined. The process is equal for NUC and FOS.

- *RESstoEAM = Surplus * Share of RES in the domestic residual mix*
- *TotalRESToEAM (TWh) = SUM of all surplus domains’ RESToEAM*

- *TotalSurplus (TWh) = TotalRESToEAM + TotalNUCToEAM + TotalFOSToEAM*
- *ShareOfRESInEAM (%) = TotalRESToEAM / TotalSurplus*

Figure 6: Determining surplus and deficit on a domain level



Source: Authors' own compilation

3.5 Determination of the Final Residual Mix

For surplus domains, the final residual mix equals the domestic one in shares of different attributes (because the attribute mix of the surplus is determined by the residual mix). In physical volume it is the amount of available attributes in the domestic residual mix subtracted with the surplus transferred to the EAM.

- *FinalAvailableRES = AvailableRES – RESToEAM (idem NUC and FOS)*
- *FinalAvailableAttributes = FinalAvailableRES + FinalAvailableNUC + FinalAvailableFOS*
- *RMRES = FinalAvailableRES / FinalAvailableAttributes (idem NUC and FOS)*

Deficit domains take in the volume of deficit from the EAM according to the share of different attributes in the EAM. These attributes are combined with the attributes in the domestic residual mix to constitute the final residual mix of a deficit domain.

- *RESFromEAM (TWh) = Deficit*ShareOfRESInEAM (idem NUC and FOS)*
- *FinalAvailableRES = AvailableRES + RESFromEAM (idem NUC and FOS)*
- *FinalAvailableAttributes = FinalAvailableRES + FinalAvailableNUC + FinalAvailableFOS*
- *RMRES = FinalAvailableRES / FinalAvailableAttributes (idem NUC and FOS)*

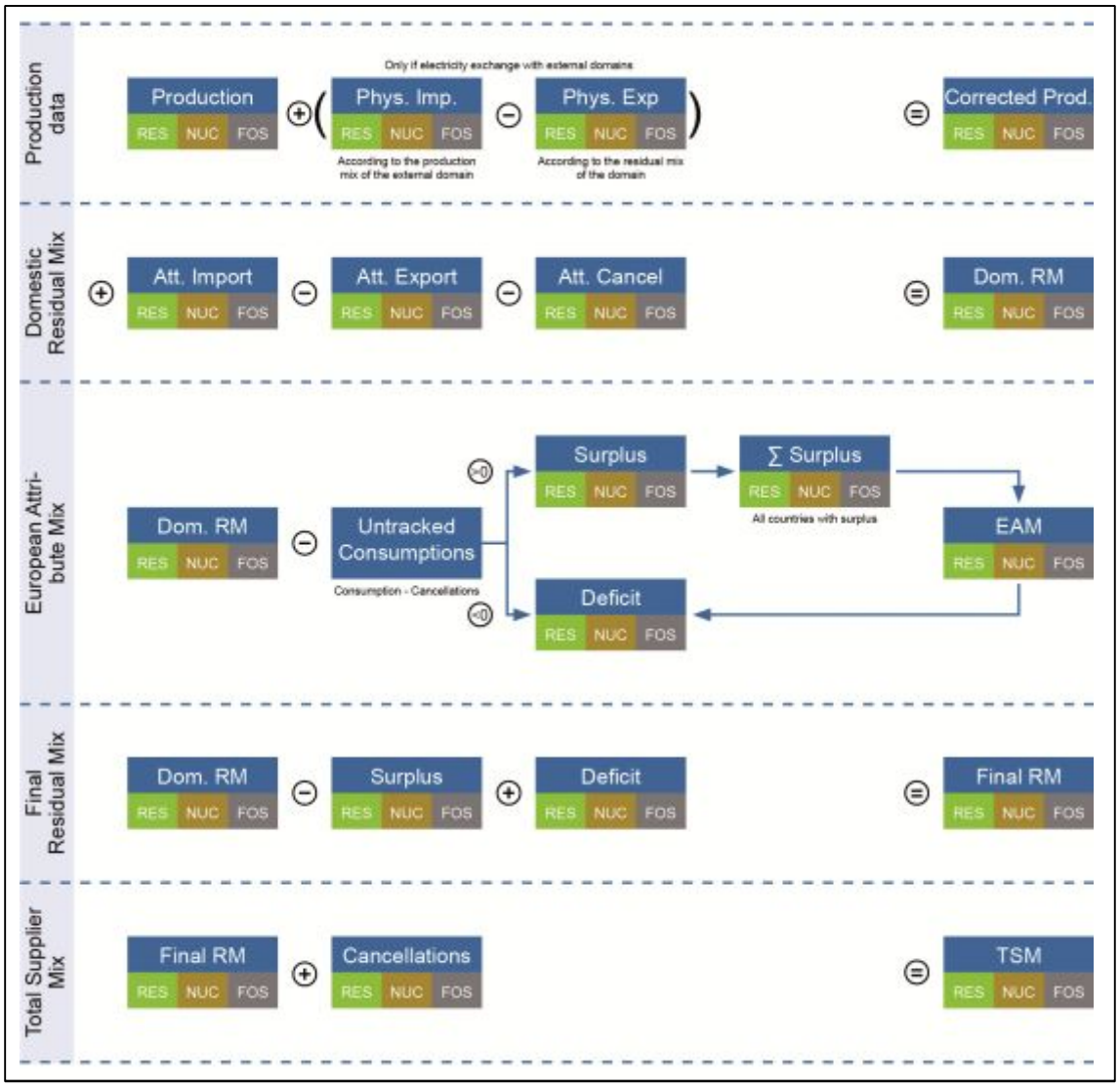
Additional note:

- Total supplier mix denotes the total volume of attributes disclosed in a domain, both explicitly tracked and those disclosed through the residual mix. It is obtained by adding the volume of cancellations per attribute with the final residual mix. Its volume is equal to the domain's total electricity consumption.

3.6 Process Description

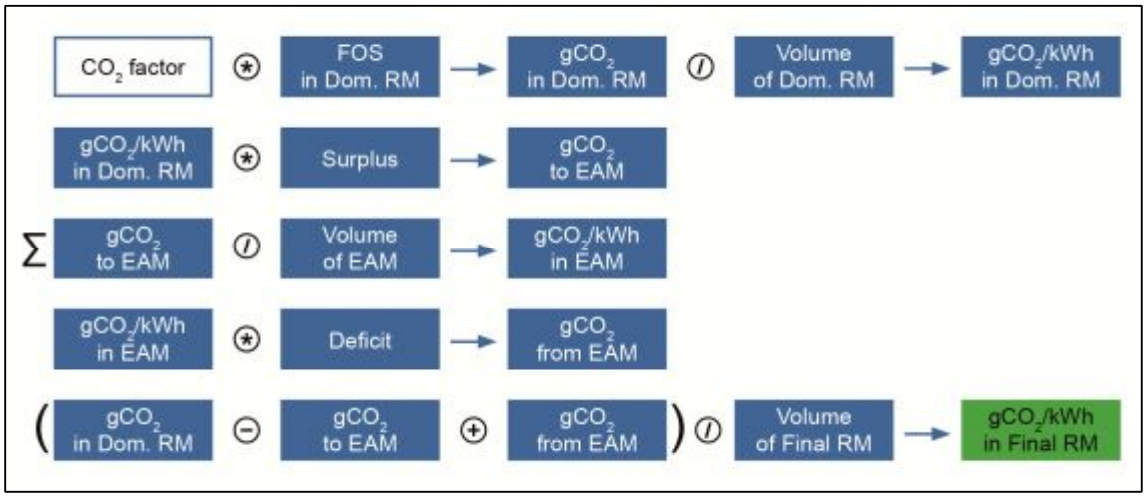
Figure 7 portrays the entire residual mix calculation process for energy source attributes and Figure 8 for CO_2 (the process for radioactive waste is similar). When using these figures it should be kept in mind that the boxes "Phys. Imp" and "Phys. Exp" only relate to the exchange of electricity with external domains which are not included in the residual mix calculation process.

Figure 7: Residual mix calculation process



Source: Authors' own compilation

Figure 8: Calculation process for content of CO_2 in the residual mix



Source: Authors' own compilation

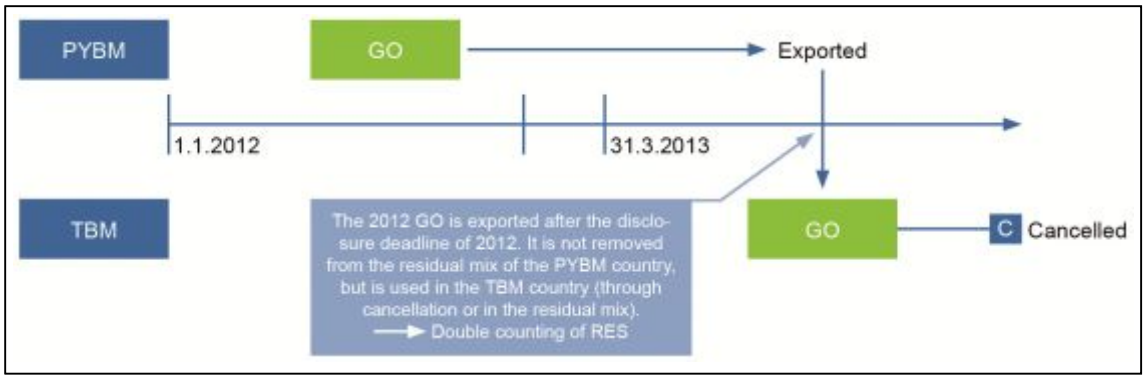
3.7 Remaining Issues

As explained, the residual mix calculation focuses on the timing of a GO transaction regardless of the production period of the GO. This is essential, since considering only transactions of GOs of production year X in residual mix calculation of year X may lead to significant double counting.

At the beginning of the RE-DISS project no tight guidelines existed on these timeframes, which led to the residual mix of some countries to be determined based on transactions of GOs of production year X (production year-based method – PYBM) whilst for others it was determined based on all transactions of the calendar year (transaction-based method – TBM).

The production year-based method is problematic, since often a large share of GOs issued for year X production remains unused at the disclosure deadline of year X (31 March X+1) because GOs have a lifetime of 12 months. Under PYBM the later cancellation of these GOs is neglected because the calculation of the residual mix in year X+1 will only consider GOs cancelled if they were issued for production in year X+1. To account for this problem, some (but not all) countries using the production year-based method do not allow production year X GOs to be used for disclosure of year X+1 consumption. However the coexistence of the production year-based method in some countries with the transaction-based method in other countries complicates the problem: If a GO is exported from a PYBM country to a TBM country after the disclosure deadline, which applies in the PYBM country for the production period of that GO, the exported attributes are not removed from the residual mix of the PYBM country, but will be used in the TBM country either through cancellation or as part of the residual mix after its expiry. This results in double counting of the related attributes.

Figure 9: Interaction of domains with different accounting methodologies for the residual mix



Source: Authors' own compilation

Using the transaction-based method consistently for all countries would remove double counting, but would not perfectly portray the usage of correct year production attributes. In rare circumstances the RES share of a residual mix can even turn negative based on a pure TBM approach, as consumption is being disclosed largely with previous year production attributes and the production from RES may fluctuate significantly between different calendar years. Another drawback of the transaction-based method (and also the production year-based method for that matter) is its sensitivity to the fluctuations of the GO market. Residual mixes of countries where GOs might be stocked (e.g. due to looser expiry rules or lower account fees) will fluctuate without relevance to the actual usage of GOs.

To ameliorate the accuracy of the calculations whilst not risking double counting, currently two viable improvements have been identified, of which the first can be seen as a short-term and the second as a long-term solution:

1. Issuance-based method

   Instead of concentrating on GO transactions the issuance-based method for residual mix calculation removes all production attributes from the available attributes for which GO have been issued. If a GO expires (because it has not been used by the end of its lifetime), the related attributes are returned to the residual mix. This solves the problems of potentially negative RES shares in the residual mix and the sensitivity of residual mix results to market conditions. However some overlap between production and disclosure years still remains due to the addition of attributes of expired GOs to the residual mix of year X, where most of these GOs will relate to production in year X-1. Despite this small drawback, this method is recommended as part of the RE-DISS Best Practice Recommendations. Further information can be found in the annex to the BPR document in Annex 1 to this report.

2. Early expiry of GOs

   In the early expiry solution, all countries agree to a common policy where electricity consumption in year X can only be disclosed based on explicit tracking by cancelling GOs issued for electricity production in the same year X, and this cancellation has to take place before the commonly set disclosure deadline (31 March X+1). This effectively means that all GOs relating to production in year X would expire on 31 March X+1. This approach would stop all overlap between production and consumption years and the solution can be combined with any of the previously described methods of residual mix calculations. If connected to the issuance-based method, the early expiry will also solve problems related to GO market fluctuations. However the implementation of this solution cuts short the lifetime of most GOs to significantly less than 12 months and requires changes in national disclosure regulations. It is therefore not possible to implement this approach consistently across Europe in the near term future.

With the issuance-based method, the RE-DISS recommendation has defined a reliable solution to the problem of different residual mix methodologies. Based on this approach, the discussion between several competent bodies on a limited potential for double counting of certain Norwegian GOs, which were issued for production in 2011 and exported to other countries after February 2012, could be solved. However, competent bodies should work on the possibility of a coordinated implementation of the early expiry approach in the medium term.

4 Avoiding Disclosure Errors

4.1 Relevance of disclosure errors in Europe

The project has identified six main disclosure problems (detailed in chapter 1) as occurring in the EU. The RE-DISS Best Practice Recommendations were developed to address these problems as well as to harmonise the implementation of disclosure and GO systems across the EU.

The further analysis conducted in this chapter on a domain level covers 17 EU domains: 11 domains were considered as “participating domains”, which were actively contributing to the discussions in the project (Austria, Belgium-Flanders, Belgium-Wallonia, Denmark, Finland, Italy, Luxembourg, Netherlands, Sweden, Norway and Switzerland) and 6 other domains which were also considered relevant (France, Germany, Ireland, Portugal, Slovenia and Spain).

Figure 10 shows in which of the domains the six main disclosure problems were identified at the beginning of the project, indicating as well what sets of the Best Practice Recommendations should be put in place to address these problems. As can be seen in this figure the main disclosure problems existed in most of the 17 domains.

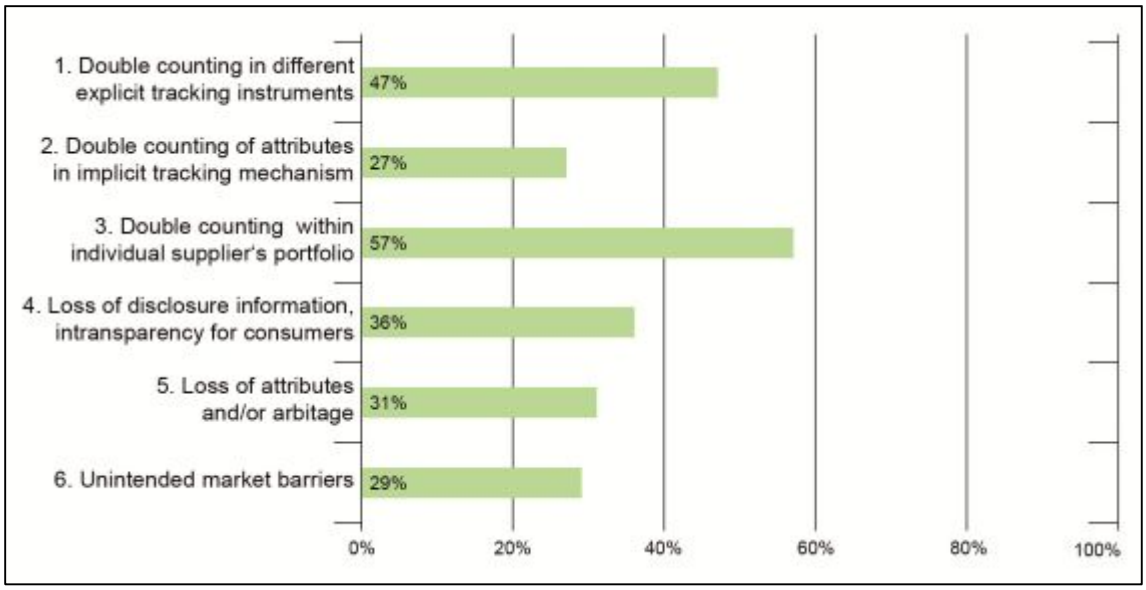
Figure 11 illustrates how the main disclosure problems were addressed at the beginning of the RE-DISS project by the 17 domains. In this figure 100% indicates that a given disclosure problem was solved in all the 17 domains by applying the respective sections of the Best Practice Recommendations and 0% indicates that a given disclosure problem occurred in all the 17 domains and that no domain had started to address it. As can be seen from this figure, no disclosure problem was completely solved at the outset of the project, but all of them were being partly addressed by the 17 domains covered in this analysis. In particular some of the participating domains had already some elements of the Best Practice Recommendations in place which contributed to solving the problems.

Figure 10: Identification of the domains in which the main disclosure problems occurred at the beginning of the project and the sets of BPRs to be applied in order to solve them

	2. „12 Months Lifetime Rule" for GO	3a. Usage of EECS	3b. Issuing of GO for different energy sources	3c. GO as the unique "tracking certificate"	3d. Recognition of imported GO	4. Disclosure Schemes and RTS	5. Calculations of Residual Mixes	6. Contract based tracking	7. Timing of Disclosure	8. Further Recommendations on Disclosure
1. Double counting in different explicit tracking instruments		BE-Fl, BE-Wa, DK, FI, IT, NL, SE, CH, LU, IE, FR, DE, PT, SI, ES	AT, BE-Fl, BE-Wa, DK, FI, IT, NL, CH, LU, NO, FR, DE, SI, ES	AT, BE-Wa, DK, FI, IT, NL, SE, CH, LU, FR, DE, PT, SI, ES		AT, DK, FI, NL, SE, CH, LU, NO, FR, DE, SI		BE-Fl, BE-Wa, FI, IT, NL, LU, SE, CH, IE, FR, DE, SI		AT, BE-Fl, FL, IT, SE, CH, LU, FR, DE, PT, SI
2. Double counting of attributes in implicit tracking mechanism	AT, BE-Fl, BE-Wa, DK, FL, SE, LU, CH, NO, FR, DE, SI, ES	DK, FI, IT, NL, SE, CH, LU, NO, FR, DE, SI, ES			BE-Fl, BE-Wa, DK, FI, IT, NL, IE, CH, LU, NO, FR, DE, PT, ES	DK, FI, NL, SE, CH, LU, NO, FR, DE, SI	AT, BE-Fl, BE-Wa, DK, FI, IT, NL, SE, CH, LU, NO, IE, FR, DE, PT, SI, ES	BE-Fl, BE-Wa, FI, IT, NL, LU, SE, CH, FR, DE, SI		
3. Double counting within individual supplier's portfolio										IT, LU, FR, DE, PT, SI, ES
4. Loss of disclosure information, intransparency for consumers			AT, BE-Fl, BE-Wa, DK, FI, IT, NL, CH, LU, FR, DE, SI, ES			AT, BE-Fl, DK, FI, IT, NL, SE, CH, LU, NO, FR, DE, SI				AT, BE-Fl, BE-Wa, DK, FI, IT, NL, SE, CH, LU, FR, DE, PT, SI, ES
5. Loss of attributes and/or arbitage	AT, BE-Fl, BE-Wa, DK, FI, IT, NL, SE, CH, LU, NO, FR, DE, SI, ES	BE-Fl, BE-Wa, DK, FI, IT, NL, SE, CH, LU, IE, FR, DE, PT, SI, ES	IE, FR, PT		BE-Fl, BE-Wa, DK, FI, IT, NL, IE, CH, LU, NO, FR, DE, PT, ES		AT, BE-Fl, DK, FI, NL, SE, LU, FR, PT, ES		AT, BE-Fl, BE-Wa, DK, FI, IT, NL, SE, CH, LU, NO, FR, DE, PT, SI, ES	
6. Unintended market barriers		BE-Fl, BE-Wa, DK, FI, IT, NL, SE, CH, LU, IE, FR, DE, PT, SI, ES			BE-FL, BE-Wa, DK, NL, CH					

Source: Raimundo et al. 2012

Figure 11: Degree of addressing the main disclosure problems by the 17 domains at the start of the RE-DISS project



Source: Raimundo et al. 2012

The different kinds of disclosure errors have been presented in chapter 1. Each type of problem can contain different aspects. In the following paragraphs, these aspects are listed, explained and illustrated by some specific examples within the 17 domains under analysis.

1) **Explicit double counting occurs if the same MWh of electricity is accounted for in different explicit tracking instruments used for disclosure (GOs, RECS certificates, support schemes, labels, electricity contracts etc.).**

   This can take the following form:

   a. Double issuing of two certificates of the same system for the same MWh. This would not happen in the EECS system since databases were programmed and procedures implemented to avoid that. In the case of GOs coming from other systems in which issuing was not electronic or safeguards are missing, this could happen because of insufficient technical or procedural provisions. Specific cases have not been reported to the project team, but could have happened.

   b. Double issuing between GOs and RECS certificates. At the beginning of the project, this was still a problem encountered in some of the 17 countries under analysis. Not all of the organisations issuing RECS certificates were also the competent authorities for GOs, and hence were able to control that no more than one certificate is issued for the same MWh. In some countries, a lack of coordination between issuing bodies for RECS and competent authorities for GOs could thus have led to a risk of double counting. This risk was mostly theoretical because producers

issuing RECS certificates committed themselves to not requesting two similar certifications for the same MWh of electricity. France and Spain were in this situation: GOs were issued there by a competent authority not using the EECS system and RECS were issued by another organisation. Also Germany showed this risk, as a number of organisations were issuing GOs, but no evidence of double issuing was reported.

c. Double counting between GOs[22] and other explicit tracking systems happens when a GO is issued for a specific MWh, and the disclosure attributes are afterwards also included in contracts for the physical electricity that the producer of this MWh concludes with another market party. Typically this occurs when the buying market party assumes that the mix that it is receiving is the general producer's mix and not a mix from which issued GOs have been deducted. This was the case in France where regulations for disclosure did not provide for any detailed mechanisms to calculate a supplier's mix. Suppliers would assume the mix from their counterpart to be their production mix. This situation was known in many countries that did not strictly regulate contract-based tracking and did not ban it (e.g. Finland, Sweden, Switzerland, Germany, Slovenia). The German branch guidelines for disclosure ask generators to remove attributes of GOs issued for their production from their "trading mix". In Sweden an attempt at regulating contract-based tracking was carried out. Electricity suppliers were given the opportunity to declare on a voluntary basis their trades through bilateral contracts by specifying the attributes linked to the contracts to a central body. Since this declaration was voluntary, it was not clear how much of the trade was actually reported. In Switzerland and Germany, an additional double counting possibility was linked to the existence of quality labels, which did not require the use of GOs, but were at least partly self-supporting (e.g. the TÜV labels).

d. Double counting between GOs and support schemes occurs when it is possible to issue a GO for supported generation and at the same time the attribution of supported generation under disclosure is not clearly regulated. In France, for example, producers were allowed to issue RECS certificates for supported generation. At the same time, they sold their production to EDF and other suppliers in charge of managing the feed-in tariff, and these could use the contracts as a source of information to calculate their disclosure mixes.

[22] The same also applies to RECS certificates, but as GOs are now mostly being used, this is not always repeated.

2) Double counting of attributes also occurs in implicit tracking mechanisms such as the Residual Mix

As mentioned, GOs may be used as a tracking instrument for disclosure. In order to avoid double counting of the generation attributes represented by cancelled GOs (or by use of other tracking mechanisms) these attributes need to be subtracted from the fuel mix disclosed to other consumers. This mix is called the residual mix (see chapter 3).

The main goal and purpose of the residual mix is to prevent explicitly tracked attributes from being double counted. But if the disclosure regulations of a country fail to enforce the calculation and use of a proper residual mix, implicit double counting occurs. The following presents the six most prominent issues, which lead to implicit double counting of RES attributes.

- Issue 1: Uncorrected generation statistics used for implicit disclosure: In the case that generation statistics of a country are used by suppliers without deducting from it attributes that are tracked through explicit tracking systems (GOs, RECS, labels) and RTSs (e.g. for supported generation) this generates double counting between implicit and explicit tracking.
- Issue 2: Missing transparency on contract-based tracking: Due to the unofficial nature of contract-based tracking, it is challenging to collect data on explicit tracking through contracts. Hence, attributes covered by contract-based tracking can seldom be deducted from the residual mix, and thus double counting is often related to contract-based tracking.
- Issue 3: Calculation not harmonised within Europe: For a given country, the balance of physical trades never equals the balance of trades in attributes (e.g. GOs). As a result, some countries have more attributes than the volume of electricity they have consumed and some have less. At the beginning of the project, these imbalances were present in all countries except Finland and Sweden which attempted to solve them through the calculation of a Nordic mix.
- Issue 4: Overlapping Domains for Implicit Disclosure: Finland and Sweden were using a Nordic Domain mix without agreement of Denmark and Norway, meaning that some Danish and Norwegian attributes were counted several times while some attributes from Sweden and Finland disappeared.
- Issue 5: Active GOs: This rather recently discovered problem occurs when unused GOs which reflect production attributes of year X are included in the residual mix of that year but are not removed from circulation. If these GOs are cancelled or exported after the disclosure deadline for year X, their attributes are double counted. This problem was only known to exist for a part of the generation in Norway (but could potentially also exist in Italy and Spain), and thus the disclosure error produced by it was not very significant.

- Issue 6: Disclosure of CO_2 and/or radioactive waste not mandatory: Not all domains require electricity suppliers to explicitly disclose the content of CO_2 and radioactive waste of sold electricity at least on external references such as company websites, as obligated in Directive 2009/72/EC. In this case, consumers receive no information about the environmental indicators of their electricity and might assume them as zero or according to grid average values.

In Table 1 on the next page, X signals that the problem is fully applicable while (X) means the problem does not exist to the full extent. Explanations are given in the description column.

3) Double counting within individual supplier's portfolio

The absence of proper disclosure of products for one supplier leads to double counting of attributes for consumers who should in fact be attributed a supplier's remaining mix (the overall mix of the supplier minus specific products). In Spain, for example, regulations foresaw that the supplier mix (including "green" products) should be disclosed to all consumers and if GOs were cancelled for a specific consumer they should be indicated as well to this specific consumer. The other consumers of this supplier would thus overestimate their renewable energy share based on the supplier mix information given to them. At the beginning of the RE-DISS project, the same problem was known in Luxembourg (when disclosure was introduced in 2010), France and Slovenia. Portugal had implemented the disclosure of products (green or default one) but not the disclosure of supplier mix.

Table 1: Situation of issues related to implicit disclosure before the RE-DISS project

Country	1	2	3	4	5	6	Description
Austria	X			X			▪ No residual mix ▪ ENTSO-E mix used for implicit disclosure
Belgium	(X)					(X)	▪ No residual mix ▪ Production mix from which all RES filtered out used for implicit disclosure ▪ Disclosure of CO_2 and RW not mandatory in Flanders
Denmark	X	(X)					▪ No residual mix ▪ CBT for NUC and FOS
Finland		X		X			▪ Residual mix of Finland based on the Nordic domain ▪ No legal status for residual mix: given as a recommendation by the Association of Energy Industries ▪ Contract based tracking allowed
Italy	X	X				(X)	▪ No residual mix ▪ Disclosure based on fuel mixes ▪ Disclosure of RW not mandatory
Luxemburg	X					X	▪ No disclosure
Netherlands	(X)	X	X				▪ Residual mix calculated, but all RES filtered out Does not consider contracts and is not harmonized
Sweden		(X)		X			▪ Residual mix based on the Nordic domain ▪ Contract based tracking allowed but accounted for ▪ No legal status for residual mix: given as a recommendation by the Association of Energy Industries
Norway			X		X	X	▪ Residual mix calculated, but not harmonized Deficit attributes disclosed as unknown ▪ Residual mix only accounts for year X certificates ▪ Disclosure of CO_2 and RW not mandatory
Switzerland	X	X				X	▪ No residual mix ▪ Contract-based tracking allowed ▪ Disclosure of CO_2 and RW not mandatory
France	X	X		X			▪ No residual mix ▪ Mix of own production, contracts and ENTSO-E mix used for disclosure
Germany	X	X		X			▪ No residual mix ▪ ENTSO-E mix as default value for disclosure ▪ CBT (ex-ante and ex-post), GOs, RECS and labels used for disclosure
Ireland		(X)	X			(X)	▪ Disclosure based on contracts and residual mix (residual mix accounts for contracts) ▪ Residual mix is not harmonized with other countries ▪ Disclosure of RW not mandatory
Portugal	X	X					▪ No residual mix ▪ Disclosure through contracts
Slovenia	X	X		X			▪ No residual mix ▪ Disclosure is based on contracts, GOs and ENTSO-E mix
Spain			X		(X)		▪ Residual mix is calculated, but not harmonized with other countries (domestic attributes expanded if needed) ▪ A problem with Active GOs might exist and GOs do not necessarily have to be cancelled in order to be used

Source: Raimundo et al. 2012

4) Loss of disclosure information and intransparency for consumers was quite frequent in the beginning of RE-DISS

a. Some countries did not require environmental indicators to be disclosed either for nuclear waste (as in Italy), or both CO_2 emissions and nuclear waste (as in Flanders, Luxembourg, Switzerland and Norway).

b. In almost all countries, (with the notable exception of Austria, Sweden, and Norway), no GOs existed for other sources than renewables, so the tracking of conventional attributes was dealt with mostly through electricity contracts, which led to some inaccuracy at least in the disclosure of fossil and nuclear energy.

c. In the case of imbalances between amount of attributes available and volume of electricity consumed, some countries resorted to the introduction of an "unknown" category of fuel type. Norway was a typical case in this sense because as a large exporter of GO, it lacked attributes and the share of "unknown origin" was very large on disclosure statements. Austria also used an unknown category and for information gave the UCTE mix. In this case, the unknown category in effect replaced some fossil or nuclear attributes. But it could also be that some green attributes disappeared. In the Netherlands, green attributes not tracked by GOs would disappear from the supplier mix as no green attributes were allowed in the residual mix and disclosure of green attributes could only be done through GOs (on a voluntary basis).

5) Leakage of attributes and/or arbitrage

The problem of leakage of attributes and/or arbitrage was detected to occur in all the 17 domains analysed at the beginning of the project. This problem arises if the basic principles of the guarantee of origin and disclosure system are not harmonised within the EU: unharmonised deadlines for operations on GOs as well as unharmonised expiration of GOs. The GOs residing in registries of domains such as Austria, Flanders and Slovenia at the beginning of the project had different lifetimes than the ones issued, for example, in Wallonia or Spain, leading to different expiration periods of the GOs. Moreover the different lifetimes of the GO also contribute to differences on the disclosure systems in the EU. In the case of different expiry rules, market players from a country in which all GOs related to the production of a given year expire at the same date as the deadline for operations on these GOs could choose to export GOs to a country where GOs have a lifetime of 12 months, while this was not linked to an actual intended use of GOs in the importing country. Both these issues can contribute towards double counting of attributes and can make the use of the European Residual Mix to account for cross-border exchanges difficult.

Unharmonised rules on the use of GOs could also lead to some inadequate effects on the disclosure side. For example, in Italy, GOs could be used by im-

porters of physical electricity to be exempted from the quota of green electricity applied in the case of importers and producers. Thus large volumes of GOs flew to Italy with physical electricity, but as Italy had not finished to implement disclosure, these green attributes would not be counted and would disappear from the total European supply mix.

6) Unintended market barriers for GOs

These barriers can include technical impossibilities of performing transfers and a rejection of transfers due to the decision not to recognise certain types of GOs. Such barriers can be created by the lack of technical harmonisation of GOs between countries because it prevented transfers of GOs. This was the case in Italy, France and Spain, where the competent authorities created a registry on their own and did not focus on the transferability of GOs issued in their own registries. Because of the lack of reliability of transfers based on PDF files or similar means, GOs issued in these countries were not accepted by some of the other member states.

4.2 Progress made during the RE-DISS project

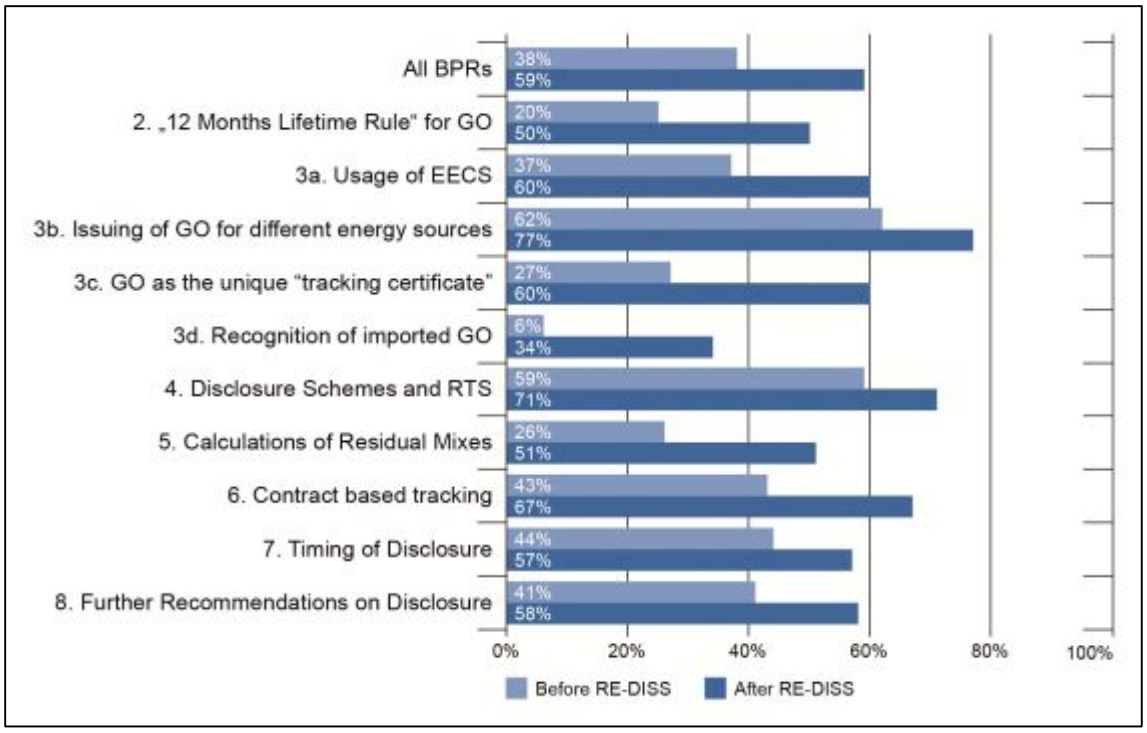
Figure 12 summarises the progress made by the 17 domains covered by this analysis in terms of the implementation of the RE-DISS recommendations. For this evaluation, each numbered element of the Best Practice Recommendations was given equal weight and the degree of compliance with the recommendations was evaluated in two steps; at the beginning and towards the end of the project.

As can be seen, there have been relatively large improvements in the implementation of the Best Practice Recommendations: Before the RE-DISS project 38% of the recommendations were implemented on average in the 17 domains and at the end of the project this number has risen to 59%. Some of these improvements resulted from the transposition of the 2009 RES Directive into national legislation, which member states had to implement until the end of 2010, and others were inspired by the RE-DISS project.

More details on the progress made in the individual countries can be found in Annex 2 of this report.

Figure 13 and Figure 14 show the status of implementation of the RE-DISS recommendations in each of the 17 domains before and after the RE-DISS project. The differences between the colour coded results in the columns “before RE-DISS” and “after RE-DISS” for a given domain reflects the improvements achieved through the period of the project in the implementation of that given BPR at the domain level.

Figure 12: Actual improvements in the 17 domains during the project, measured based on the Best Practice Recommendations



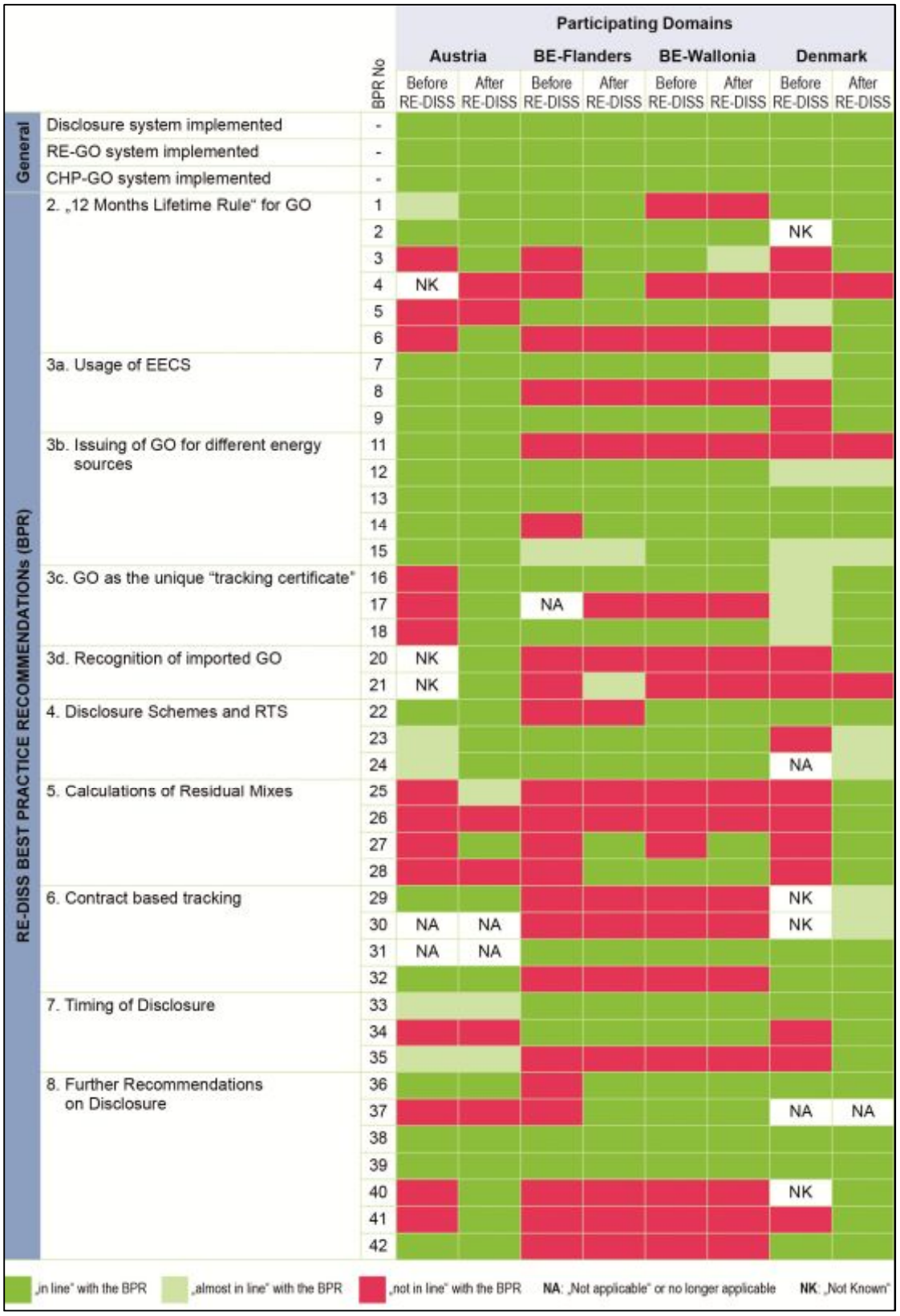
Source: Raimundo et al. 2012

The results of Figure 13 and Figure 14 have been further aggregated: (i) by section of the Best Practice Recommendations in order to show the overall improvement of the project at this level and (ii) by the six main disclosure problems in order to show the overall improvements in addressing/minimising/solving these problems. The results of these assessments are shown in Figure 12 above and in Figure 15 respectively.

As can be seen from these figures there have been relatively large improvements in the implementation of the Best Practice Recommendations within the 17 domains. Some of these improvements resulted from the transposition of the 2009 RES Directive in the respective country, while others were inspired by the RE-DISS project.

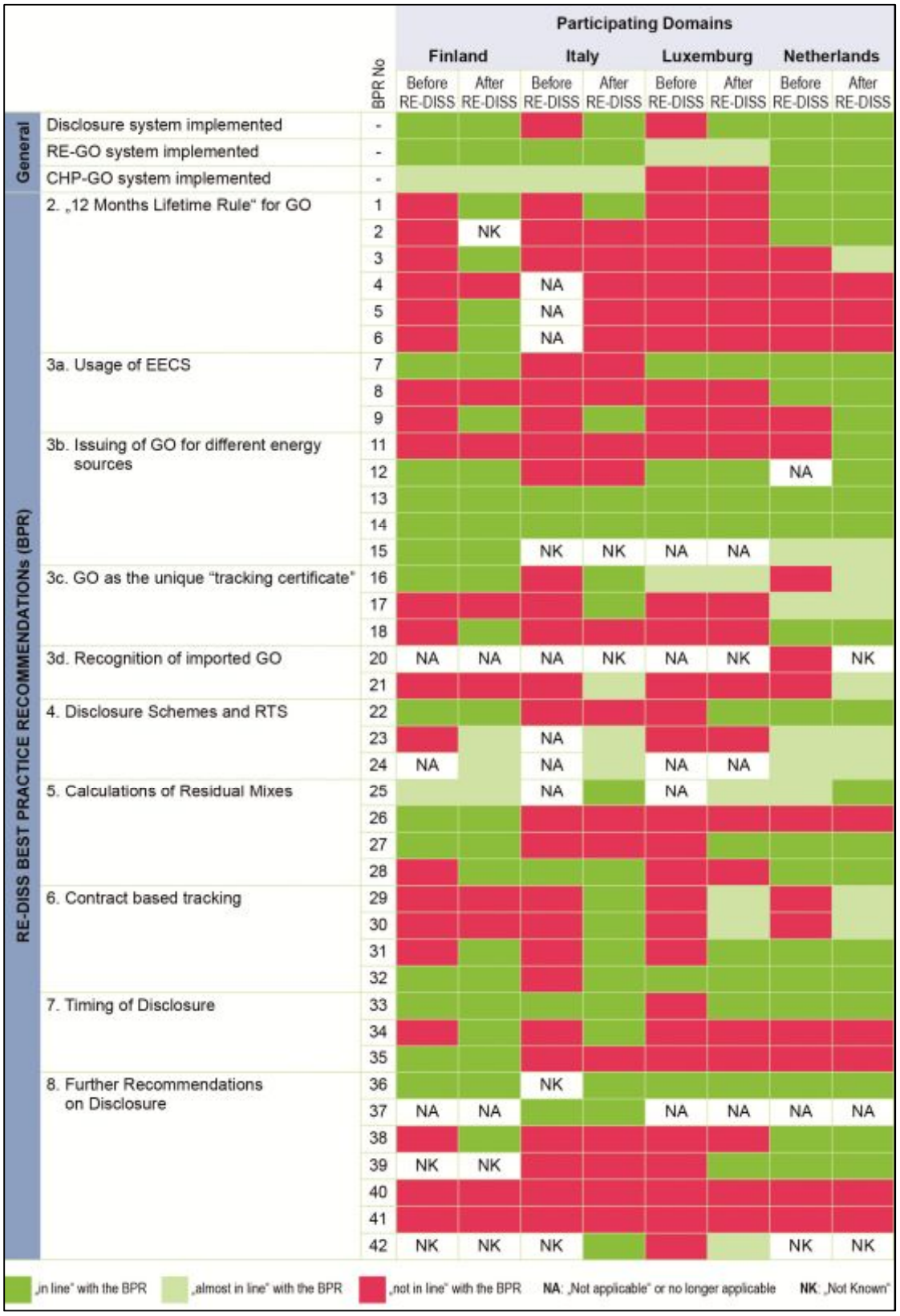
The Best Practice Recommendations include recommendations that not only foresee the improvement of the disclosure and GO systems with regard to the transposition of the explicit requirements of the RES Directive and the Internal Energy Market Directive, but also other recommendations that aim at implementing more advanced systems and that provide a coordination of the disclosure and GO systems across Europe. This is the reason why, although almost all countries have transposed the RES-Directive during the project, it does not mean that their systems were all in line with the RE-DISS recommendations at the end of the project.

Figure 13: Actual improvements, evaluation matrix for the Participating Domains



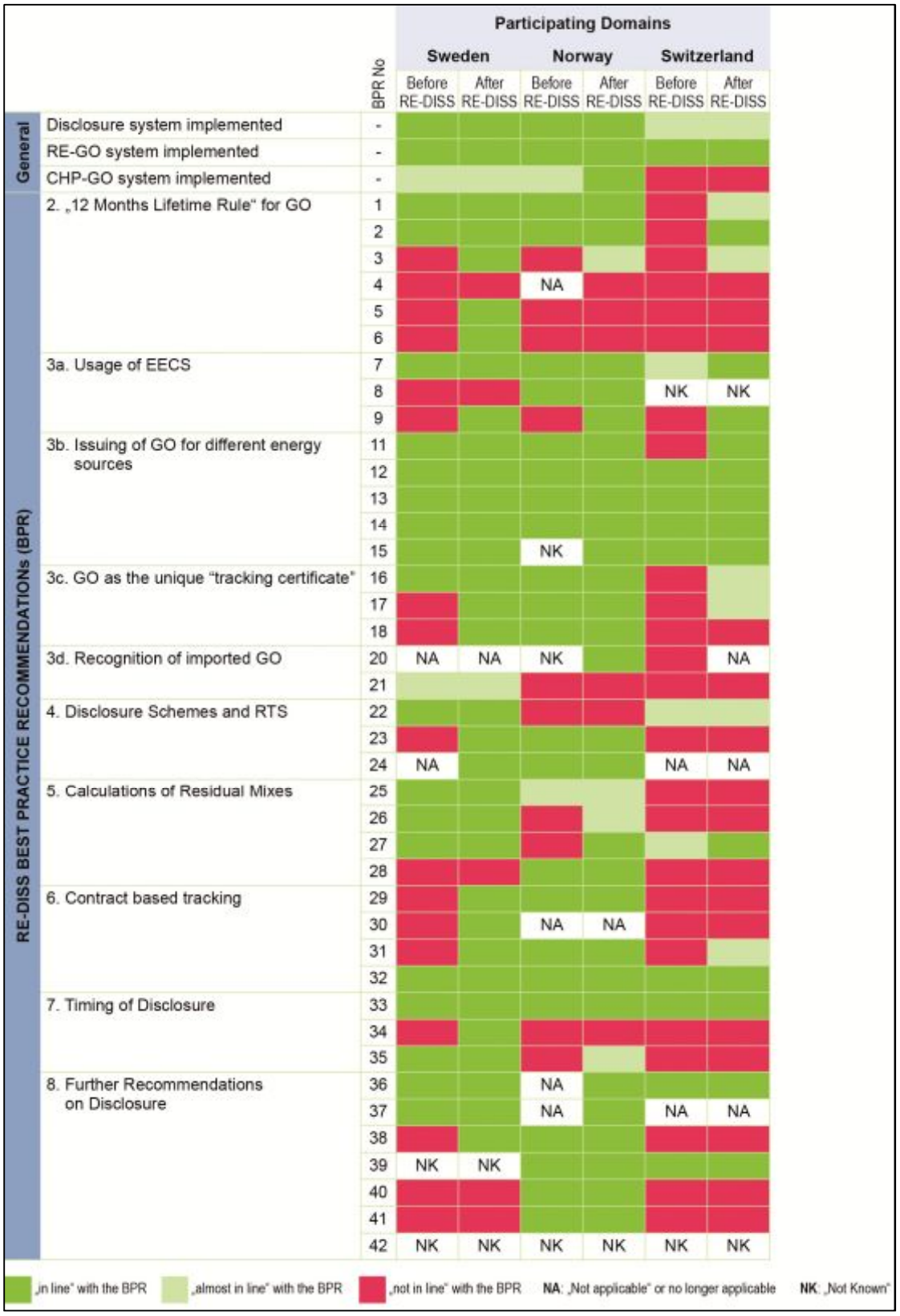
Source: Raimundo et al. 2012

Figure 13a:Actual improvements, evaluation matrix for the Participating Domains



Source: Raimundo et al. 2012

Figure 13b:Actual improvements, evaluation matrix for the Participating Domains

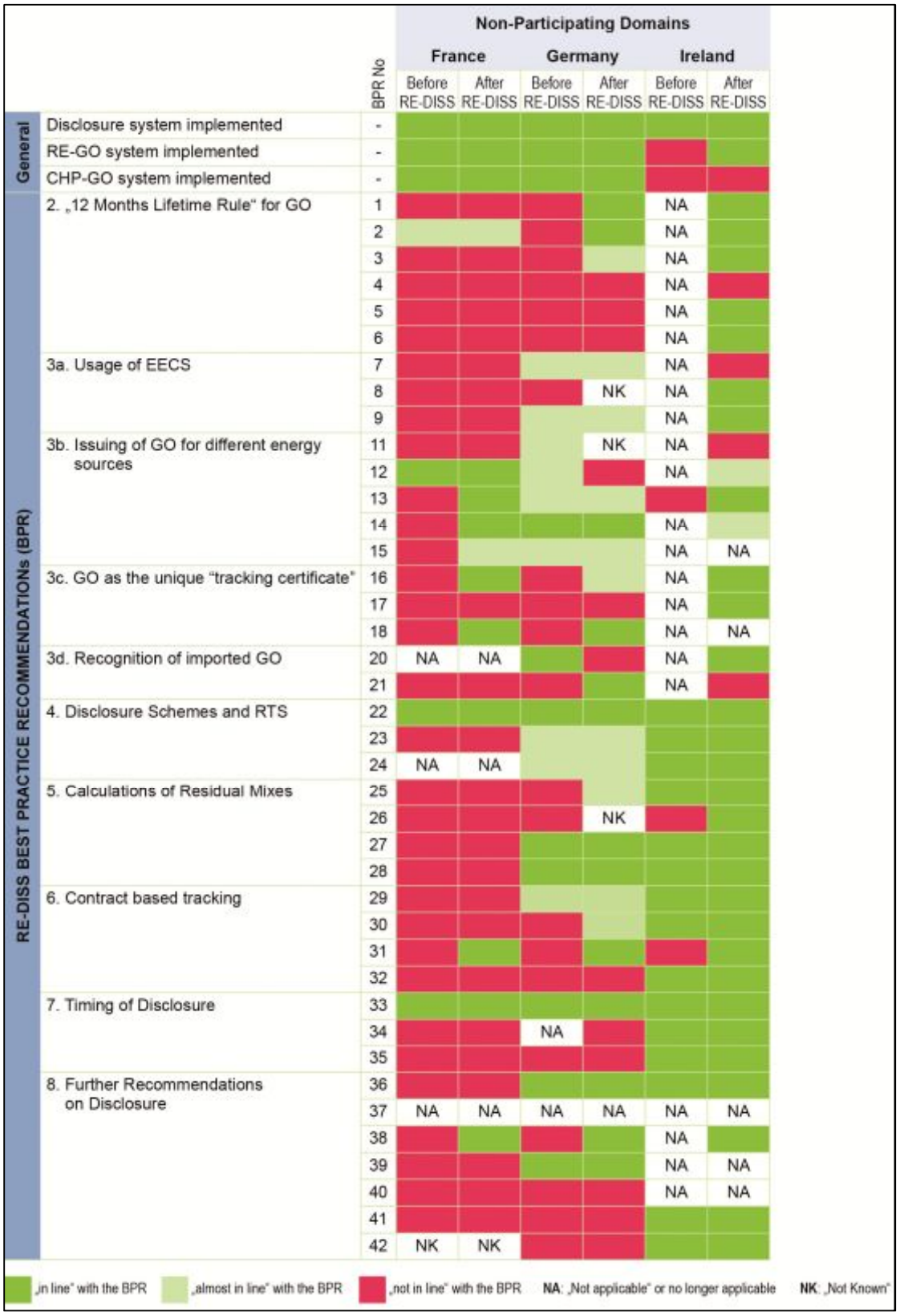


		BPR No	Participating Domains: Sweden Before RE-DISS	Sweden After RE-DISS	Norway Before RE-DISS	Norway After RE-DISS	Switzerland Before RE-DISS	Switzerland After RE-DISS
General	Disclosure system implemented	-						
	RE-GO system implemented	-						
	CHP-GO system implemented	-						
RE-DISS BEST PRACTICE RECOMMENDATIONs (BPR)	2. „12 Months Lifetime Rule" for GO	1						
		2						
		3						
		4			NA			
		5						
		6						
	3a. Usage of EECS	7						
		8					NK	NK
		9						
	3b. Issuing of GO for different energy sources	11						
		12						
		13						
		14						
		15			NK			
	3c. GO as the unique "tracking certificate"	16						
		17						
		18						
	3d. Recognition of imported GO	20	NA	NA	NK			NA
		21						
	4. Disclosure Schemes and RTS	22						
		23						
		24	NA				NA	NA
	5. Calculations of Residual Mixes	25						
		26						
		27						
		28						
	6. Contract based tracking	29						
		30			NA	NA		
		31						
		32						
	7. Timing of Disclosure	33						
		34						
		35						
	8. Further Recommendations on Disclosure	36			NA			
		37			NA		NA	NA
		38						
		39	NK	NK				
		40						
		41						
		42	NK	NK	NK	NK	NK	NK

„in line" with the BPR „almost in line" with the BPR „not in line" with the BPR **NA**: „Not applicable" or no longer applicable **NK**: „Not Known"

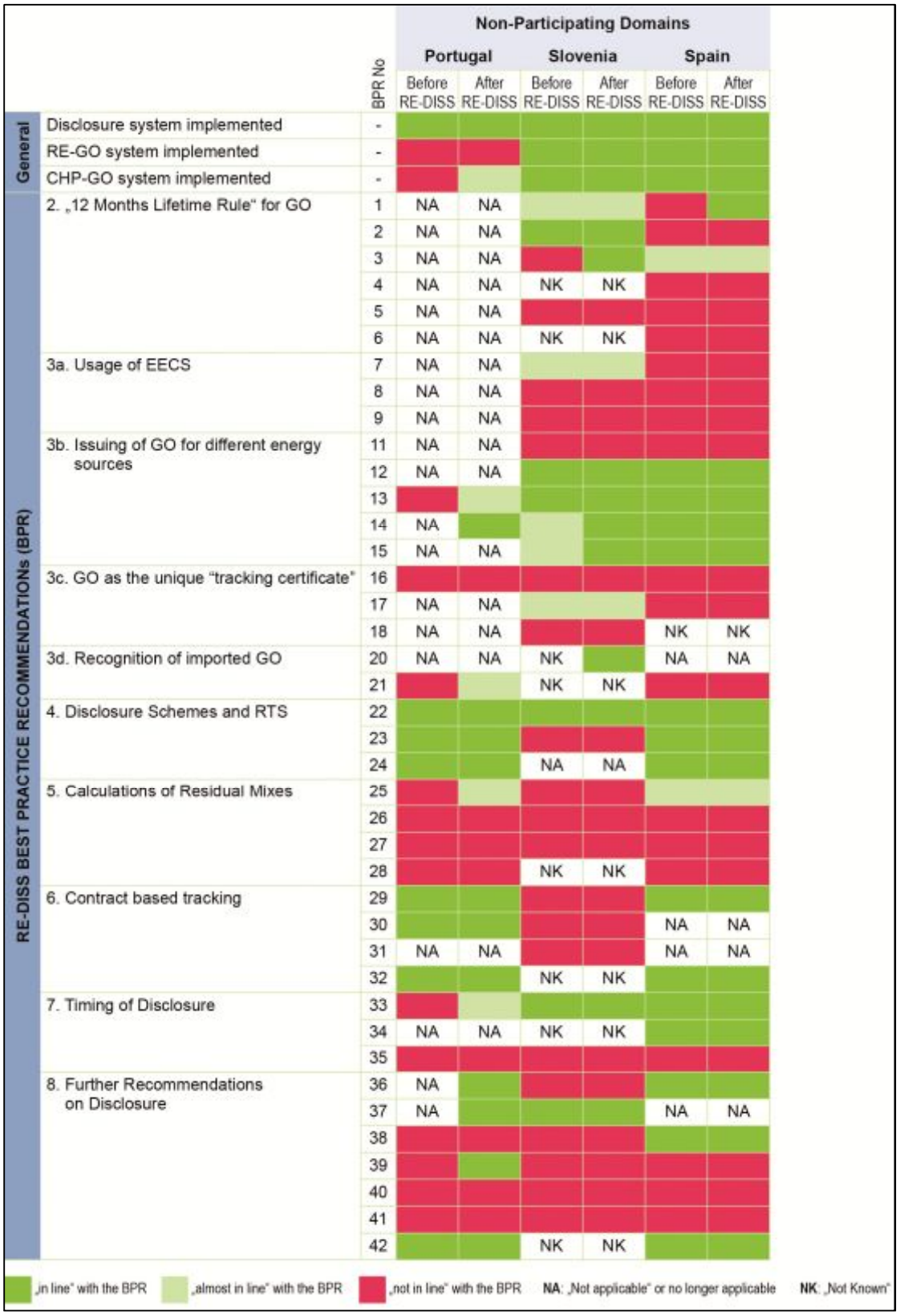
Source: Raimundo et al. 2012

Figure 14: Actual improvements, evaluation matrix for the Non-Participating Domains



Source: Raimundo et al. 2012

Figure 14a:Actual improvements, evaluation matrix for the Non-Participating Domains



Source: Raimundo et al. 2012

In the next paragraphs the registered improvements to both disclosure and GO systems at the level of the Best Practice Recommendations are explained for the 17 domains as a whole. More details can be found in the domain sections in Annex 2.

At the end of the RE-DISS project almost all 17 domains had implemented disclosure systems with national legislation that transposed the Internal Electricity Market Directive (except from Switzerland). Also, most domains had implemented RES-GO systems (except from Luxembourg and Portugal). 12 of the 17 domains had GO systems for HE cogeneration in place with legislation, electronic registers and competent bodies appointed (with the exception of Switzerland, Luxembourg, Italy, Portugal and Ireland, see BPR element “general” in Figure 13 and Figure 14).

Regarding section 2 of the Best Practice Recommendations (the implementation of the 12 month lifetime of GO), although no country has implemented the full set, a large improvement has been registered during the project (see Figure 13 and Figure 14). 29 percentage points of improvement in the implementation of section 2 was registered during the project, as depicted in Figure 12. The domains that improved the most in implementing this section of the recommendations are Flanders, Sweden and Ireland. Also within this section, the recommendation to limit the lifetime of the GO to 12 months after the end of the production period (BPR [3]) and that metering production periods for the issuing of GOs should be no longer than one calendar month and should not run across disclosure periods (BPR [1]) have been the most implemented ones. At the end of the project 13 of the 17 domains were fully or almost in line with both BPR [1] and BPR [3].

The implementation of section 3a of the BPR (usage of EECS) registered an improvement of 23 percentage points during the project. Countries such as Denmark, the Netherlands and Norway have implemented this recommendation during the RE-DISS project period (see Figure 13). The majority of the improvements in this section were registered in the participating domains. Among the non-participating domains, Ireland was the only one in which half of the recommendations of this section were implemented during the project period. Moreover, the most implemented recommendation within this section was BPR [7] (GO systems should be based on EECS), but this BPR had already reached a good degree of implementation at the outset of RE-DISS, as most of the participating domains had already implemented GO systems based on EECS. The recommendation in which more improvement have been registered was BPR [9], related to the ex-domain cancellations of GOs (see Figure 13 and Figure 14).

Section 3b of Best Practice Recommendations was already quite implemented within the 17 domains before RE-DISS (see Figure 12, Figure 13 and Figure 14). Although this section has been implemented by 77% of the domains at the end of the project, the adoption of these recommendations only increased by 15 percentage points when compared with the status before the project (61% of the recommendations included in section 3b were already in place across the 17 domains before the start of RE-DISS). At the end of the project this set of recommendations was completely implemented in Austria, Sweden, Switzerland and Norway.

Strong improvements have been registered in the adoption of section 3c of the recommendations: 32 percentage points of improvement were registered during the project period (see Figure 12). Austria, Denmark, Sweden and Ireland had adopted the full set by the end of the project (see Figure 13, Figure 14) and strong improvements were registered as well among the other domains. BPR [16] (making GO the unique tracking system for disclosure) was the recommendation within this section in which the most improvements have been registered during the project duration.

In the implementation of section 3d of the recommendations, strong improvement was registered during the project. This set of the BPR was the least implemented at the beginning of RE-DISS (6% of implementation). During the project an improvement of 28 percentage points has been registered (see Figure 12). Nevertheless, Austria is the only domain in which this set had been completely implemented by the end of the project.

At the beginning of the project there was also a quite good degree of implementation of section 4 of the recommendations, like section 3b, across the 17 domains (59% of implementation before RE-DISS). During the project slight improvements of 12 percentage points have been registered. Most of the improvements were made in terms of BPR [23] and BPR [24], both of which are related to the definition and clarification of the reliable tracking systems in place in the domains.

Strong improvements of 25 percentage points were registered within section 5 of the Best Practice Recommendations that addresses the calculation of residual mixes (see Figure 12). Within the 17 domains only Denmark and Ireland had implemented this full set of recommendations at the end of the project, and these two countries had residual mix calculations fully aligned with the RE-DISS methodology. General improvements in the definition and adoption of the national residual mix (BPR [25]) and the participation in the collection of data for European Residual Mix calculation (BPR [27]) have been the recommendations mostly adopted during the project within this section (see Figure 13 and Figure 14).

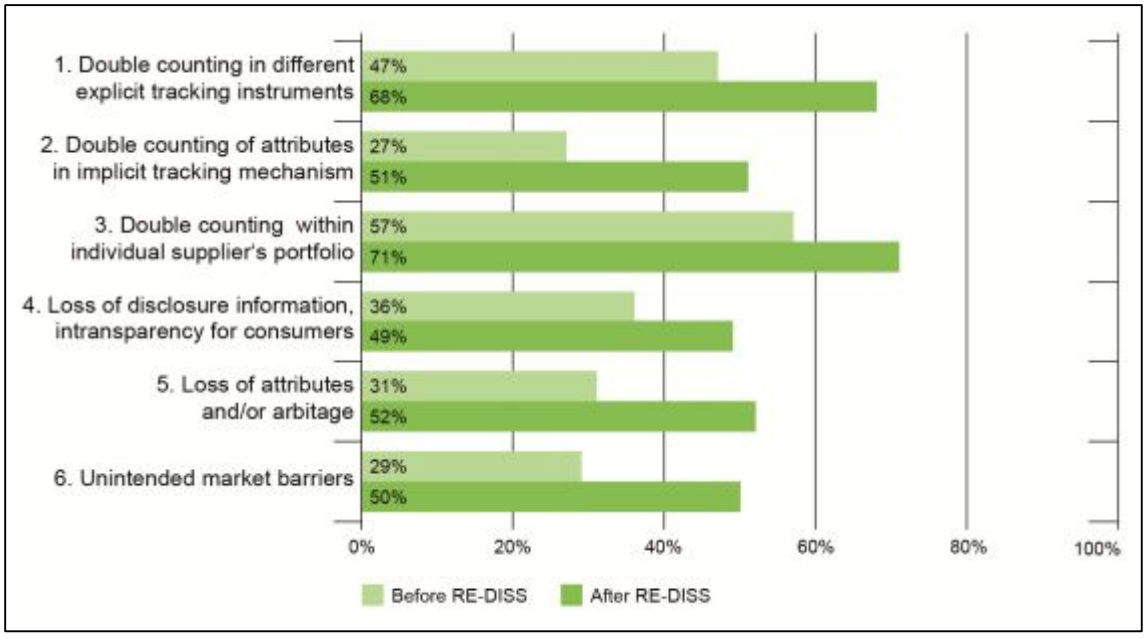
Improvements along the same range as in section 5 were registered for section 6 of the Best Practice Recommendations (contract-based tracking). At the beginning of the project this set of recommendations was implemented by 43% across the 17 domains and at the end of the project it was adopted by 67%. At the end of the project Italy, Sweden and Ireland had improved their systems and implemented all recommendations in this section. At the beginning of the project Austria, Norway, Portugal and Spain were already in line with this set of BPRs.

Smaller improvements were registered in terms of the implementation of section 7 of the recommendations (timing for disclosure). This set of BPR already had a quite good degree of implementation at the beginning of the project (44% before RE-DISS as shown in Figure 12) and during the project an increase of 13 percentage points was registered in its implementation across the 17 domains. However, from the 17 countries only three were fully in line with this set of BPR, namely Finland, Sweden and Ireland, as can be seen in Figure 13 and Figure 14.

In terms of the implementation of the further recommendation on disclosure (section 8), only a relative small improvement has been registered during the project term (17 percentage). Within this set of recommendations only Norway and Ireland can be considered to have adopted the Best Practice Recommendations completely as shown in Figure 13 and Figure 14.

Figure 15 below shows the actual improvements registered among the 17 domains in addressing the six main disclosure problems. These problems have been addressed quite substantially during the project through the implementation of the above-mentioned recommendations. The disclosure problems in which bigger improvements have been registered across the 17 domains are: double counting in different explicit tracking instruments (item 1), double counting of attributes in implicit tracking mechanism (item 2), loss of attributes and/or arbitrage (item 5) and unintended market barriers (item 6). Item 2 was the one for which the largest improvements have been registered. At the end of the project the issue of double counting within the individual supplier's portfolio (item 3) had the highest overall score among the problems listed.

Figure 15: Actual improvements registered in the 17 domains during the project duration in addressing the main disclosure problems



Source: Raimundo et al. 2012

4.3 Quantified Reduction in Implicit Disclosure Errors

Regarding implicit disclosure, Table 2 presents the improvements achieved during the course of the RE-DISS project regarding implicit disclosure in the 17 domains. The first line (1) of Table 2 portrays the status-quo of implicit disclosure at the beginning of the project, whereas the second line (2) presents the situation after RE-DISS for each country, indicating the issues for which improvements have been achieved.

Table 2: Improvements in implicit disclosure during RE-DISS

Country	1	2	3	4	5	6	Description
Austria (1) Austria (2)	X (X)			X			Before RE-DISS: ▪ No residual mix ▪ ENTSO-E mix used for implicit disclosure Improvements: ▪ All RES is filtered out of the ENTSO-E mix before used for implicit disclosure
Belgium (1) Belgium (2)	(X) (X)					(X) (X)	Before RE-DISS: ▪ No residual mix ▪ Production mix from which all RES filtered out used for implicit disclosure ▪ Disclosure of CO_2 and RW not mandatory in Flanders Improvements: ▪ No improvements
Denmark (1) Denmark (2)	X	(X) (X)					Before RE-DISS: ▪ No residual mix ▪ CBT for NUC and FOS Improvements: ▪ Reliable and harmonized residual mix calculation
Finland (1) Finland (2)		X (X)		X			Before RE-DISS: ▪ Residual mix of Finland based on the Nordic domain ▪ No legal status for residual mix: given as a recommendation by the Association of Energy Industries ▪ Contract based tracking allowed Improvements: ▪ Reliable and harmonized residual mix calculation ▪ CBT only for NUC and FOS
Italy (1) Italy (2)	X	X X	---- (X)		---- (X)	(X) (X)	Before RE-DISS: ▪ No residual mix ▪ Disclosure based on fuel mixes ▪ Disclosure of RW not mandatory Improvements: ▪ Residual mix calculated but not completely harmonized (Electricity imports are disclosed with Eurostat mix) ▪ It is not clear whether residual mix accounts for Active GOs
Luxemburg (1) Luxemburg (2)	X (X)			 X		X	Before RE-DISS: ▪ No disclosure Improvements: ▪ Disclosure system implemented ▪ ENTSO-E mix from which all RES filtered out used for implicit disclosure
Netherlands (1) Netherlands (2)	(X) (X)	X (X)	X				Before RE-DISS: ▪ Residual mix calculated, but all RES filtered out. Does not consider contracts and is not harmonized Improvements: ▪ Residual mix calculation considers contracts and is harmonized
Sweden (1) Sweden (2)		(X)		X X			Before RE-DISS ▪ Residual mix based on the Nordic domain ▪ Contract based tracking allowed but accounted for ▪ No legal status for residual mix: given as a recommendation by the Association of Energy Industries Improvements: ▪ Contract-based tracking not allowed (disclosure based on GOs or residual mix) ▪ Use of the residual mix obligated by law

Source: Raimundo et al. 2012

Table 2a: Improvements in implicit disclosure during RE-DISS

Country	1	2	3	4	5	6	Description
Norway (1)			X		X	X	Before RE-DISS: ▪ Residual mix calculated, but not harmonized. Deficit attributes disclosed as unknown ▪ Residual mix only accounts for year X certificates ▪ Disclosure of CO_2 and RW not mandatory Improvements: ▪ Deficit attributes replaced with the European Attribute Mix
Norway (2)					X	X	
Switzerland (1)	X	X				X	Before RE-DISS ▪ No residual mix ▪ Contract-based tracking allowed ▪ Disclosure of CO_2 and RW not mandatory Improvements: ▪ All electricity explicitly tracked (no residual mix needed)
Switzerland (2)	----	(X)	----	----		X	
France (1)	X	X		X			Before RE-DISS: ▪ No residual mix ▪ Mix of own production, contracts and ENTSO-E mix used for disclosure Improvements: ▪ No improvements
France (2)	X	X					
Germany (1)	X	X		X			Before RE-DISS: ▪ No residual mix ▪ ENTSO-E mix as default value for disclosure ▪ CBT (ex-ante and ex-post), GOs, RECS and labels used for disclosure Improvements ▪ National production mix from which all RES filtered out used for implicit disclosure
Germany (2)	(X)	(X)					
Ireland (1)		(X)	X			(X)	Before RE-DISS: ▪ Disclosure based on contracts and residual mix (residual mix accounts for contracts) ▪ Residual mix is not harmonized with other countries ▪ Disclosure of RW not mandatory Improvements: ▪ Harmonized residual mix calculated
Ireland (2)		(X)				(X)	
Portugal (1)	X	X					Before RE-DISS: ▪ No residual mix ▪ Disclosure through contracts Improvements: ▪ Approach to a kind of residual mix
Portugal (2)	X	X					
Slovenia (1)	X	X		X			Before RE-DISS: ▪ No residual mix ▪ Disclosure is based on contracts, GOs and ENTSO-E mix Improvements: ▪ No improvements
Slovenia (2)	X	X		X			
Spain (1)			X		(X)		Before RE-DISS: ▪ Residual mix is calculated, but not harmonized with other countries (domestic attributes expanded if needed) ▪ A problem with Active GOs might exist and GOs do not necessarily have to be cancelled in order to be used Improvements: ▪ No improvements
Spain (2)			X		(X)		

Source: Raimundo et al. 2012

The quantitative analysis was performed by simulating implicit disclosure practices of each country in two cases: before RE-DISS and after RE-DISS according to information presented in Table 1 and Table 2 above. The benchmark was implicit disclosure according to the RE-DISS Best Practice Recommendations.

The impact of issues in implicit disclosure on the total supplier mix of the domain was examined, which demonstrates all attributes disclosed in the domain (both tracked and untracked). The volume of the total supplier mix is the volume of total electricity consumption in the domain.

The following important settings and assumptions were made for the analysis:

- The input data is the same throughout the analysis: Data collected for the 2011 residual mix calculation;
- If contract-based tracking (issue 2) was allowed by the disclosure practices of the country, it was assumed that 50% of otherwise available RES attributes were tracked based on contracts and 20% of NUC and FOS attributes. For France and Sweden, domain specific estimates were available.
    - Otherwise available RES, NUC and FOS attributes are those which are not tracked with other explicit tracking instruments.
- If it can be foreseen that a new legislation will be implemented in the near future, with RE-DISS analysis was performed according to the new legislation. This is relevant for Germany, Sweden and Switzerland where the legislation/regulation has already been ratified as well as for Finland and Italy where it is still a draft.

Finally, two relevant terms need to be clarified:

- Positive disclosure error signifies that the attribute is over-reflected in disclosure in before RE-DISS or after RE-DISS compared to the RE-DISS Best Practice Recommendations. For example, a positive disclosure error of RES means that too much RES resides in the total supplier mix of the country; hence double counting of RES occurs.
- Negative disclosure error signifies that the attribute is under-reflected in disclosure. For example, a negative disclosure error of CO_2 signifies that not enough CO_2 was disclosed (this is often an outcome of double counting of RES).[23]

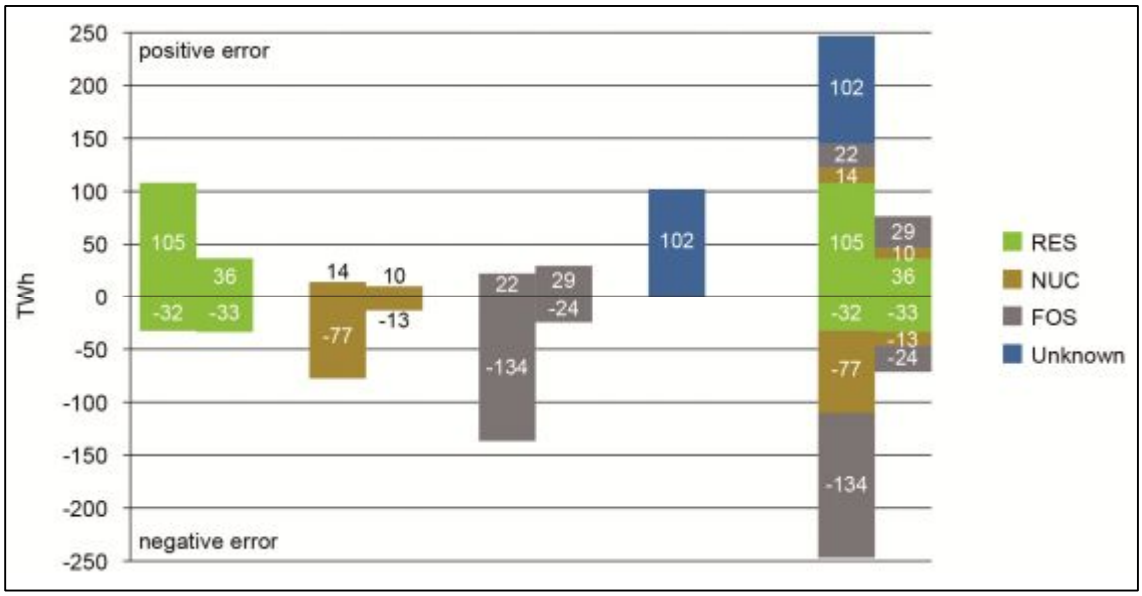
On an overall level, Figure 16 presents the reduction of implicit disclosure errors caused by the improvements described in Table 2 per fuel type and aggregated for all

[23] It is important to note that regarding RES, NUC and FOS attributes, the positive disclosure error of certain attribute(s) in a country always equals the negative disclosure error of other attribute(s) in the country. Logically, if an attribute is over-reflected, it automatically leads to another attribute being under-reflected, as the total electricity consumption to be disclosed is in all cases the electricity consumption of 2011.

fuel types. The left-hand bars of Figure 16 indicate the total positive and negative disclosure errors at the beginning of the RE-DISS project, whereas the right-hand bars illustrate them at the end of the project. Hence the difference between the two bars depicts the reduction in the disclosure error during the RE-DISS project.

Note that the total positive error equals the total negative error (righter most two columns), as an over-reflection of certain attribute(s) always results in a corresponding under-reflection of other attributes, if total consumption is constant.

Figure 16: Implicit disclosure error at the beginning (left) and at the end (right) of the RE-DISS project in volume of energy origin disclosed in 2011 by fuel type

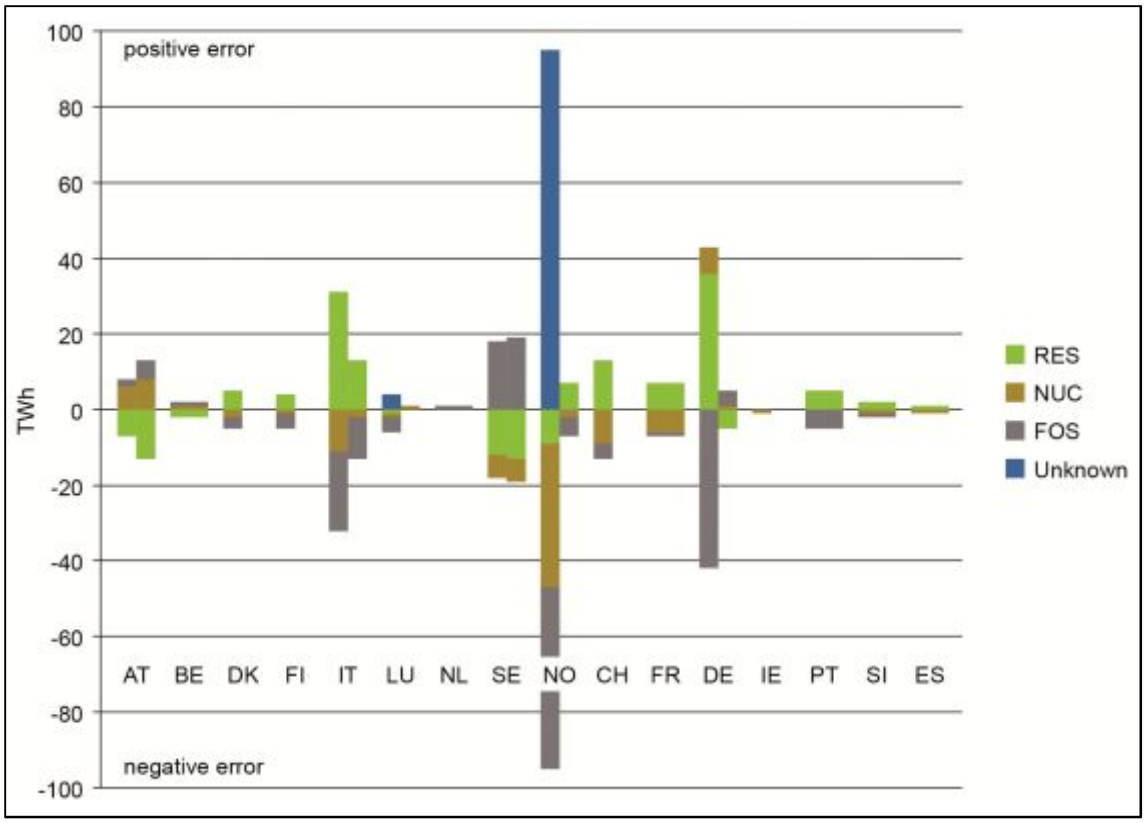


Source: Raimundo et al. 2012

The two far right columns of Figure 16 depict that the total implicit disclosure error has decreased from 243 TWh to 75 TWh during the RE-DISS project period. This means that erroneous disclosure of 168 TWh of consumption was avoided by enhanced implicit disclosure practices implemented during the RE-DISS project. It needs to be reminded that this only relates to implicit disclosure problems on a national level and not to those resulting from disclosure errors inside a supplier's portfolio.

Positive disclosure error of RES (double counting) decreased by 70 TWh, which is a major outcome of the RE-DISS project. Furthermore, no "unknown origin" was disclosed any more at the end of RE-DISS, compared to 102 TWh at the beginning of RE-DISS. This is also a significant improvement because most (95 TWh) of the unknown origin was disclosed in Norway in the first case. Given the production mix of this country, it is very likely that consumers assumed a renewable origin of their electricity without better knowledge. The decreased amounts of RES and unknown were correctly replaced by NUC and FOS attributes, for which the negative disclosure error was reduced by 58 TWh and 110 TWh respectively.

Figure 17: Implicit disclosure error at the beginning (left) and at the end (right) of the RE-DISS project in volume of energy origin disclosed in 2011 by country



* Legislation amendment considered in the analysis, but not yet in force.

Source: Raimundo et al. 2012

Figure 17 breaks down Figure 16 into the disclosure errors per individual country.

Concerning environmental parameters, the progress in correcting disclosure errors was not as rapid. This is due to the fact that many countries still do not require the disclosure of CO_2 and radioactive waste content of the electricity.

On an overall level, the negative disclosure error of CO_2 was estimated at 103 million tons in the beginning of RE-DISS and still amounted to 55,1 million tons at the end of the project. This means that the volume of disappeared CO_2 in European disclosure was reduced by about 50 million tons during the project. For radioactive waste the progress was much slower because even fewer countries require its disclosure than the disclosure of CO_2. Respective figures are 329 tons and 321 tons and hence the progress is roughly only 8 tons. In these figures, it was assumed that if a domain does not require disclosure of an environmental parameter the content of that parameter in disclosure is zero.

It needs to be noted that we have assumed here that the calculation of environmental indicators in implicit disclosure follows the practices of residual mix calculation in the country. This means that countries correctly calculate the CO_2 and radioactive waste

content of their implicit mix, which might not be realistic in all cases. It is possible that even though a residual mix is correctly calculated, the country still uses, for example, the content of CO_2 and radioactive waste in the grid mix for implicit disclosure. Therefore the results obtained in this analysis for environmental indicators could be too optimistic and should only be considered indicative.

5 Tracking systems for heat & cooling from RES

According to the European Technology Platform on Renewable Heating and Cooling (Sanner at al, 2011), almost 50% of the total energy consumed in Europe is used for heat generation, either for domestic or industrial processes. The biggest share of this energy is produced through the combustion of fossil fuels such as oil, coal and gas, which contribute to climate change. Cooling as well, with few exceptions, is produced by processes driven through electricity, which is still predominantly produced from fossil fuel sources. Due to high social, environmental and economic costs of climate change there is an urgent need to shift towards a more sustainable energy economy based on renewable energy sources.

For this reason, renewable energy penetration in the heating and cooling sector is essential. This has been recognised at the European level by the new RES Directive and in the necessity of MS to set targets in this regards. The RES Directive addresses various subjects related to the development of renewable energies in the EU MS, amongst others the legally binding share of renewable energy in gross final energy consumption.

The RES Directive required all MS to develop and adopt National Renewable Energy Action Plans (NREAP), to be delivered to the European Commission by 30 June 2010, in which MS should set out separate national targets for 2020 for the share of energy for renewable sources consumed in transport, electricity and heating and cooling. According to the report produced by Energy Research Centre of the Netherlands (ECN) on the NREAPs submitted (Beurskens and Hekkenberg, 2011), the total gross production from RES for the 27 European MS will amount to 245 Mtoe in the year 2020, with the largest contributions of renewable energy originating from heating and cooling (RES-H/C, 46% in 2020) and from renewable electricity (RES-E, 42% in 2020). Renewable transport (RES-T) is expected to contribute with 13% to the overall renewable energy in 2020.

Besides the RES Directive, the European Strategic Energy Technology (SET) Plan (Commission, 2009), created by the European Commission to accelerate the deployment of low-carbon technologies, has recognized the essential role of using RES sources for heating and cooling as part of the European strategy to improve the security of energy supply and to create markets for highly innovative technologies that are useful to society and where the European industry can take a lead role.

The RES Directive sets out, under Article 2 (definitions), that a GO is defined as: *an electronic document which has the sole function of providing proof to a final customer that a given share or quantity of energy was produced from renewable sources as required by Article 3(6) of Directive 2003/54/EC*, being this only applicable to the use of the GO in the renewable electricity market. However, Article 15 of the RES Directive transfers the concept of the GO to the RES – Heating and Cooling (H/C) sector: *Member states may arrange for guarantees of origin to be issued in response to a request from producers of heating and cooling from renewable energy sources.* Although not obliged to, MS can introduce a GO scheme for RES-H/C.

Like RES and CHP GO the main potential use for RES-H/C GO lies in the disclosure of the renewable origin of heating or cooling energy in the voluntary market.

In terms of uses, RES-H/C GO probably only make sense in case of RES-H/C installations connected to H/C grids, especially in larger supply systems (where heat and cold produced from fossil fuels is also available)[24]. In such systems the differentiation between renewable and other H/C sources makes sense, and the cost for setting up and operating such a system could be justified. According to the RES-Directive MS may establish a minimum capacity limit that would be eligible for participation in a RES-H/C GO system; thus this minimum amount of energy in a heat or cool grid for which a GO is to be issued should be established in order to avoid very high costs in smaller system (small local grids) where these type of GOs may be of limited practicability.

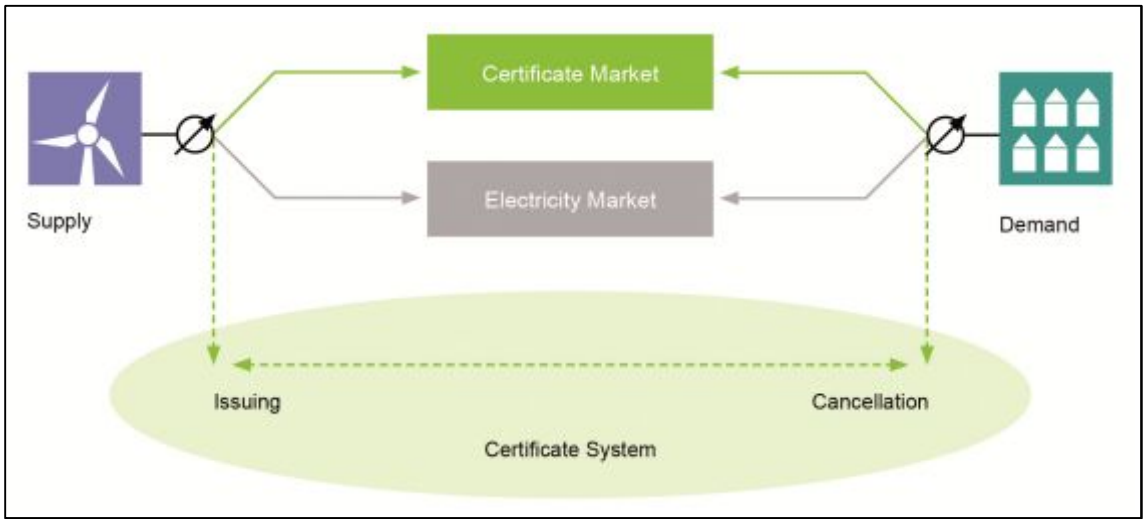
In terms of technologies (e.g. biomass, solar thermal, geothermal etc), RES-H/C GO can be applied to all technologies, but auditing and measurement mechanisms must be put in place.

Few countries in Europe have established RES-H/C GO schemes with the transposition of the 2009 RES Directive. Up to now only Portugal and Austria passed national legislation that establishes such a scheme. When transposing the RES Directive to national legislation, Portugal referred that with the DL 141/2010 of 31st December 2010 (Diário da República, 2010) it created a system for issuing GO for RES-E and RES-H/C. In this system the GO will be an electronic document that will be used for disclosing information to the final consumers, and its content, will be what Art.15 of the Directive requires. However, the operating model of the system is left to be specified in secondary legislation, which had not been passed at the time of writing of this report. Formally Austria has a RES-H/C GO system that is operated by E-Control (the same competent body as for RES-E GO and cogeneration GO schemes); however it is not operational and there is no further legislation or guidelines on it, as up to now there was no demand for this specific type of GO, and this is the reason why this systems is not fully developed.

From the consultation during the 4th RE-DISS Domain Workshop, most competent bodies stated that they were not thinking about implementing a RES-H/C GO systems in their countries as this system is not obligatory and part of these countries are still struggling to implement operational RES-E and HE cogeneration GO schemes. Even those participating domains which stated that they had implemented RES-H/C GO systems, such as Austria, will only develop this system further when there is demand for these GOs.

[24] For small-scale RES-H/C installations, where the producer and the consumer are generally the same actor (the heat and cold tend to be produced for private use in residential and non-residential buildings) the GO system does not seem to provide any practical benefits

Figure 18: Scheme for the GO process independent of the physical electricity market



Source: Authors' own compilation

Thus, it is somewhat unclear what the potential demand for the type of GO will be in the future; the countries that stated that they have already established a RES-H/C GO system or that they will create such a system have not yet received any request for the issuance of this type of GO. Obviously there is not (yet) any relevant voluntary demand for "green heat/cold", which could be comparable to the demand for green power in the electricity sector. Furthermore, any system of transferable support certificates, which might facilitate a support scheme for RES-H/C, may not be based on RES H/C GO, but would rather have to use support certificates, which are different from GOs at least in legal terms. Currently there is no relevant mechanism in sight, which could lead to a relevant market demand for RES-H/C GO.

However, if established a potential RES-H/C system could follow the same principles as the RES-E GO systems: a GO for RES-H/C should be issued, transferred and cancelled. The RES-E GO system is illustrated in Figure 18.

Producers/market participants which wish to have GOs issued firstly need to register with the national issuing body and the required data about the production site as well as its technical features should be recorded in the registry system. For requesting the issuance of GOs for a given production, an independent auditor could be required to compile a Renewable Energy Declaration with the data of the respective production site and the energy input used for H/C production. A GO will then be issued for each MWh of energy produced from RES and electronically stored in a central database. These GOs can then be transferred to other market participants, either in the country of origin or in other EU countries, provided that these countries have also established a compatible system of GOs for RES H/C. When the value of the GO is realized, it is cancelled. When cancelled, the GO is removed from circulation and market participants can no further use that GO (however its information is kept in the registers as cancelled data). As specified in the Directive, each GO should have a maximum lifetime of 12

months. According to the RE-DISS BPR, and to assure harmonisation with other GO schemes, the GO should expire after its 12 month lifetime and be automatically cancelled. The competent body operating the electronic register for RES H/C-GO should possess all information on the life cycle of each H/C-GO.

A GO for H/C should encompass information on the amount of RE energy used for the production of 1MWh of heat or cold, the energy source from which the heat or cold was produced as well as the place and the time span of production. It should also have a unique identification number and related technical information on the production device. Additionally it would have to include information on whether the production of RES-H or RES-C or the investment in the production device has been supported under any public funding scheme (e.g. quota system or feed-in). Furthermore, if support schemes in the country in which the RES-H/C GO system is being established are using transferable certificates, these certificates should be clearly separated from GOs.

The EECS scheme supports RES-E GO as well as RECS certificates for renewable source electricity, CHP-GO for electricity from high-efficient cogeneration and disclosure certificates for fossil and nuclear source electricity. Under these systems GOs are issued, transferred domestically or between actors in different countries and cancelled. AIB is currently discussing the potential impact of opening up the EECS system to GOs for RES-H on its own rules and structure (but also for biogas or white certificates for energy efficiency). Also the question of whether there should only be one institution per country representing the different forms of GO is under discussion.

Other elements of the RE-DISS Best Practice Recommendation for the electricity and CHP markets, e.g. the concept of residual mixes and details of the timing for disclosure, seem not to be transferable to the sector of RES H/C.

A joint working group on "Guarantees of Origin and Energy Certificates" has been set up by CEN/CENELEC. It aims to establish a CEN/CENELEC standard for RES-E GO, which includes the definition of the terminology and requirements for registration, issuing, transfer and GO cancellation as well as measurement and auditing methods. In the longer term GOs for RES-H/C could also be addressed as well by this standard, and also other energy certificates (e.g. white certificates).

In summary, even in the few countries that have established RES-H/C GO systems in its national legislation, these systems are not operational. Thus up to now no RES-H/C GO have been issued, as there are no requirements established for this type of GO. The non-development of this system may be due to different reasons, the main one being the lack of demand for this type of GO. The biggest challenge in relation to GO for RES-H/C seems to be the creation of a market environment in which a voluntary demand for RES-H/C can emerge. As long as this is not achieved, there is hardly a justification for the effort to implement RES-H/C GO systems.

6 Outlook

The RE-DISS project has developed a detailed methodology for the implementation of reliable tracking systems for disclosure and has supported the improvement of existing tracking procedures in many countries. The methodology builds upon the results of the E-TRACK project and has extended it by many practical details which are important for the actual implementation of tracking. The description of the methodology is laid down in the Best Practice Recommendations document and its annex on the methodology of residual mix calculations, which are included in this report as Annex 1.

Chapter 4 of this report demonstrates the progress which has been made in 17 European domains in implementing European legislation and in reducing the error in disclosure information provided to consumers. However, both the quantitative analysis of the remaining measureable disclosure error and the qualitative assessment of the implementation of the RE-DISS recommendations are showing that much work still remains to be done to further improve the information of the origin of electricity which is given to European consumers.

In the follow-up to the RE-DISS project, the following activities should be carried out:

- Further guidance for countries with advanced tracking systems

  Figure 13 and Figure 14 in chapter 4.2 show the extent to which the participating domains in the RE-DISS project and other countries, which are of specific relevance for the European tracking mechanism, have implemented the elements of the RE-DISS Best Practice Recommendations. The two figures show that in a number of countries a number of improvements are still possible. However, it should be noted that not all elements of the BPR are of equal importance for creating a more reliable European tracking system, and for some elements there may be alternative solutions which are compatible to the approach promoted in the BPR. However, it is clear from this analysis that there is a need for further coordination of the future development of the tracking systems in these countries in the years ahead.

- Specific support for countries with less advanced tracking systems

  The RE-DISS project has developed outreach to quite a number of domains, including some which have not yet developed advanced tracking systems. Typically this relates to countries which do not yet have a fully competitive electricity market and therefore the implementation of electricity disclosure, GO systems and a residual mix was considered not of a high priority. However, the implementation of GOs and of electricity disclosure is a requirement under European legislation, and the reliability of this implementation will be a prerequisite for the participation of these countries in the European market for GOs. Furthermore, as these countries are participating in the cross-border exchange of electricity, they may impact the residual mix of other countries even without issuing and transferring GOs. Therefore, and in support of a more competitive electricity

market in these countries in the future, it is important to implement at least the fundamentals of a reliable tracking system in all European countries. Support from political actors and stakeholders on the European level might be needed in order to achieve this goal.

- Further maintenance of the Best Practice Recommendations

  The BPR published as part of this report represent the result of an intensive process of analysis and discussion with relevant stakeholders during the RE-DISS project. However, the framework conditions and the requirements on tracking systems will keep changing in the future as the EU, its member states and other countries further develop their policies on electricity markets and consumer protection. In addition to this, competent bodies should work on further optimisation of the harmonised residual mix methodology, as described in chapter 3.7 of this report. Thus, at least some gradual modifications to the BPR will be needed in the future. Such changes may result in a need for adaptations in all domains which are implementing the BPR, and therefore should be decided about very carefully.

- Improving and managing qualitative and quantitative data

  In order to calculate the European Attribute Mix, an important step in the calculations of the residual mix under the RE-DISS recommendations, the process of data collection and the provision of centrally processed data needs to be continued for every year. In order to make this task easier, the procedures should be further standardised. At the same time, the quality of data should be improved further where possible.

  Besides the quantitative data for the residual mix calculations, a well-functioning European tracking system would also benefit from a central repository of qualitative data about the tracking mechanisms used and the features of the disclosure systems applied in all countries across Europe. Such information could support competent bodies in Europe in their decisions, e.g. about the recognition of imported GOs or the reliability of disclosure data in neighbour countries.

- Guidelines for generators, traders and suppliers of electricity on how to make the best of use tracking mechanisms

  While the RE-DISS project has focused on the coordinated implementation of tracking mechanisms by competent bodies across Europe, the discussions with stakeholders have made clear that there is also a need for a best practice standard for the implementation of electricity disclosure by market actors. Such a standard could supplement the mandatory regulations set by competent bodies on a national level. It could also address recommendations for the use of information from electricity disclosure, particularly on CO_2 emissions, under other policies such as corporate carbon accounting and footprinting.

- Long-term governance structure for a coordinated European tracking system

  In order to support a long-lasting reliable European tracking system, some activities should be carried out continuously based on an appropriate European governance structure. This comprises, but is not restricted to, the future maintenance of the Best Practice Recommendations and the management of qualitative and quantitative data, including the provision of residual mix data for all countries in Europe. It is important to develop an appropriate organisational structure which is able to ensure that these activities are carried out on an annual basis and that future challenges for the reliability of electricity disclosure information in Europe are addressed.

  It is advisable that such a structure is created in close relationship with existing organisations on the European level which are dealing with issues related to electricity markets, GO systems and consumer protection. So far, the highest attention for the recommendations of the RE-DISS project has come from the competent bodies responsible for GO systems. However, electricity disclosure often falls under a different responsibility on a national level. These competent bodies should also get involved in the follow-up to the RE-DISS project.

  The potential European actors which could take further the activities following from RE-DISS include the European Commission, ACER and CEER as European bodies of energy regulators, ENTSO-E as the association of transmission system operators and the Association of Issuing Bodies, which is administering the European Energy Certificate System. There are also a number of other bodies which could be involved.

It would be helpful if these activities could be covered by a follow-up action to the RE-DISS project. The project team has applied for a grant for a follow-up project “RE-DISS II” under the 2012 call for proposals of the Intelligent Energy Europe programme. The objectives of this proposed project focus on successfully carrying out the tasks mentioned above. At the time of writing of this report, it seems likely that such a project could be supported by the Commission. In the case that this proves not to be possible, other actors should consider assuming responsibility at least for the most important activities, such as the annual residual mix calculations. As outlined above, a permanent governance structure should be established as soon as possible, which manages the continuous tasks in ensuring reliable disclosure data for European electricity consumers.

7 References

Beurskens, L.W.M. and Hekkenberg, M. (2011): Renewable Energy Projections as Published in the National Renewable Energy Action Plans of the European Member States: Executive Summary, February 2011. Energy research Centre of the Netherlands (ECN). Available for download at: www.ecn.nl/docs/library/report/2010/e10069_summary.pdf

Boardman, Brenda, J. Palmer, A. Arvidson, V. Bürger, J. Green, K. Lane, J. Lipp, M. Nordstrom, H. Ritter, C. Timpe, D. Urge-Vorsatz (2003): 4CE Final Report, Prepared as part of the ALTENER project 'Consumer Choice and Carbon Consciousness for Electricity (4CE)'. Available for download from the website: http://www.electricitylabels.com/downloads/4CE_Final_Report.pdf.

Boardman, Brenda, Palmer, Jane (2007): Electricity disclosure: The troubled birth of a new policy. Energy Policy 35 (2007) 4947–4958.

Draeck, Mark (2009): The state of implementation of electricity disclosure and Guarantees of Origin across Europe. A report from the E-TRACK II project, June 2009. Available for download from the E-TRACK website: http://www.e-track-project.org/docs.php.

European Commission (COM) (2004): Note of DG Energy & Transport on Directives 2003/54/EC and 2003/55/EC on the internal market in electricity and natural gas – Labelling provision in Directive 2003/54/EC. Brussels 2004.

European Commission (COM) (2009): European Commission webpage: http://ec.europa.eu/energy/technology/set_plan/doc/2009_comm_investing_development_low_carbon_technologies_en.pdf (consulted in July 2011)

Klimscheffskij, Markus (2012): Results from Calculation on Tracking Relevant Data. Summary of the Results of the Residual Mix Calculations for 2010 and 2011. Report D4.2 from the RE-DISS project. Available for download from the RE-DISS website: http://www.reliable-disclosure.org/documents.

Raimundo, Claudia (2012): Report on Verification of conditions for implementing Heating and Cooling (H/C) Guarantee of Origin Systems. Report D3.3 from the RE-DISS project. Available for download from the RE-DISS website: http://www.reliable-disclosure.org/documents.

Raimundo, Claudia, Klimscheffskij, Markus, Lescot, Diane (2012): Report on Improvements Achieved by the Project based on the Best Practice Recommendation. Report D5.1 from the RE-DISS project. Available for download from the RE-DISS website: http://www.reliable-disclosure.org/documents.

RECS (n.d.). RECS International. Retrieved 2011, from www.recs.org.

RE-DISS project (2012): Final Country-specific Recommendations. Paper D3.1 from the RE-DISS project. Available for download from the RE-DISS website: http://www.reliable-disclosure.org/documents.

RE-DISS project (2012a): Summary about the measures taken in RE-DISS participating domains to implement the project's recommendations. Report D3.2 from the RE-DISS project. Available for download from the RE-DISS website: http://www.reliable-disclosure.org/documents.

Sanner, Burkhard; Kalf Ria; Land, Anna; Mutka, Kira; Papilon, Philippe; Stryi-Hipp, Gerhard; Weiss, Werner (2011): "2020-2030-2050 Common Vision for the Renewable Heating & Cooling sector in Europe". European Technology Platform on Renewable Heating and Cooling Report, July 2011. Available for download at: www.rhc-platform.org.

Timpe, Christof (2007): A European Standard for the Tracking of Electricity. Final report from the E-TRACK project, August 2007. Available for download from the E-TRACK website: http://www.e-track-project.org/documents.php.

Timpe, Christof (2009): Best Practice for the Tracking of Electricity, Final report from the E-TRACK II project, November 2009. Available for download from the E-TRACK website: http://www.e-track-project.org/documents.php.

Annex

Annex 1: The Best Practice Recommendations

The Best Practice Recommendations consist of a main section and an annex on the residual mix calculation methodology.

Best Practice Recommendations

For the implementation of Guarantees of Origin and other tracking systems for disclosure in the electricity sector in Europe

Version 2.1, December 2012

1 Introduction

This document is meant to provide guidance to competent bodies and legislators which are implementing and managing systems of Guarantees of Origin (GO) and other tracking systems for purposes of electricity disclosure in Europe. The Best Practice Recommendation builds upon the findings and recommendations of the project "A European Tracking System for Electricity (E-TRACK)".[1] These have been developed further in the RE-DISS project[2] and were discussed in six workshops which involved representatives of Competent Bodies from 19 European countries. Comments received during and in between the workshops have been taken up in this version of the recommendation. It was not intended to ask the workshop participants for a formal approval of the Best Practice Recommendation. However the broad majority of participants supported the proposals and only very few reservations on single elements of the recommendation were made by some workshop participants.

The members of the RE-DISS project team recommend that competent bodies and legislators in Europe follow the proposals as specified in this document when implementing the details of GOs and disclosure systems in their countries. This will facilitate an advanced implementation of these instruments, which satisfies the requirements for GOs to be accurate, reliable and fraud-resistant (as set out in Directives 2009/28/EC and 2004/8/EC[3]) and for disclosure information to be reliable (as set out in Directive 2009/72/EC). The Best Practice Recommendation cannot be binding for any party, but we hope that it serves as a point for orientation for many countries and that it supports a truly reliable implementation of GOs and disclosure across Europe.

The term "Europe" used throughout this document refers to the EU member states and all other European countries which have implemented systems for Guarantees of Origin and electricity disclosure which are comparable to those stipulated by the EU directives mentioned above. We speak about "countries" and their competent bodies, but it should be noted here that in Belgium the competent bodies are working on a regional rather than a national level and that disclosure in Ireland comprises the Republic of Ireland as well as Northern Ireland.[4]

---

1 See the website of the E-TRACK project, which ran until 2009 (http://www.e-track-project.org). The E-TRACK final report contains a lot of background information which might help in understanding this document, including a glossary.

2 For more information on the RE-DISS project, which runs until October 2012, please see the project website http://www.reliable-disclosure.org, which contains lots of useful information regarding GOs and disclosure.

3 Note that this Directive has been replaced recently by the new Energy Efficiency Directive 2012/27/EC, which must be implemented by member states by June 2014.

4 In order to make the text easier to read we have left out the term "domain" in this paper and are simply referring to "countries", but this is meant to include the regions in those cases in which this is applicable.

Supported by INTELLIGENT ENERGY EUROPE

As more experience is gained with the implementation of GOs and disclosure, the Best Practice Recommendation will be developed further. It will thus be a living document and new versions will be published after consultations with those competent bodies which have agreed to become participants of the RE-DISS project.

Any comments or questions regarding this document or the RE-DISS project should be directed to Ms. Anja Sachs at Öko-Institut (a.sachs@oeko.de), phone +49-761-45 295-226.

The following chapters address the most relevant items which have been identified for the Best Practice Recommendation by the project team and workshop participants. After a short introduction to each subject the actual recommendations are given in numbered paragraphs, which makes references easier. Details of the recommended methodology for residual mix calculations have been added as an annex to this document.

2 How to implement the "12 month lifetime rule" for GOs

Article 15 (3) of the Directive 2009/28/EC specifies:

> *"Any use of a guarantee of origin shall take place within 12 months of production of the corresponding energy unit. A guarantee of origin shall be cancelled once it has been used."*

The production of an energy unit can only be accounted for over a period of time (production period). Thus the term "production" in the text of the directive needs interpretation. The term "use" could be interpreted as the act of cancelling a GO or as the act of using the information contained in a GO for disclosure.

If the approach to the GO lifetime is not harmonised across Europe, then an option is created for arbitrage deals in the GO market, so that GOs could be moved from domains with stricter lifetime rules to those which allow for a longer lifetime. In the absence of specific incentives to do so this might not be relevant. However, if GO market prices vary from one year to another (for example due to natural variations in RES supply), then this might become an issue.

The following regulations are thus recommended not only for RES-GOs but for any type of GOs.

Best Practice Recommendation:

[1] The metered production periods for purposes of issuing GOs should not be longer than a calendar month and where possible should not run across the start and end dates of the disclosure periods (see item [33]). Longer intervals up to one year are acceptable for very small plants, for example.

[2] If possible, the issuing of GOs should be done without delay after the end of each production period.

[3] The lifetime of GOs should be limited to 12 months after the end of the production period. GOs which have reached this lifetime should be collected into the Residual Mix (see chapter 5).

[4] An extension to this lifetime can be granted if a GO could not be issued for more than six months after the end of the production period for reasons which were not fully under the control of the plant operator. In this case, the lifetime of the GO might be extended to six months after issuing of the GO.

[5] Cancellations of GOs relating to production periods in a given year X which occur by 31 March of year X+1 should be counted in disclosure for year X. Later cancellations should be counted in disclo-

sure for year X+1. (If disclosure periods differ from the calendar year (see item [33]), the deadline should be defined accordingly.)

[6] The disclosure information from expired GOs (see item [3]) can be allocated either to the production year of the corresponding energy unit or to the year when the GOs have expired, depending on the methodology used for Residual Mix calculation in the respective domain. (Note that in the RE-DISS calculation of Residual Mixes, the production year of the expired GOs determines the year for which the disclosure information is allocated.)

3 Further Recommendations on GOs

Usage of the European Energy Certificate System

The European Energy Certificate System (EECS) is a ready-to-use standard for the implementation of electronic GO systems in Europe which reflects the requirements of European Directives and coordinates the details of GO systems, including the electronic interfaces for transferring GOs between registries in different countries. The Association of Issuing Bodies (AIB) which governs EECS is a membership-based non-profit organisation with high expertise and currently has members from 14 EU member states plus Norway and Switzerland.

Further guidance for implementing GOs will be given by a CEN standard for Guarantees of Origin for electricity, which will be published in summer 2013, and which is expected to reflect the achievements of EECS.

Best Practice Recommendation:

[7] The implementation of GOs in all countries in Europe should be based on the European Energy Certificate System (EECS) operated by the Association of Issuing Bodies (AIB). If national GO systems are established outside of EECS, then EECS should at least be used for transfers between registries.

[8] If not all European countries are members of EECS, appropriate connections between the EECS system and non-EECS members as well as in between different non-EECS members will need to be established. These include inter alia procedures for assessing the reliability and accuracy of the GOs issued in a certain country and interfaces for the electronic transfer of GOs. The AIB is developing procedures for allowing non-members of EECS to connect their GO registries to the EECS Hub. This option should be used by all countries which have decided not to become members of EECS.

[9] So-called ex-domain cancellations of GOs, where a GO is cancelled in one registry and a proof of cancellation is then transferred to another country in order to be used there for disclosure purposes, should only be used if a secure electronic transfer is not possible and if there is an agreement on such ex-domain cancellations between the competent bodies involved. Statistical information on all ex-domain cancellations relating to a disclosure year should be made available differentiated by energy source[5] in order to support Residual Mix calculations.

The implications of a coexistence of electronic GO transfers within EECS and outside of EECS are not fully clear yet and require further assessments.

5 This information should be provided using a structure for energy sources which corresponds to the highest hierarchy level of fuel codes in the EECS Fact Sheet 5 (see http://www.aib-net.org/portal/page/portal/AIB_HOME/EECS/Fact_Sheets)

Issuing of Guarantees of Origin for different energy sources and generation technologies

European Directives require the establishment of GOs for electricity from renewable energy sources and from high-efficiency cogeneration. However, in order to support differentiation also between other forms of electricity generation it is advisable to extend the system of GOs to other forms of electricity generation.

Best Practice Recommendation:

[10] GOs should generally be issued only for the net generation of a power plant, i.e. gross generation minus the consumption of all auxiliaries related to the process of power production. For hydro power plants involving pumped storage this means that GOs should be issued only for the net generation which can be attributed to natural inflow into the reservoir.

[11] The GO system should be extended beyond RES & cogeneration to all types of electricity generation.

[12] All types of GOs should be handled in one comprehensive registry system per country. (For an exception from this recommendation see the coexistence of national GO systems and EECS in item [7]).

[13] All GOs should be linked to disclosure.

[14] There should be no issuing of more than one GO for the same unit of electricity. If multiple certificates are to be issued, for example, a GO for disclosure and a support certificate for management of a support system, then these should be legally separated.

[15] This also applies to cogeneration plants which are using RES as the energy source: Only one GO should be issued per unit of electricity, which should combine the functionalities of a RES-GO and a cogeneration GO.

Note that linking cogeneration GOs to disclosure means that there should be a use of the information content of cogeneration GOs in disclosure statements. For example, suppliers might be encouraged or even required to disclose the share of electricity from high-efficiency cogeneration in their company or product mix.

The GO as the unique "tracking certificate"

Currently, other tracking mechanisms are also being used which are very similar to GOs, but do not have the same status. This includes RECS certificates and some "green power" quality labels.

In some domains, GOs may not only be used by suppliers of final consumers, but also by (typically large) consumers who purchase energy and GOs separately and cancel the GOs for their own purpose. In this case, the related energy might be associated with generation attributes two times (once by the supplier of the energy and once by the consumer itself through the cancellation of GOs).

Best Practice Recommendation:

[16] GOs should be the only "tracking certificate" used. Any other tracking systems of a similar purpose and function as GOs should be converted to GOs.

[17] Besides GOs, only Reliable Tracking Systems (which may include contract-based tracking, see chapter 6) and the Residual Mix should be available for usage for disclosure. No other tracking mechanisms should be accepted.

[18] Green power quality labels should use GOs as the unique tracking mechanism.

[19] European countries should clarify whether and under which conditions the use of GOs by end consumers is allowed. Such GO use should not be based on ex-domain cancellations performed in other countries. If consumers are allowed to use GOs themselves, a correction should be implemented in the disclosure scheme which compensates for any "double disclosure" of energy consumed.

Note that item [18] requires a cooperation between competent bodies and the operators of "green power" quality labels. For example, the GO systems need to become capable to convey label information as part of their data content.

Recognition of GOs imported from other countries

Directive 2009/28/EC allows member states to reject the recognition of a RES-GO for disclosure only if they have "well-founded doubts about its accuracy, reliability or veracity". Similar rules apply for co-generation GOs under Directive 2004/8/EC, which has now been replaced by the new Energy Efficiency Directive 2012/27/EC, to be implemented by member states by June 2014.

Best Practice Recommendation:

[20] Any such rejection should only relate to the actual use of cancelled GOs for disclosure purposes in the respective country and should not restrict the transfers of GOs between the registries of different countries. This means that the decision about the recognition of a GO should not hinder its import into a specific country.

[21] Within the rules set by the respective Directives, European countries should consider their criteria for the acceptance of imported GOs for purposes of disclosure.

- *These criteria should address imports at least from all EU member states, other members of the European Economic Area (EEA) and Switzerland. The parties to the Energy Community Treaty should be considered as well, as soon as GO imports from these countries become relevant.*
- *The criteria should specify the electronic interfaces, specifying data format and contents of GOs to be imported, which the respective country accepts for imports of GOs (such as the EECS Hub and any other interfaces accepted).*
- *Conditions for the recognition of GOs from other countries should be that they were issued based on Art. 15 of Directive 2009/28/EC or compatible national legislation, and that they meet the explicit requirements set in Art. 15, for example, regarding the information content of the GOs.*
- *The recognition of GOs from other countries should be rejected if these countries have not implemented an electricity disclosure system.*
- *The recognition of GOs from other countries should be rejected if the country which has issued the GOs or the country which is exporting the GOs have not implemented appropriate measures which effectively avoid double counting of the attributes represented by the GOs. Such appropriate measures should ensure the exclusivity of the GOs for representing the attributes of the underlying electricity generation, implement clear rules for disclosure, establish a proper Residual Mix (see chapter 5) or equivalent measures, and ensure their actual use. Furthermore, the appropriate measures should ensure that attributes of exported GOs are*

subtracted from the Residual Mix of the exporting country and cannot be used for disclosure at any time in the issuing or the exporting country by explicit mechanisms, unless the GOs are re-imported and cancelled there.

European countries should establish a register of their decisions taken regarding the acceptance of imported GOs, which gives guidance to other competent bodies and also provides transparency for market actors.

4 Disclosure Schemes and other Reliable Tracking Systems

European Directives require EU and EEA member states to implement full disclosure systems. However, the analysis undertaken in the course of the E-TRACK project showed that as of 2009 not all countries had fully implemented these requirements yet. As of 2012 there are still some hints of incomplete compliance regarding disclosure schemes.

In order to set up a full disclosure system, GOs and a Residual Mix should be implemented (see the following chapter 5 on the Residual Mix). As a third element, other Reliable Tracking Systems may be implemented where appropriate, but these should fulfil certain criteria.

Best Practice Recommendation:

[22] Full disclosure schemes should be implemented, including the disclosure of CO_2 emissions and radioactive waste.

[23] (Other) Reliable Tracking Systems (RTS) should be defined where appropriate based on criteria of added value, reliability and transparency.[6]

[24] RTS can comprise, where applicable:

- *Homogenous disclosure mixes for non-competitive market segments where no choice of supplier or different products exists,*
- *Support systems whose interaction with disclosure requires a certain allocation of the attributes of supported generation (for example, a pro-rata allocation to all consumers in a country in which RES electricity is supported by a feed-in tariff),*
- *Contract-based tracking (see chapter 6 below).*

5 Calculations of residual mixes

The use of uncorrected generation statistics for purposes of disclosure should be avoided, because this leads to double counting in relation to GOs (and other Reliable Tracking Systems, if applicable).[7] A Residual Mix should be provided for disclosure of electricity of unknown origin, based on the methodology developed in the RE-DISS project. For details of the recommended methodology for residual mix calculations see the methodology paper in the annex to this document.

Best Practice Recommendation:

[25] All countries should provide a Residual Mix as a default set of data for disclosure of energy volumes for which no attributes are available based on cancelled GOs or based on other Reliable Track-

6 For more details on the criteria for Reliable Tracking Systems please see the final report of the E-TRACK project.

7 For more details on this issue please see the final report of the E-TRACK project.

ing Systems (RTS, see item [23]). The use of uncorrected generation statistics (for example on national or UCTE, Nordel etc. levels) should be avoided.

[26] The calculation of the Residual Mix should follow the methodology developed in the RE-DISS project. As part of this methodology, competent bodies should ensure that double counting between GOs they have issued, other Reliable Tracking Systems in use in their country and the Residual Mix is excluded.

[27] Competent bodies from all countries in Europe should cooperate in order to adjust their Residual Mixes in reflection of cross border transfers of physical energy, GOs and RTS. For this purpose, competent bodies should use data provided by RE-DISS.[8] They should also support the collection of input data for the related calculations by the RE-DISS project team.

[28] As a default, the Residual Mix should be calculated on a national level.[9] However, if the electricity markets of several countries are closely integrated (for example in the Nordic region), a regional approach to the Residual Mix may be taken. This should only be done after an agreement has been concluded between all countries in this region which ensures a coordinated usage of the regional Residual Mix.

6 Contract-based tracking

Currently, producers and suppliers in most countries are using an implicit allocation method for disclosure attributes which follows the bilateral contracts which are concluded in the electricity market. In most cases, market participants simply assume that they are receiving a certain set of attributes from their contractual counterparts in the electricity market. In most of these countries, this tracking mechanism is not clearly regulated, its relation to GO systems and RTS is not clarified and there are no reliable statistics about the volumes and types of electricity attributes which are tracked through this mechanism. This makes it impossible to generate a reliable Residual Mix and inevitably leads to double counting of generation attributes, including those represented by GOs. In order to establish reliable tracking systems, contract-based tracking should either be banned or the related practices need to be improved significantly by clear regulation and statistics.

Best Practice Recommendation:

[29] If contract-based tracking is allowed in a country, it should be regulated clearly.

[30] Such regulations should ensure that

- *The rules of the tracking system are transparent and comprehensive and are clearly understood by all participants in the system.*
- *Double counting of attributes and loss of disclosure information is minimised within the contract-based tracking scheme and also in the interaction of the contract-based tracking scheme to GOs and other RTS (if applicable). As a precondition for this, the contract-based*

8 An appropriate replacement for the RE-DISS project in providing this information to Competent Bodies will have to be determined for the time after the project has terminated. Currently, the project team has applied for funding of a second phase of the RE-DISS project. During this second phase, options for a long-lasting organisational structure for this task will be assessed.

9 Exceptions may apply when the domestic market is separated into two or more regions. In this case, regional mixes can be determined. See also the introduction of this document on the usage of the term “country”.

tracking scheme should be able to provide comprehensive statistics about the volumes and types of electricity attributes which are tracked through it.

- *The relevant information for disclosure purposes should be available in time to meet the timing requirements set out in chapter 7.*

[31] If suppliers of electricity intend to use contract-based tracking in order to fulfil claims made towards consumers regarding the origin of a certain electricity product (for example a "green" energy product), GOs should be used in addition to the contract (see also item [38]).

[32] If a country implements a system in which generation attributes are allocated to suppliers and consumers of electricity "ex post" based on the contracts concluded in the electricity market, then such a system should fulfil the requirements mentioned above in order to qualify as a Reliable Tracking System (see item [23]). This includes the need to produce reliable statistics about the attributes allocated by this system.

7 Timing of Disclosure

It is necessary to coordinate the timing of the most relevant steps for calculating disclosure data across Europe. This helps to avoid market distortions and possibilities for arbitrage deals between different countries with different deadlines and is a precondition for the recommended cooperation of European competent bodies regarding the calculation of their Residual Mixes (see item [26]).

Best Practice Recommendation:

[33] Electricity disclosure should be based on calendar years.

[34] The deadline for cancelling GOs for purposes of disclosure in a given year X should be 31 March of year X+1 (see item [5]).

[35] The timing of the calculation of the Residual Mix should be coordinated across Europe:[10]

- *By 30 April X+1 all countries should determine their preliminary domestic Residual Mix and whether they have a surplus or deficit of attributes.*
- *By 15 May X+1, the European Attribute Mix should be determined.*
- *By 31 May X+1, the final national Residual Mixes should be published.*
- *As of 1 July X+1 the disclosure figures relating to year X can be published by suppliers.*

It must be noted here that some countries are already using diverging disclosure periods: Austria, the United Kingdom and Estonia are using financial years which are different from calendar years. In Portugal suppliers are disclosing based on rolling 12 month invoicing periods and therefore disclosure figures are determined on a monthly basis. In order to avoid market distortions and possibilities for arbitrage deals between countries with different deadlines and in order to support the cooperation of competent bodies regarding the calculation of their Residual Mixes, these countries should move to a calendar year disclosure period whenever possible.

[10] For details of the recommended methodology for residual mix calculations see the methodology paper in the annex to this document. See item [28] on the regional scope of the Residual Mixes.

8 Further Recommendations on Disclosure

The following additional items have been identified as recommendations for disclosure systems. For details on the background of these items please refer to the E-TRACK final report.

Best Practice Recommendation:

[36] All countries should clarify the relation between their support schemes for RES & cogeneration on the one side and GOs and disclosure schemes on the other side. Where necessary, the support schemes should be defined as RTS (see item [23]).

[37] If support schemes in a country are using transferable certificates, then these certificates should be separated from GOs and should not be used for disclosure (see also item [14]).

[38] All electricity products offered by suppliers with claims regarding the origin of the energy (for example "green" or low-carbon power) should be based exclusively on cancelled GOs. No other tracking systems should be allowed, with the exception of mechanisms required by law, e.g. a pro-rata allocation of generation attributes to all consumers which is related to a support scheme (see item [24]).

[39] Suppliers offering two or more products which differ in terms of the origin of the energy should be required to give product-related disclosure information to all their customers, including those who are buying the default "remaining" product of the supplier.

[40] There should be clear rules for the claims which suppliers of, for example, "green" power can make towards their consumers. There should be rules how the "additionality" of such products can be measured (the effect which the product has on actually reducing the environmental impact of power generation), and suppliers should be required to provide to consumers the rating of each product based on these rules.

[41] Claims made by suppliers and consumers of "green" or other low-carbon energy relating to carbon emissions or carbon reductions should also be regulated clearly. These regulations should avoid double counting of low-carbon energy in such claims. A decision needs to be taken whether such claims should adequately reflect whether the energy purchased was "additional" or not.

[42] If suppliers are serving final consumers in several countries rules must be developed and consistently implemented in the countries involved on whether the company disclosure mix of these suppliers should relate to all consumers or only to those in a single country.[11]

[43] The following recommendations should be followed with respect to the relation of disclosure to the cooperation mechanisms (Art. 6 – 11 of Directive 2009/28/EC):

- *If EU member states or member states and other countries agree on Joint Projects, such agreements should also clarify the allocation of attributes (via GOs, RTS or Residual Mix) issued from the respective power plants.*
- *If EU member states agree on Joint Support Schemes, such agreements should also clarify the allocation of attributes (via GOs, RTS or Residual Mix) issued from the power plants supported under these schemes.*

11 This is also relevant in Belgium, in which disclosure is governed on the regional level.

9 Steps for determining the disclosure figures of a supplier

In order to clarify how the recommendations in this document could be applied by market participants, the following process description is given.

[44] Suppliers should apply the following steps in order to determine their disclosure figures:

- *During the disclosure period, suppliers which aim at a certain disclosure mix should use the "explicit" tracking mechanisms which are available in the respective countries in order to acquire the desired generation attributes. In all countries this comprises GOs, but contract-based tracking and certain other Reliable Tracking Systems might also be available.*
- *If suppliers are offering electricity products with claims regarding the origin of the energy (for example "green" or low-carbon power) then they should acquire the related generation attributes during the disclosure period exclusively based on GOs. Besides such products, GOs can also be used for shaping the overall disclosure mix of a supplier.*
- *All GOs which are meant to be used for the disclosure period of calendar year X should be cancelled before the deadline of 31 March X+1.*
- *After this deadline, the total volume of electricity sold to final consumers and all generation attributes which have been acquired based on cancelled GOs and other Reliable Tracking Systems including contract-based tracking (if applicable) should be accounted for. This may include a pro-rata allocation of attributes of electricity supported, for example, under a feed-in tariff to all suppliers, which might have been implemented in the respective country as a Reliable Tracking System.*
- *Any use of contract-based tracking should strictly follow the regulations issued for the respective country. Any attributes assumed for or notified by the contractual counterpart in the electricity market may only be used if explicitly allowed by such regulations. National generation statistics and other data which is not corrected by the different tracking systems in use should not be used at all. Instead, the Residual Mix should be used (see below).*
- *Suppliers should respond in time to requests by the Competent Body on statistical reporting of volumes of electricity sold to final consumers and of any "explicit" tracking mechanisms used.*
- *Typically the volume of electricity sold to final consumers is larger than that of the generation attributes acquired through "explicit" tracking mechanisms. In this case the missing generation attributes should be "filled up" from the Residual Mix for the respective country, which will be determined and published by the Competent Body according to the schedule set out in chapter 7.*
- *The overall supplier disclosure mix consists of the attributes of all electricity sold to final consumers, including all products which might be differentiated.*
- *If electricity products which differ in terms of the origin of the energy have been offered to part of the consumers then these consumers will receive product-related disclosure information based on the GOs cancelled for this purpose. However, in this case such product-related disclosure information should also be given to those consumers who have not purchased a specific product. This means that a "remaining" product should be defined which consists of the disclosure mix of the supplier minus the attributes of all separated products.*

This information should be disclosed as product-specific disclosure data to the consumers who are receiving the "remaining" product.[12]

- *CO_2 emissions and radioactive waste should be disclosed on the supplier and product levels in direct relation to the fuel mix which is being disclosed.*[13]

Disclaimer:

The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union. Neither the EACI nor the European Commission is responsible for any use that may be made of the information contained therein.

12 This recommendation avoids the implicit double counting of attributes which might be part of, for example, a "green" power product and which also appears in the overall disclosure mix of the supplier. See the E-TRACK final report for more details.

13 For this purpose, generic technology-specific emission factors could be applied, which are defined by the domain in which the GO is used.

Reliable Disclosure Systems for Europe

Methodology of Residual Mix Calculation

Electricity Residual Mix Calculation According to the RE-DISS Project

Annex to the RE-DISS Best Practice Recommendations

Version 1.0, October 2012

Written by

Markus Klimscheffskij (markus.klimscheffskij@grexel.com)
Grexel Systems Ltd.

Supported by
INTELLIGENT ENERGY EUROPE

Content

List of Figures

1 Glossary

(Electricity generation/production) Attribute – Attribute refers to a piece of information, which is tracked in order to disclose specific consumption. Most important attributes for disclosure are the energy source and the associated CO_2 emissions and radioactive waste. In the de-linked tracking system the information content of a GO represents all the relevant generation attributes of 1 MWh of electricity. In the residual mix calculation, the term attribute often means merely the energy source, and hence RES, NUC and FOS attributes are discussed.

Available attributes – Attributes that are not explicitly tracked in order to disclose certain consumption. The pool of yearly available attributes in a domain constitutes the domestic residual mix.

European Attribute Mix (EAM) – The EAM is a calculatory pool of available attributes in residual mix calculation. It results from surpluses of available attributes compared to untracked consumption in surplus domains. The EAM is used to cover deficits of available attributes compared to untracked consumption in deficit domains.

Reliable Tracking Systems (RTS) – RTSs are other explicit tracking systems besides EECS that are considered reliability and transparency. Typical examples of certificate-based RTSs are national GO systems and examples of non-certificate-based RTSs are Feed-in tariffs when linked to disclosure or in some cases contract-based tracking.

Residual mix – The residual mix is a pool of available generation attributes, which are not explicitly tracked in order to disclose certain consumption.

Residual mix calculation – Residual mix calculation is an implicit tracking mechanism in which shares of energy sources and environmental impacts of untracked consumption are determined by the statistical mix of available attributes.

Total supplier mix (TSM) – TSM means the total volume of attributes disclosed in a domain, both explicitly tracked and those disclosed through the residual mix.

Untracked consumption – Untracked consumption refers to consumption that is not disclosed by using explicit tracking mechanisms, such as GOs. Untracked consumption is disclosed with the residual mix.

2 Introduction

This methodology paper aims to describe, in detail, how electricity residual mixes are calculated according to the Best Practice Recommendations of the RE-DISS project (Reliable Electricity Disclosure Systems for Europe) in EU27 (incl. EEA and Switzerland).

Residual mix is an implicit disclosure mechanism in which volumes and shares of energy sources and environmental impacts of untracked electricity consumption[1] are determined by the statistical mix of a domain's yearly generation attributes, available after explicit tracking. Residual mix is defined on a domain level[2] and calculated based on a calendar year. Data on reference-year electricity generation

[1] i.e. consumption, which has not been disclosed with explicit tracking instruments such as guarantees of origin or contract-based tracking.

[2] With the exception that the three domains in Belgium only have a single residual mix. Under unified power markets (e.g. the Nordic countries) a broader approach can be taken as long as all associated domains agree upon it.

and consumption as well as explicit tracking until the disclosure deadline are accumulated in order to calculate the domestic residual mix.

Due to the international transfer of both electricity and guarantees of origin (which represent electricity generation attributes), the calculation of residual mixes needs to be harmonized across Europe. This means domains can themselves calculate the domestic residual mix, but have to coordinate to form the European Attribute Mix (EAM), which is needed in order to establish the final residual mix of each domain. This coordination was, from 2010 to 2012 carried out by the RE-DISS project.

RE-DISS project finished with two equally reliable calculation methodologies: transaction-based method (TBM) and the issuance-based method (IBM), both of which will be explained in this document. In the past, methodology relating to transactions has been used, but recent discussion has favoured the issuance-based method. It must be stressed that the correct implementation of either of these methods effectively removes double counting in residual mix calculation. This is required to secure the reliability of explicit tracking instruments; guarantees of origin.

3 Background

The need for residual mix calculation arises from the combined effect of Directives 2009/28/EC and 2009/72/EC, but interestingly enough, it is not mentioned in either of them and it is still a rarity among national legislations and regulations transposing those Directives. The Article 15 of the RES directive, 2009/28/EC, sets forth guarantees of origin, which can be used for explicit tracking of electricity generation attributes from production to consumption. It also requires Member States to “ensure that the same unit of energy from renewable sources is taken into account only once” (2009/28/EC, Art.15(2)). On the other hand Article 3 paragraph 9 of the Internal Energy Market directive (2009/72/EC) obliges regulatory authorities of Member States to ensure the reliability of electricity disclosure information, which energy suppliers are obliged to deliver to their customers according to the same directive.

Using explicit tracking mechanisms, guarantees of origin, for the disclosure of a part of electricity consumption, requires that the explicitly tracked attributes are removed from the energy source mix of other consumption (untracked consumption), when complying with 2009/28/EC, Art.15(2) and with 2009/72/EC, Art. 3(9). Reliable and transparent residual mix calculation, enables this task, and is an accurate way to disclose untracked consumption to consumers and in the best case, to increase demand for green power.

The residual mix calculation process divides into four phases:

1. *Data collection*
2. *Determination of the domestic residual mixes of European countries (henceforth domains[3])*
3. *Determination of the European Attribute Mix (EAM)*
4. *Determination of the final residual mixes of European countries*

[3] The use of the word domain derives from the terminology of the rules of the European Energy Certificate System (EECS), in which countries are defined as domains with the exception of Belgium, which constitutes 3 domains. In the residual mix calculation, also Belgium is considered as only one domain.

4 Data Collection

4.1 Common Data Collection in both Methods

- *Domain's net electricity production during year X*
  - *All own consumption of power production is excluded. For hydro plants this means that only electricity production relating to natural inflow should be considered*
  - *Energy losses related to hydro pumping should be considered as consumption and not deducted from hydro production.*
- *Domain's electricity consumption during year X*
  - *Grid losses are included as well as losses from hydro pumping.*
- *Net electricity export to and import from external domains*[4]
  - *The domain should determine the net exchange of electricity with all relevant external domains.*
    - *In case the domain has net import from a specific external domain, the net imported volume should be specified by energy source (at least at accuracy of RES, NUC, FOS) according to the production mix of the external domain (or if available, residual mix). Sources for external domains' production mixes are ENTSO-E*[5] *and International Energy Agency*[6]*.*
    - *In case the domain has net export to a specific external domain, the net exported volume is collected as a single value to be used in the calculation.*
  - *Important: note that information of electricity transfers between the domain and other internal domains* ***should not be*** *collected.*
- *CO_2 emissions from fossil-based electricity production in g CO_2 per kWh*
  - *Only relates to direct emissions from electricity production. CO_2 data based on LCA has not yet been utilized in residual mix calculation due to absence of mutually agreed, reliable and consistent data source.*
- *Radioactive waste from nuclear electricity production in mg of radioactive waste per kWh*[7]

4 Currently the list of external domains contains all countries outside EU27. As exceptions, Iceland, Norway and Switzerland are not external domains, but Malta and Cyprus are such. The list of internal domains is: Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and Switzerland

5 https://www.entsoe.eu/resources/data-portal/production/

6 http://www.iea.org/stats/index.asp

7 In the future, the level of radioactive waste should be distinguished.

4.2 Explicit Electricity Tracking Information in Transaction-Based Method

- *EECS certificates and certificate-based RTSs[8]:*
    - *Volume of imports, exports and cancellations of tracking certificates in the domain during 1.4.year X – 31.3.year X+1[9] per attribute.*
        - *Note that this relates to transactions of all production year GOs that occur during this time period (not only production year X)[10].*
        - *Ex-domain cancellations from the domain, for the benefit of other domains, should be considered as exports.*
        - *Ex-domain cancellations for the benefit of the domain, from other domains, should be considered as both imports and cancellations.*
- *Non certificate-based RTSs:*
    - *Explicit tracking per attribute in the domain for calendar year X disclosure (e.g. Contract-based tracking, feed-in tariff linked to disclosure)*
        - *Explicit tracking by non-certificate-based RTSs should be considered as cancellations.*

4.3 Explicit Electricity Tracking Information in Issuance-Based Method

- *EECS certificates and certificate-based RTSs[8]:*
    - *Volume of issuance of tracking certificates for year X electricity production per attribute.*
    - *Volume of cancellations and expiries in the domain during 1.4.year X – 31.3.year X+1[9] per attribute.*
        - *Note that this relates to expiries of X and X-1 production year certificates that occur during this time period.*
        - *Ex-domain cancellations from the domain, for the benefit of other domains, should not be considered.*
        - *Ex-domain cancellations for the benefit of the domain, from other domains should be considered as cancellations.*
- *Non-certificate-based RTSs:*
    - *Explicit tracking per attribute in the domain for calendar year X disclosure. (E.g. Contract-based tracking, feed-in tariff linked to disclosure).*
        - *Explicit tracking by non-certificate-based RTSs should be considered as both issuance and cancellation.*

---

8 Certificate-based RTSs can be for example national GO systems or other tracking certificate systems

9 According to RE-DISS BPR [32] "The deadline for cancelling GO for purposes of disclosure in a given year X should be 31 March of year X+1". This means that cancellations which relate to disclosure of year X occur during 1.4.X – 31.3.X+1. Imports and exports are collected for the same time period (relevant for the transaction-based method).

10 Considering only production year X GO transactions would lead to cancellations, exports and imports of GOs from production year X-1 after 31.3.X not to be accounted for in any residual mix calculation.

5 Determination of the Domestic Residual Mix

5.1 Underlying Theory

After the necessary data has been collected, the first step of the calculation is to determine the yearly available generation attributes of the domain (available after explicit tracking). This pool of available attributes is called the domestic residual mix. Excluding explicitly tracked attributes from the domestic residual mix can be achieved by two ways:

- *Transaction-based method where the focus is on the use of the attributes, i.e. where attributes represented by cancelled and exported certificates are removed from the residual mix, but consequently attributes represented by imported certificates are added to the residual mix.*
- *Issuance-based method where the focus is on the supply of the attributes, i.e. where all attributes which are issued (and will thus potentially be used) are removed from the residual mix and those which are, in the end, not used (expired) are added back to the residual mix.*

These two methods are essentially the same, because if we consider the entire lifetime of production year X certificates for example, the input of certificates to a domain has to equal the use of certificate in the domain, i.e:

Issue + import = cancellation + export + expiries

By rearranging the above equation, we can illustrate that the two methods described above are just two sides of the same equation:

- issue + expiry = - cancellation - export + import

However, they differ in the sense of how attributes of unused GOs are returned to the residual mix. The transaction-based method returns attributes of all GOs of production year X, which are unused at 31.3.X+1 to the residual mix of year X, but then removes them from residual mix of year X+1 in case the GOs are used after 31.3.X+1. Whereas the issuance-based method removes attributes of all issued GOs of production year X (used or unused at 31.3.X+1) from the residual mix of year X, but returns those which remain unused (expire) to the residual mix of X+1[11]. The downside of the transaction-based method is that since year X "left-over" attributes can be removed from the year X+1 residual mix, in a very rare occasion it might happen that there is a negative balance of renewable attributes in the residual mix of year X+1.

For as long as production year X certificates are allowed to be used after the deadline for disclosure of year X (31.3.X+1), leakage between production and consumption years is unavoidable also in the residual mix calculation. The main question is, which of the two is more accurate: Leakage of "minus" from year X to X+1 (TBM) or leakage of "plus" from year X to X+1 (IBM)? This report considers the latter solution (IBM) to portray the use of generation attributes from year X for electricity disclosure in year X more accurately, but it needs to be stressed that neither of the solutions risks double counting and therefore both are applicable.

[11] Or into the year X residual mix in case the GO from production year X expires before 31.3.X+1.

5.2 Step 1: Determining Available Attributes

The calculation begins with the domain's production mix of year X, which is corrected by explicit tracking of generation attributes to obtain the available attributes of the domestic residual mix. Depending on which calculation method is used (TBM or IBM) select either chapter 5.2.1 or 5.2.2 to determine the available attributes.

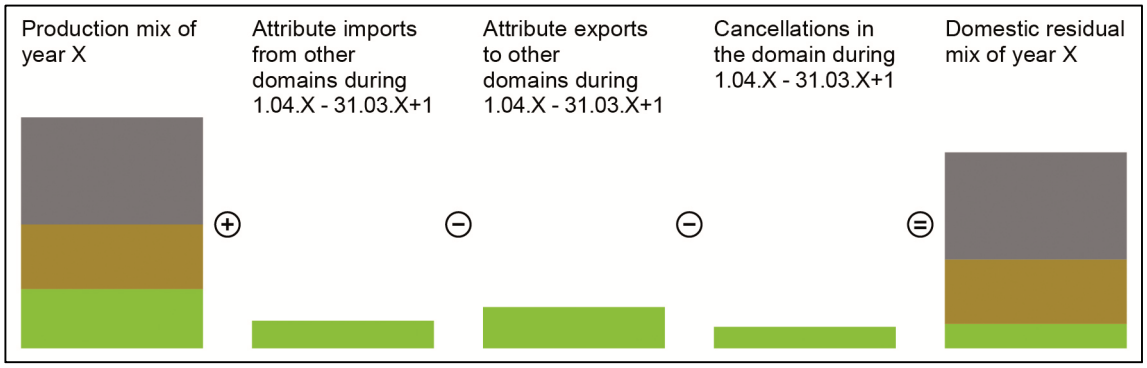
- Please see chapter 4.1 for instructions on how power production data should be considered.
- In case the domain has import or export of physical electricity from external domains, see chapter 5.5.

5.2.1 Transaction-Based Method

In the transaction-based method, as explained, attribute imports are added to the production mix, and attribute exports and cancellations are subtracted from it. Note that the volume of the domestic residual mix in TWh is lower than that of the production mix in domains where electricity is explicitly tracked.

- Please see the data collection chapter for information on how ex-domain cancellations and non-certificate based RTSs should be considered.

Figure 1: Determining available attributes for the domestic residual mix in the transaction-based method



Source: Authors' own compilation

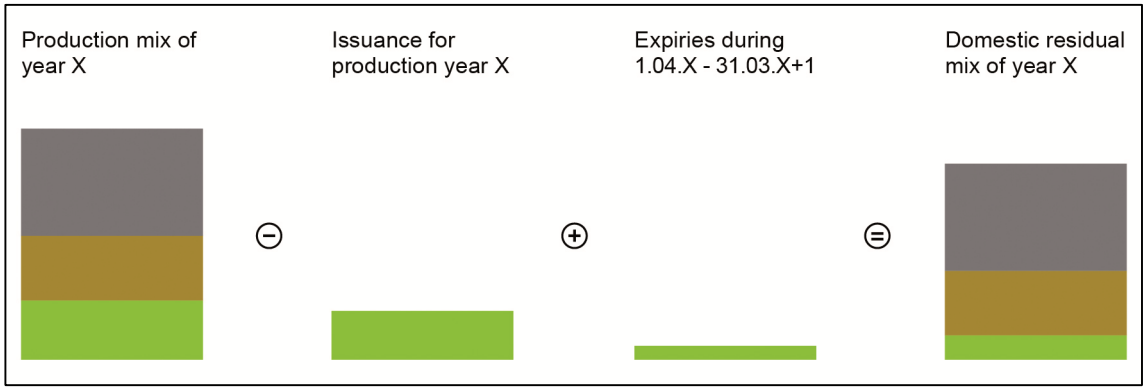
RES Generation + RES Imports – RES Exports – RES Cancellations = RES in domRM
(Likewise for NUC and FOS)

5.2.2 Issuance-Based Method

In the issuance-based method, the issuing for generation attributes is considered. As explained, attributes, which are issued a tracking certificate (or are tracked by non-certificate based RTSs) are subtracted from the production mix and unused attributes from previous years (expiries) are added to it. Note that the volume of the domestic residual mix in TWh is lower than that of the production mix in domains where electricity is explicitly tracked.

- Please see the data collection chapter on information how ex-domain cancellations and non-certificate based RTSs should be considered.

Figure 2: Determining available attributes for the domestic residual mix in the issuance-based method



Source: Authors' own compilation

RES Generation – RES Issuance + RES expiries = RES in domRM
(Likewise for NUC and FOS)

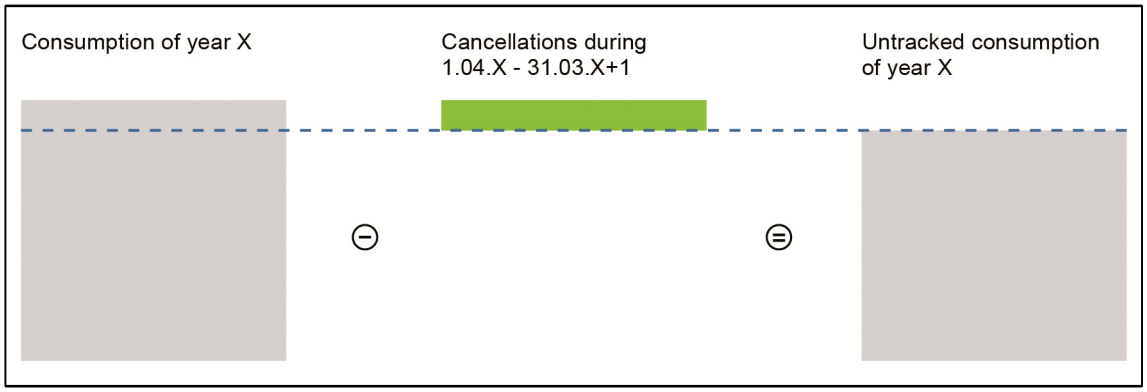
5.3 Step 2: Establishing Surplus/Deficit

In the second phase of the calculation, the domestic residual mix is compared to the physical volume of untracked consumption in the domain.

Untracked consumption is such consumption, which has not been disclosed with explicit tracking instruments. Therefore it can be obtained simply by deducting cancellations from the domain's yearly electricity consumption.

- *Please see the chapter 4 on information how ex-domain cancellations and non-certificate based RTSs should be considered.*

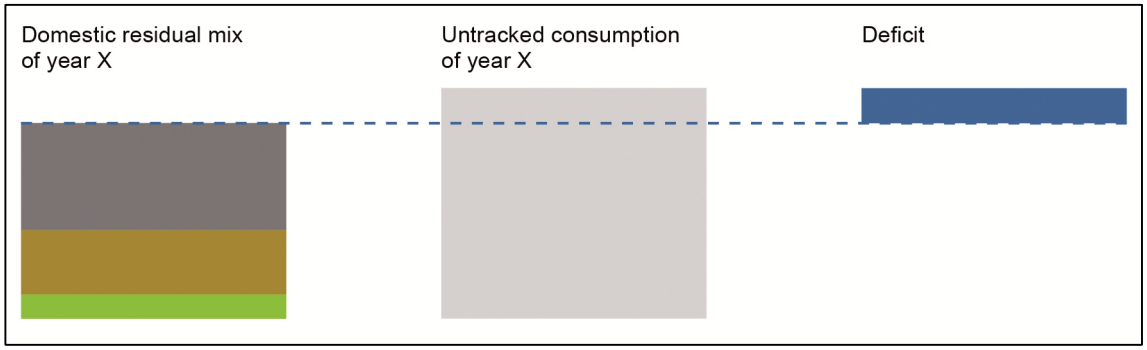
Figure 3: Determining untracked consumption out of the total electricity consumption of the domain



Source: Authors' own compilation

The difference between the volumes of the domestic residual mix and untracked consumption shows the deficit or surplus of attributes in the domain. In case the domain has an attribute deficit, the deficit needs to be fulfilled with attributes from the European Attribute Mix (Figure 4). In case the domain has an attribute surplus, the surplus needs to be transferred to the European Attribute Mix. This will be explained in chapters 6 and 7.

Figure 4: Determining attribute deficit/surplus as the difference between the residual mix and untracked consumption



Source: Authors' own compilation

5.4 Environmental Indicators

The calculation for environmental attributes of power production in the residual mix mostly follows the calculation of energy source attributes. The first step is to determine the total volume of CO_2 and radioactive waste associated with the year X electricity production in the domain. Unless fossil or nuclear attributes are explicitly tracked, the same volume of CO_2 and radioactive waste is also included in the domestic residual mix. To obtain the value per kWh, the total volume simply needs to be divided with the physical volume of the residual mix. If fossil and/or nuclear attributes are explicitly tracked, the associated CO_2 and/or radioactive waste should not be included in the residual mix. In case the domain has physical electricity import from or export to external domains, the FOS / NUC generation needs to be corrected accordingly by considering it as part of domestic production.

*CO_2 Factor * (FOS Generation – Explicit FOS tracking) = CO_2 in domRM*

CO_2 in domRM / Volume of domRM = CO_2 / kWh of domRM

Likewise for radioactive waste

5.5 Physical Electricity Import or Export with External Domains

The effect of physical electricity import or export with external domains on residual mix calculation is elaborated separately, because it only concerns a small number of domains and because its significance is relatively small[12].

- *Net electricity import during year X from an external domain is added to the production data of the importing (internal) domain according to the shares of different energy sources in the production mix (or if available, residual mix) of the exporting (external) domain.*
- *Net electricity export during year X from an internal domain to an external domain is deducted from the available attributes of the exporting (internal) domain according to the shares of different energy sources in the domestic residual mix of the exporting (internal) domain.*
- *Exchange with external domains is always considered domain by domain, so it is possible for an internal domain to have both physical electricity import from external domain A and physical electricity export to external domain B.*

[12] However for some domains this might have a significant effect, for example Finland and Slovenia in the 2011 calculation.

Note: Physical electricity import from external domains should also be reflected in the CO_2 and radioactive waste factor of the domain.

*Physical electricity import RES = Volume of net import from the external domain * Share of RES in the production mix (residual mix if available) of the external domain. (likewise for NUC and FOS)*

*Physical electricity export RES = Volume of net export to the external domain * Share of RES in the domestic residual mix of the internal domain. (likewise for NUC and FOS)*

Corrected RES in domRM = RES in domRM + Physical electricity import RES – Physical electricity export RES (likewise for NUC and FOS)

6 Determination of the European Attribute Mix

6.1 Underlying Theory

It is important to outline first, that electricity production in Europe in a given year X always equals electricity consumption during the same year as long as physical electricity transfer with external domains is accounted for. Consequently, in the residual mix calculation of year X, the amount of attribute surplus equals the amount of attribute deficit at European level. Attributes are transferred between borders due to:

1. *Physical transfer of electricity across borders, which causes a net exporter to have more attributes than consumption and a net importer to have less attributes than consumption*
2. *Explicit tracking of electricity generation attributes, which causes a net exporter of tracking instruments (most generally GOs) to have less attributes than consumption and a net importer to have more attributes than consumption.*

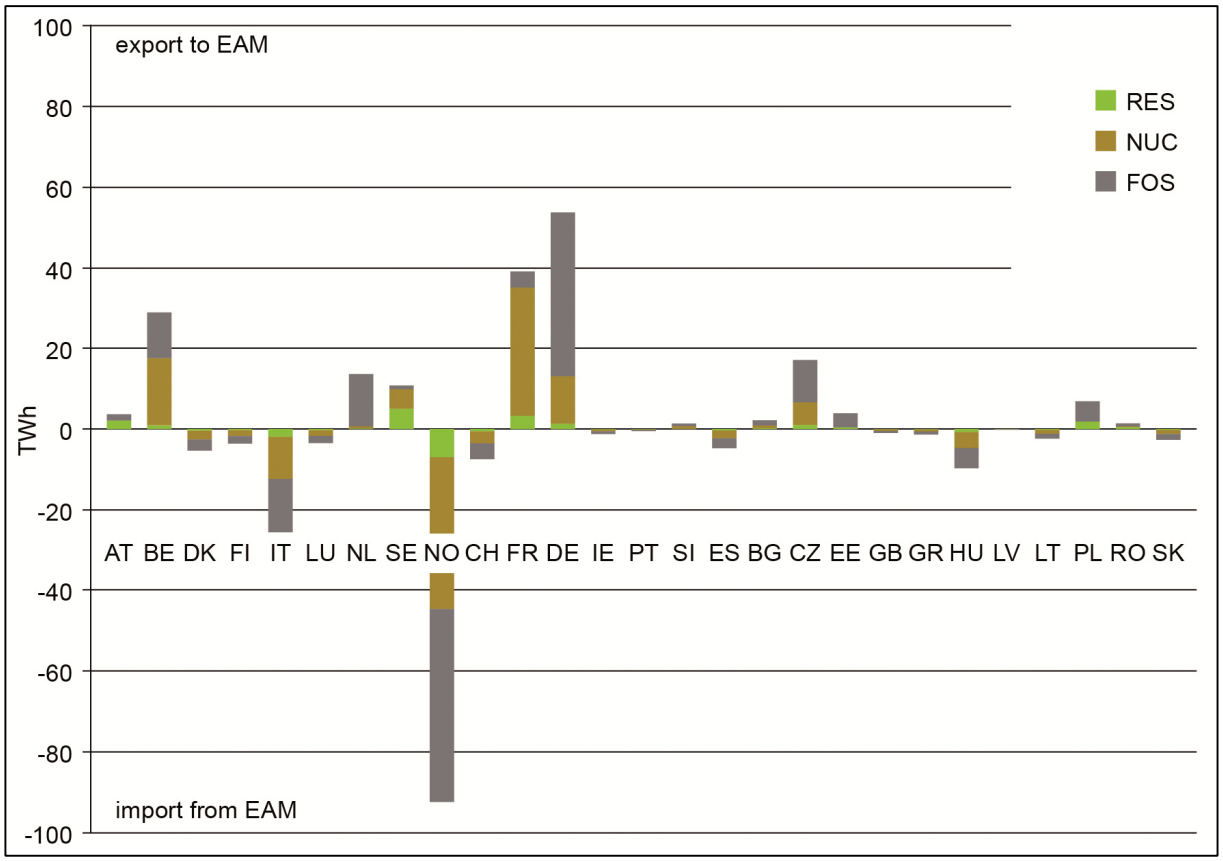
The total surplus or deficit of a domain is the combined effect of these two factors.

Figure 5 illustrates the surpluses (+) and deficits (-) of domains and how the surplus and deficit attributes have been balanced in the EAM in the 2011 residual mix calculation. If GO trading is set aside, domains on the negative side would be the ones net importing physical electricity (i.e. such in which the domestic production would not amount to the domestic consumption). On the other hand, net exporters of electricity, would have too many attributes to merely disclose the domestic consumption. The status of Czech Republic, Italy and France in

Figure 5 can be largely explained by this factor, and not by the exchange of GOs.

When GO exporting and importing is added to the picture, large exporters of GOs, such as Norway, lose generation attributes. Even though the difference between production and consumption in Norway is not great, the large export of GOs causes there to be significantly more untracked consumption than available attributes in the domestic residual mix. This would not happen, if GOs were used internally, since cancellations as such do not cause surplus or deficit; though they decrease the amount of available attributes, they also decrease the amount of untracked consumption: i.e. there is less consumption to be disclosed with the residual mix. The counter-effect of Norway can be seen mainly in Belgium, Germany and the Netherlands. Also there the production and consumption are quite equal, but Norwegian attributes as well as the domestic ones are used for disclosure.

Figure 5: Attribute Balancing with the EAM in 2011



Source: Authors' own compilation

Note: Though these elaborations seem to only apply to the transaction-based model, indirectly they are also valid for the issuance-based model, as every GO issued in the domain is either exported, cancelled or expired and the difference between issuance versus cancellations and expiries in the domain is the net import/export of the domain.

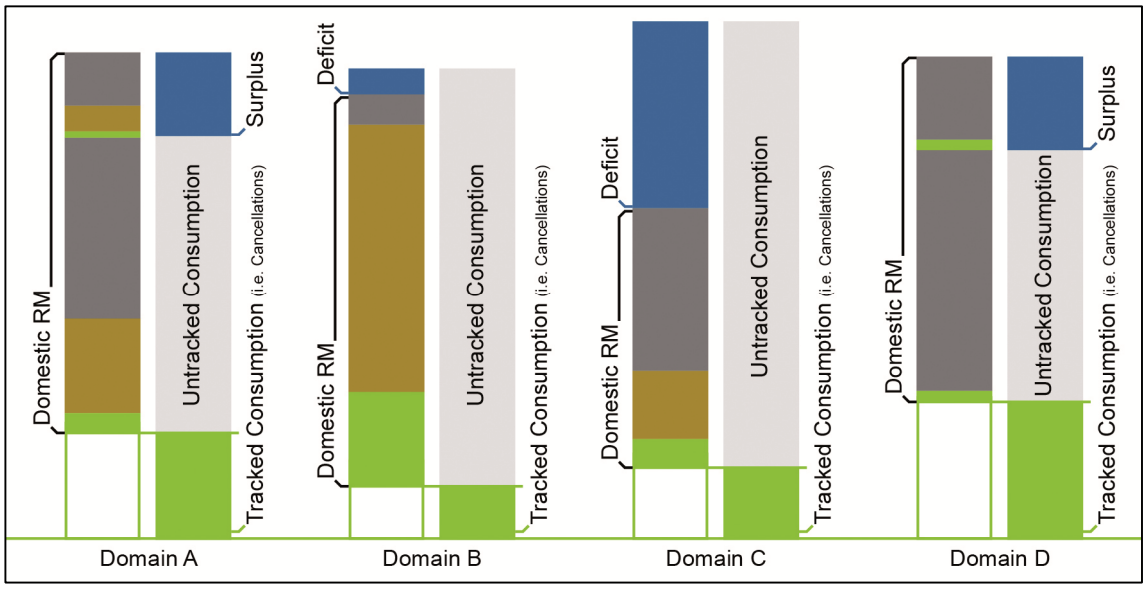
6.2 Calculation

Due to the uneven allocation of attributes to different domains, which is portrayed as surplus or deficit of attributes in the domestic residual mix, the harmonized residual mix of RE-DISS needs to balance surpluses and deficits by establishing a European Attribute Mix for surplus attributes.

First, domains with more available attributes than untracked consumption determine their surplus, which is the difference between available attributes and untracked consumption in the domain. The shares of different attributes in the surplus are defined by the shares of different attributes in the domestic residual mix.

So, for example if a domain has 20 TWh of available attributes of which 33 % is each RES, NUC and FOS, and 10 TWh of untracked consumption, it would have a surplus of 10 TWh of which 3,33 TWh would be each RES, NUC and FOS.

Figure 6: Determining surplus and deficit



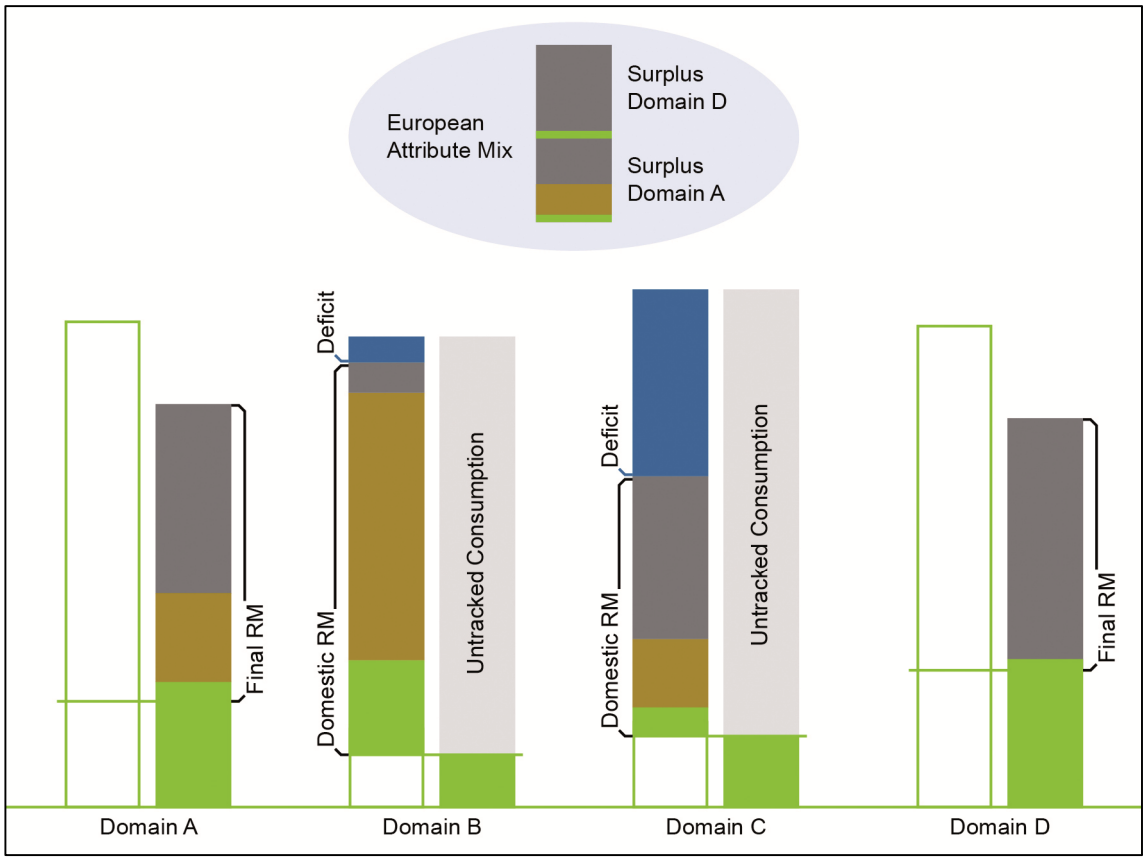
Source: Authors' own compilation

IF (Available Attributes – Untracked Consumption) > 0 → Surplus

*RESstoEAM = Surplus * Share of RES in the domestic residual mix*
(likewise for NUC and FOS)

All surpluses are collected into a virtual pool of attributes, the European Attribute Mix. The share of different attributes in the EAM is determined by the combined surpluses of all surplus domains. Once the EAM is established, it can be used to fill in deficits in deficit domains.

Figure 7: Collecting surpluses to the EAM



Source: Authors' own compilation

TotalRESToEAM (TWh) = SUM((over domain 1,…i) RESToEAM)
(likewise for NUC and FOS)

TotalSurplus (TWh) = TotalRESToEAM + TotalNUCToEAM + TotalFOSToEAM

ShareOfRESInEAM (%) = TotalRESToEAM / TotalSurplus
(likewise for NUC and FOS)

6.3 Environmental Indicators

The CO_2 and radioactive waste content of the EAM is determined by the CO_2 and radioactive waste contents of the surpluses transferred into the EAM. The total volume of CO_2 and radioactive waste which is transferred to the pool is first calculated by multiplying the amount of surplus of each surplus domain with the CO_2 and radioactive waste factor of the domestic residual mix of that domain. These surpluses of CO_2 and radioactive waste are then added up and divided by the total volume of the EAM.

*SUM((over domain 1,…i) CO_2 / kWh in domRM * surplus) = CO_2 in EAM*

CO_2 in EAM / Total volume EAM = CO_2 / kWh in EAM
(likewise for radioactive waste)

7 Determination of the Final Residual Mixes of European Countries

Surplus domains

For surplus domains, the final residual mix equals the domestic one in shares of different attributes. In physical volume it is the amount of available attributes in the domestic residual mix subtracted with the surplus transferred to the EAM (since the shares of different attributes in the surplus is equal to their share in the domestic residual mix, the shares of different attributes remain unchanged when moving from domestic to final residual mix in surplus domains).

FinalAvailableRES = AvailableRES – RESToEAM
(Likewise for NUC and FOS)

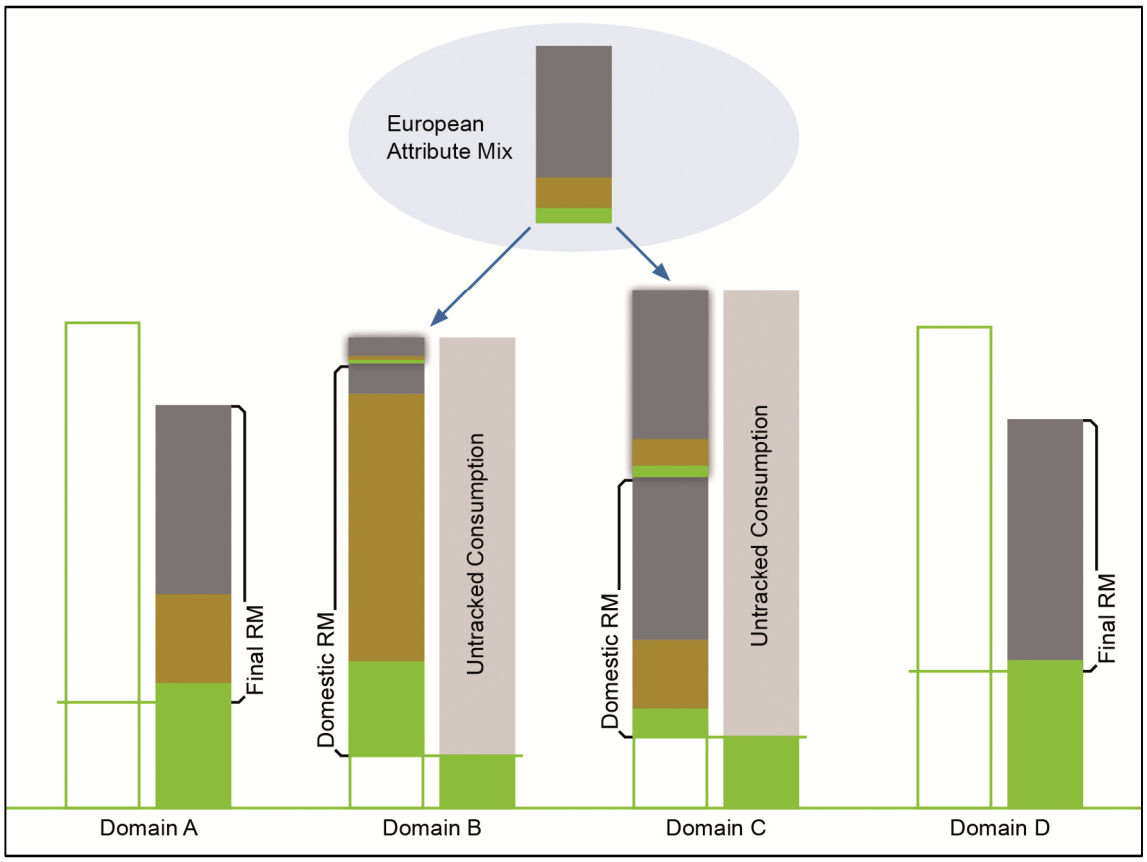
FinalAvailableAttributes = FinalAvailableRES + FinalAvailableNUC + FinalAvailableFOS

RMRES = FinalAvailableRES / FinalAvailableAttributes
(Likewise for NUC and FOS)

Deficit Domains

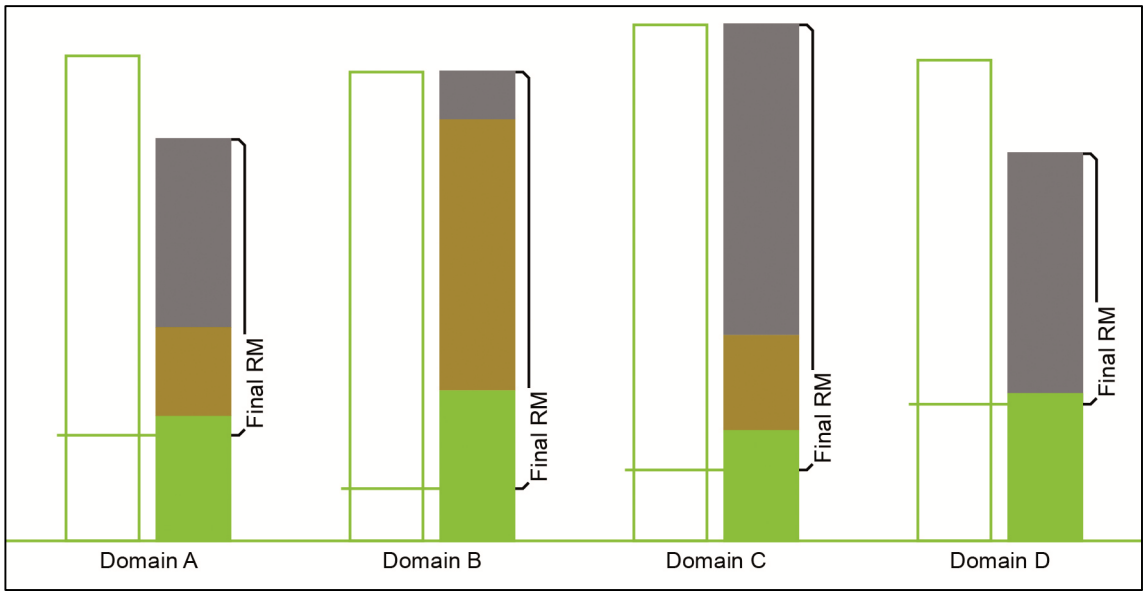
Deficit domains take in the volume of deficit from the EAM according to the share of different attributes in the EAM. These attributes are added with the attributes in the domestic residual mix to constitute the final residual mix of the deficit domain. Note that CO_2 and radioactive waste are also transferred according to the volume of the deficit and according to the CO_2 and radioactive waste content of the EAM.

Figure 8: Fulfilling deficits



Source: Authors' own compilation

Figure 9: Disclosing untracked consumption with the final residual mixes



Source: Authors' own compilation

IF (Available Attributes – Untracked Consumption) < 0 → Untracked Consumption – Available Attributes = Deficit

*RESFromEAM (TWh) = Deficit*ShareOfRESInEAM*
(likewise for NUC and FOS)

FinalAvailableRES = AvailableRES + RESFromEAM
(likewise for NUC and FOS)

FinalAvailableAttributes = FinalAvailableRES + FinalAvailableNUC + FinalAvailableFOS

RMRES = FinalAvailableRES / FinalAvailableAttributes
(likewise for NUC and FOS)

Environmental Indicators

The CO_2 and radioactive waste content of the final residual mix is determined by the CO_2 and radioactive waste contents of the domestic residual mixes deducted with what was transferred to the EAM relating to surpluses (surplus domains) and added with what was transferred from the EAM relating to deficits (deficit domains). The total volume of CO_2 and radioactive waste is divided by the total volume of the final residual mix to obtain the content of CO_2 and radioactive waste per kWh of residual mix.

- *Surplus domains:*

  *CO_2 in domRM – CO_2 / kWh in domRM * surplus = CO_2 in final RM*

  CO_2 in final RM / volume of finalRM = CO_2 / kWh in finalRM

- *Deficit domains:*

  *CO_2 in domRM – CO_2 / kWh in EAM * deficit = CO_2 in final RM*

  CO_2 in final RM / volume of finalRM = CO_2 / kWh in finalRM

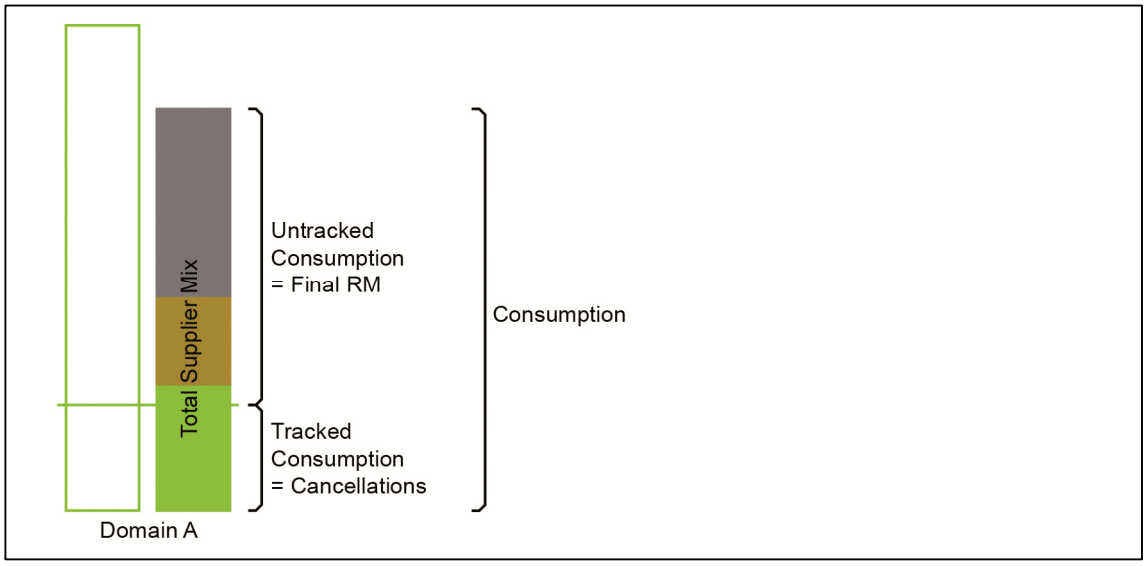
- *Likewise for radioactive waste*

8 Total Supplier Mix

Total supplier mix means the total volume of attributes disclosed in a domain, both explicitly tracked and those disclosed through the residual mix. It is obtained by summing the volume of cancellations per attribute with the final residual mix. In physical size it equals the total electricity consumption in the domain.

Environmental indicators of the total supplier mix are calculated by adding CO_2 / radioactive waste content of the final residual mix with the possible CO_2 / radioactive waste content of tracked consumption (e.g. if FOS or NUC GOs are used). This sum is divided by the volume of electricity consumption in the domain to obtain the CO_2 / radioactive waste content per kWh of consumption.

Figure 10: Determining total supplier mix

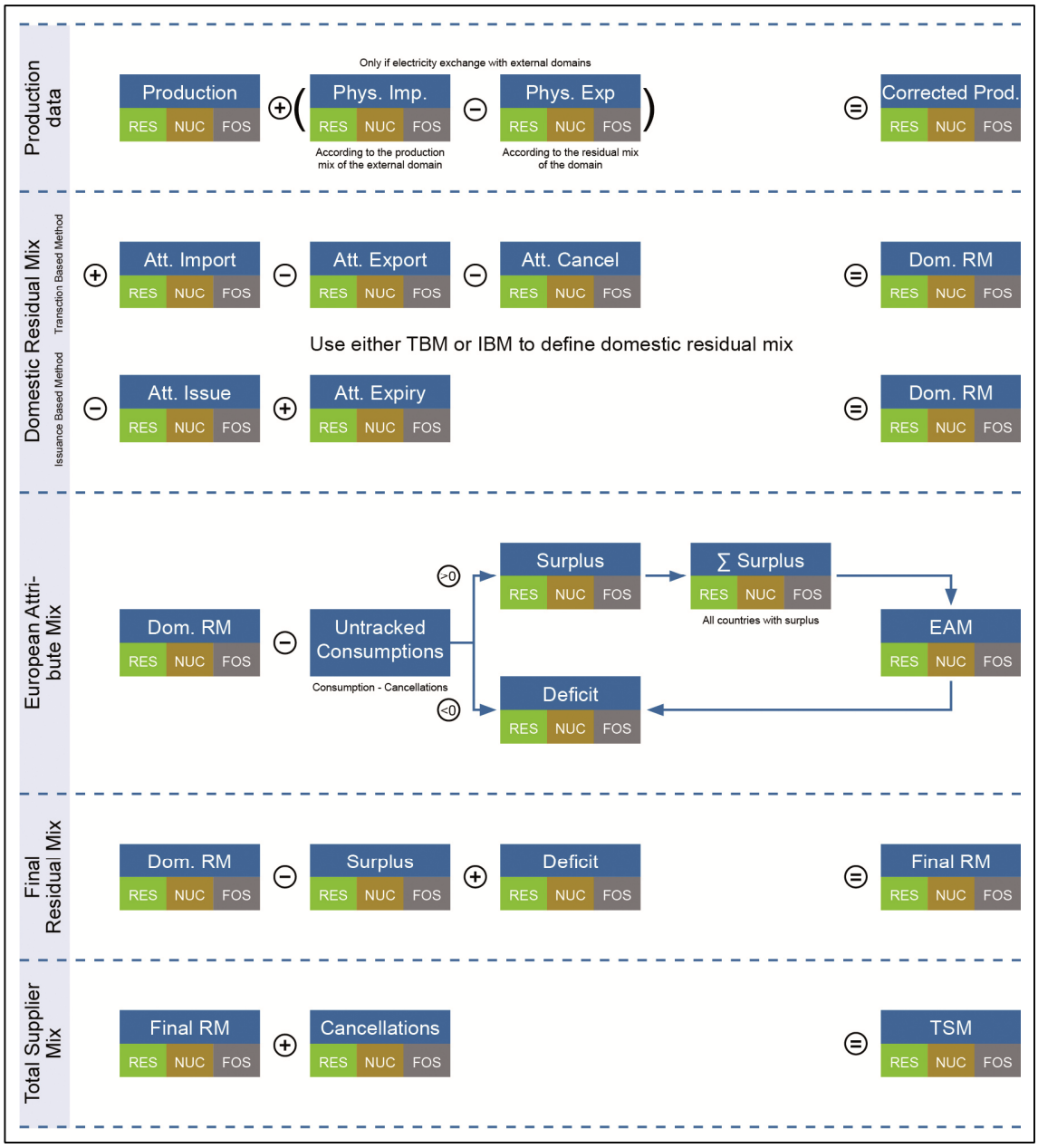


Source: Authors' own compilation

9 Process Description

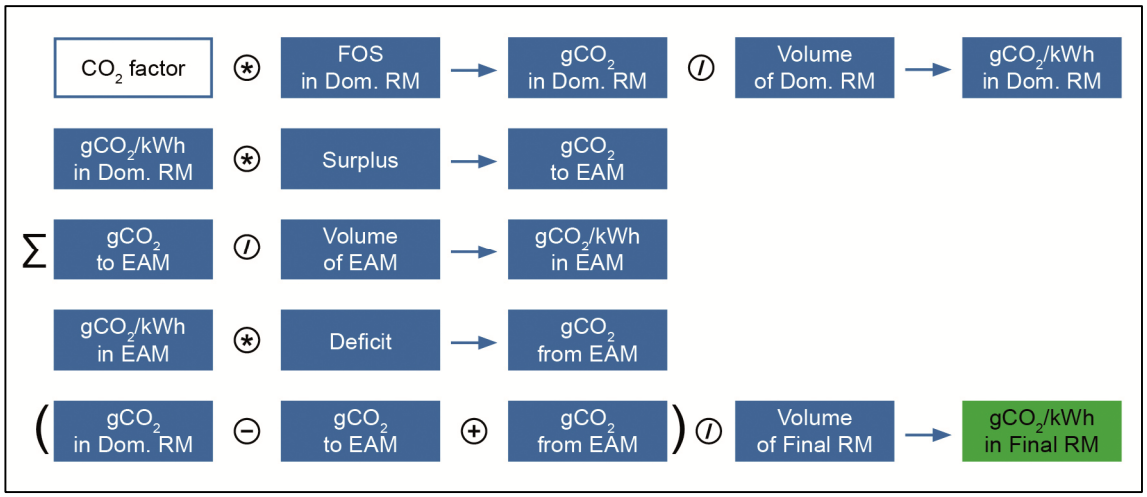
Figure 11 and Figure 12 portray the entire residual mix calculation process.

Figure 11: Residual mix calculation process



Source: Authors' own compilation

Figure 12: Calculation process for content of CO_2 in the residual mix



Source: Authors' own compilation

Annex 2: Progress made in individual countries in reducing disclosure errors

This annex contains high-level result summaries of the analysis on the progress made in selected countries in reducing disclosure errors.

Austria

During RE-DISS, Austria improved its disclosure and GO systems, and thus at the end of the project the systems were mostly aligned with the BPR (80% of all BPR have been implemented at the end of the project as shown in Figure 22). The changes have been incorporated in both disclosure and GO systems.

The 12 month lifetime rule was implemented in 2011, as part of the BPR. Before RE-DISS certificates had a lifetime of 5 years. At the end of the project the lifetime of certificates is based on 12 month after the production period. With that change it is guaranteed that old certificates are not used for disclosure purposes anymore.

The GO system implemented (RES-GO, thermal GO and CHP-GO) is an EECS system (before RE-DISS, paper GOs were also a possibility). The use of GO from non-EECS members in Austria requires a fulfilment of strict regulations set in the disclosure by-law. Ex-domain cancellations and contract-based tracking are not possible in Austria.

Before the project, Austria already had a GO system for all types of electricity in place. Especially within the last two years and all the information RE-DISS has given to the market parties the issuing of thermal certificates has risen due to the growing awareness of Austrian customers of having disclosed electricity displayed on their annual bill.

One major step was the implementation of GOs as the unique tracking system, as part of the BPR. GOs are the basis and other qualities can be displayed as additional information on the certificate. In parallel Austria developed a set of regulations for the acceptance of GOs from foreign countries for Austrian disclosure purposes. This has been carried out in the disclosure by-law in 2011 and forms a reliable tool for keeping the quality of disclosed certificates high. It must be guaranteed that the certificates are based on Art. 15 of Directive 2009/28/EC or compatible national legislation, coming from an exporting country which has implemented a full disclosure system which excludes double counting and has identified one competent body.

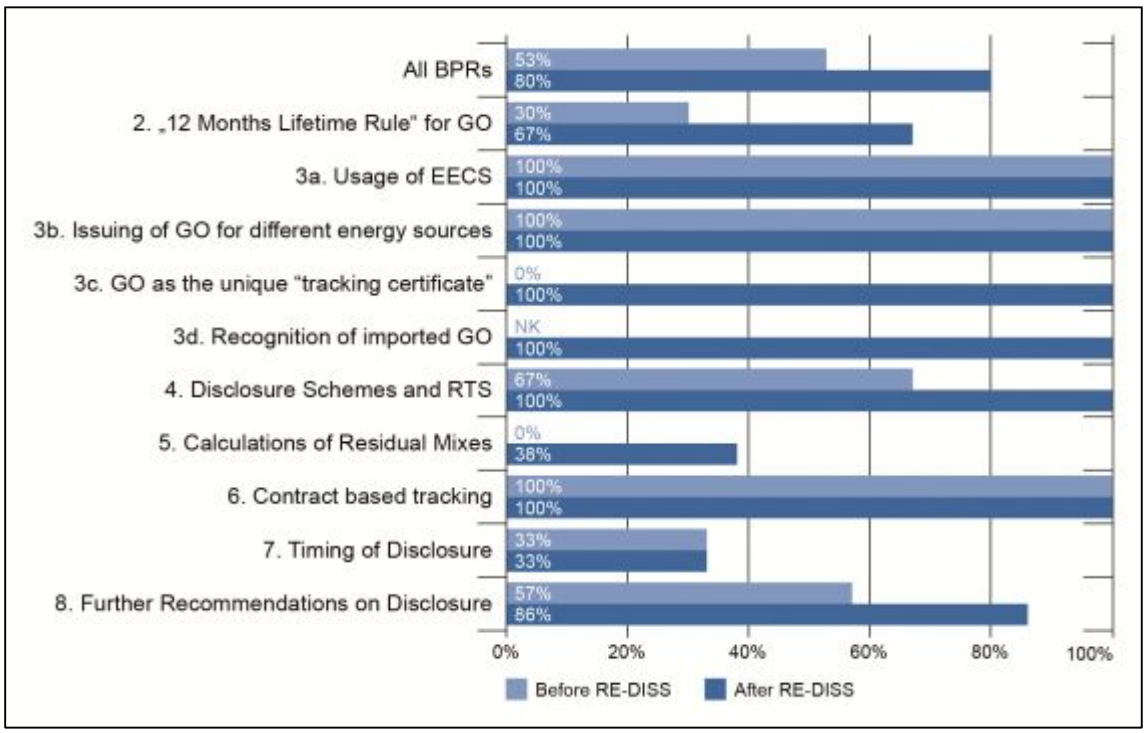
Before the project Austria used uncorrected ENTSO-E Mix data for implicit disclosure. Due to a change in law based on the RE-DISS BPR renewables are now deducted from the ENTSO-E Mix. This significantly reduces the amount of RES in the total supplier mix in the “after RE-DISS” case and eliminates the change for implicit double counting of RES. Austria worsened its status in implicit disclosure. On the contrary, this ensures under all circumstances that Austrian GOs are not implicitly double counted.

The problems relating to double counting of implicit and explicit tracking mechanisms and loss of attributes and/or arbitrage have improved substantially through the imple-

mentation of the related BPRs during the project. Austria's main disclosure problems included loss of disclosure information and intransparency for consumers and unintended market barriers have been completely addressed during the project.

Even though Austria made a lot of improvements, small improvements still need to be made so that the systems become fully aligned with the BPRs. Austria always tries to set a high standard on regulations on GOs and disclosure. The RE-DISS BPR is an excellent platform and has developed high level recommendations based on European Directive and the extensive experience of the project team. Austria tried to fulfil most elements of the BPR with the exception on the ones where national law is setting different rules.

Figure 19: Austria actual improvements in the implementation of the BPR during RE-DISS



NK = not known

Source: Raimundo et al. 2012

Belgium (Flanders and Wallonia)

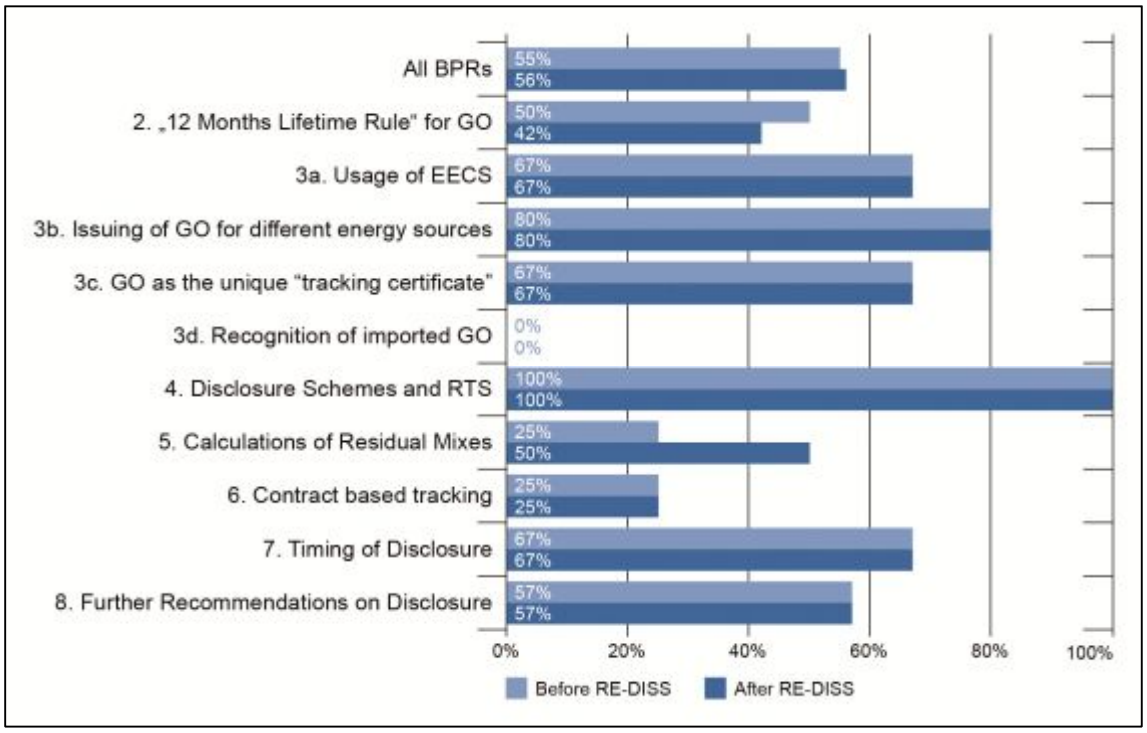
In Wallonia, no legislative or regulatory changes took place during the RE-DISS project (the 1% increase in the implementation of all BPR shown in Figure 20 has been due to participation of the domain in the collection of data for residual mix calculation during the project). In Flanders, the main changes were the limitation of the lifetime of the GO and the separation of the GO with the support certificate (which was already realized from the start in Wallonia).

In both domains, discussions on further improvements of the disclosure system have been delayed due to intensive discussions on the support system. Both domains have delivered input to the calculations of the residual mix, but the resulting output data and methodology of RE-DISS has not yet been formally approved.

The competent bodies of both domains have committed themselves to start discussing the implementation of a harmonised disclosure methodology, based on the RE-DISS recommendations.

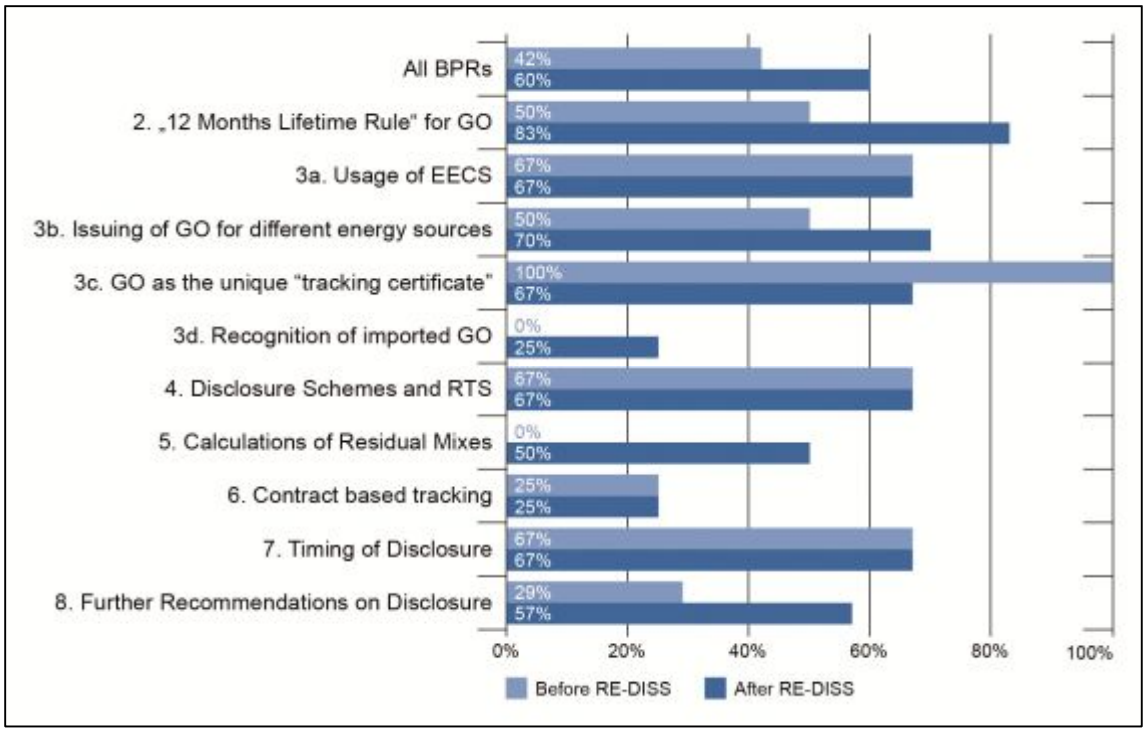
Moreover, discussions on the recognition from foreign GOs have been intensified.

Figure 20: Wallonia: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



Source: Raimundo et al. 2012

Figure 21: Flanders: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



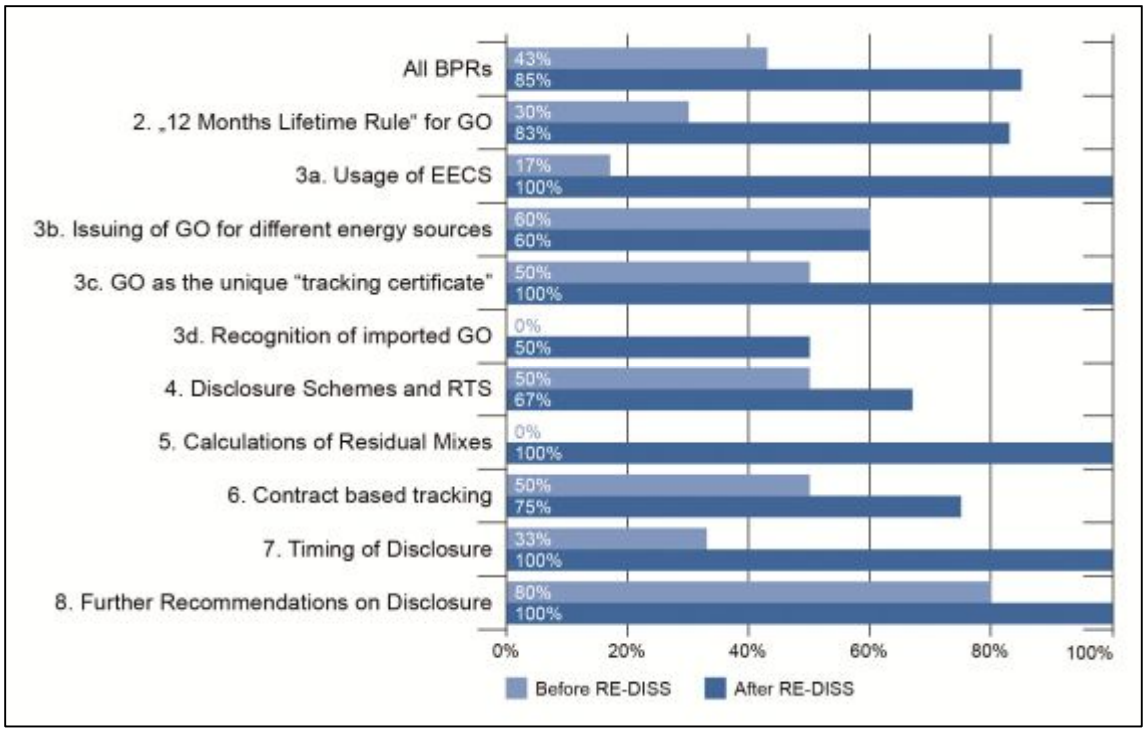
Source: Raimundo et al. 2012

Denmark

During RE-DISS, Denmark improved its disclosure and GO systems, and thus at the end of the project the systems were mostly aligned with the BPR (85% of all BPR have been implemented at the end of the project as shown in Figure 22). The following changes have been incorporated in both disclosure and GO systems.

In terms of GOs, at the end of the project GOs were issued on a monthly basis - Energinet.dk as a general rule issues GOs on the 15th of the subsequent month of the production period (e.g. GOs for production in January are issued not later than 15 February); and had a 12 month lifetime after the end of the production period after which they expire and are collected into the residual mix. The GO system implemented (RES-GO and CHP-GO) is an EECS system (before RE-DISS paper GOs were also a possibility). The use of GOs from non-EECS members in Denmark requires a case-specific approval by Energinet.dk, and ex-domain cancellations are not possible in Denmark.

Figure 22: Denmark: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



Source: Raimundo et al. 2012

During the project Denmark introduced a residual mix calculation that follows the methodology recommended by the project. The domain has actively supported the project in the collection of data for the RE-DISS RM calculation and has been making use of the RM data provided by the project for cross-border adjustments (implementing in this way the complete set of BPRs related with RM calculation). The adoption of the harmonised residual mix calculation has eliminated the entire implicit tracking error: before the project no residual mix was calculated and more RES was being disclosed (12,9TWh) than after the project (7,6TWh) (Raimundo et al. 2012). However, since contract-based tracking can still be used for disclosure of fossil and nuclear energy generation (if declared to Energinet.dk) alongside GOs and the residual mix calculation, a possible small disclosure error remains in the disclosure of fossil and nuclear energy.

Improvements on disclosure have also been registered during the project. The RE-DISS timeline for cancellation of GOs for disclosure purposes has been introduced (cancellations of GOs relating to production periods in a given year X which take place by 31 March of year X+1 should count for disclosure in year X. Later cancellations should count for disclosure in year X+1) – implementing in this way the complete set of BPR 7 related with the timing for disclosure. Before the project, the GOs were already related to the disclosure year (thus no banking of GOs was allowed). However, the timeline for cancellation of GOs for disclosure purposes was not aligned with the pro-

ject's recommendations and with other countries across Europe. Moreover, during the project the tracking systems used for disclosure – GO, the residual mix and contract-based tracking for fossil and nuclear – have been closely coordinated.

Furthermore, at the end of the project, disclosure of green power quality labels was uniquely based on GOs and clear rules had been defined for claims which suppliers of (e.g. green power) can make towards their consumers and for claims by suppliers and consumers of green or other low-carbon energy relating to carbon emissions or carbon reductions. The Association of Danish Electricity Traders has together with, among others, Energinet.dk developed a Danish standard for 'green' electricity products that is publicly available (Danish website: www.elpristavlen.dk) and includes minimum demands in the description of the green products and what suppliers can claim in relation to climate effect.

Finland

During RE-DISS, the process for amending the legislation of both electricity disclosure and guarantees of origin started in the summer of 2011, and a draft of the new law was prepared and commented by key stakeholders. Although it is planned that the new law on disclosure and GOs will enter into force in spring 2013, the actual improvements achieved during the project have been analysed according to the new draft law.

The forthcoming law (according to the published draft version) clearly sets: guarantees of origin as the sole mechanism to sell electricity from renewable energy sources to consumers and that electricity from unknown origin would have to be disclosed with the Residual Mix, calculated by the Energy Market Authority according to the RE-DISS methodology. In this amendment, the residual mix will be the Finnish national residual mix instead of the previously used Nordic residual mix.

As can be seen in Figure 23 at the beginning of the project, less than 40% of the RE-DISS BPRs were implemented in Finland's disclosure and GO systems. During the project, Finland has strongly improved its systems, by aligning its system with almost 70% of the RE-DISS BPR. Finland's systems have been improved through the proposed amendment to the national legislation that foresees, for example, the implementation of:

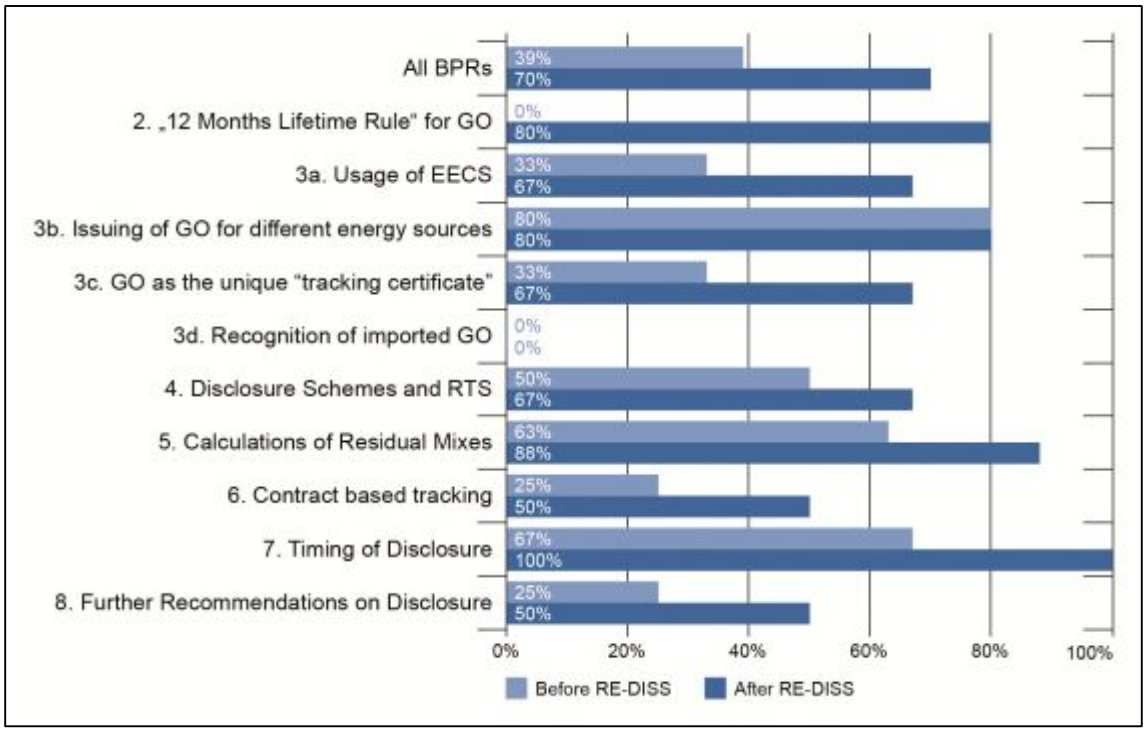
- The 12 month lifetime rule of GOs,
- GOs as the sole tracking mechanism for green labels and electricity products,
- Disclosure deadline for previous calendar year consumption, according to RE-DISS Best Practices, and
- National residual mix (as opposed to the Nordic one used before) to be used for unknown energy origin.

Furthermore, Finland has banned ex-domain cancellations to EECS domains during the RE-DISS project, due to adherence to EECS rules. However, the new law draft does not enable issuance of non-renewable GOs nor does it recognize the usage of

non-RES GOs for disclosure. This means that nuclear and fossil based electricity will continue to be tracked based on contracts.

Regarding quantified disclosure errors in the total supplier mix according to the RE-DISS Report on improvements achieved by the project (Raimundo et al. 2012), Finland has eliminated implicit double counting of renewable origin, assuming that the new law will be passed. The error before RE-DISS was largely due to contract-based tracking being used for explicit tracking, without being considered in the residual mix.

Figure 23: Finland: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



Source: Raimundo et al. 2012

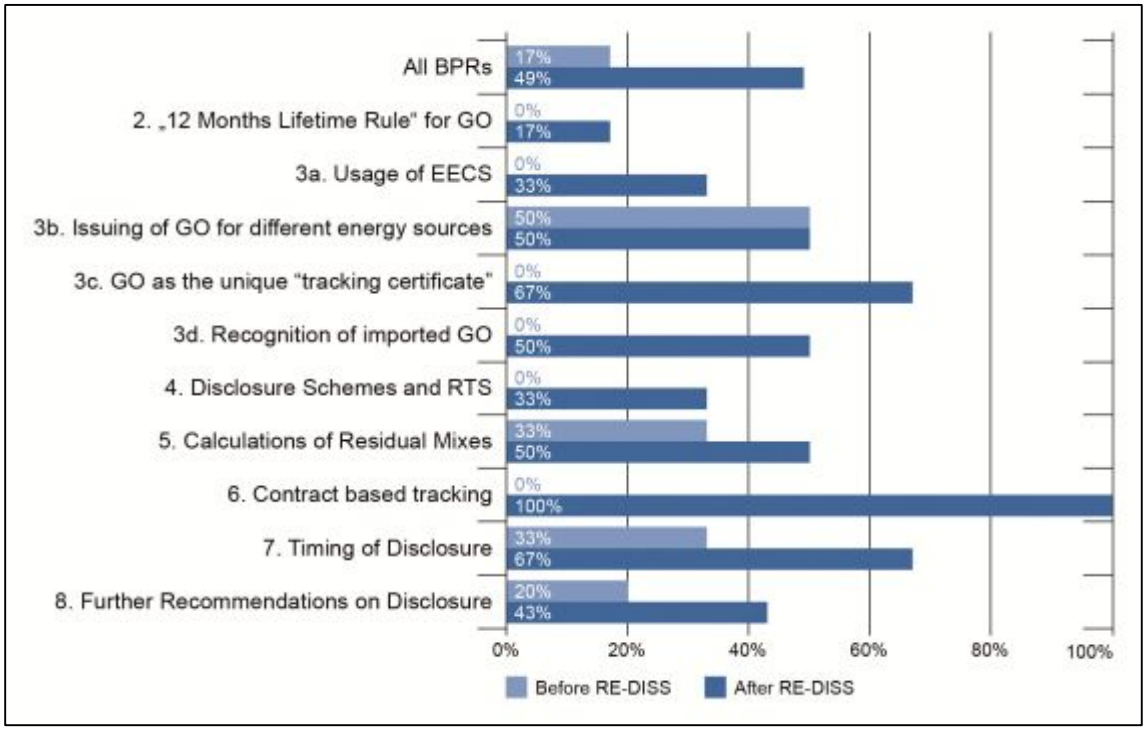
Italy

During RE-DISS, progress has been important in Italy since implementation of BPRs at the beginning of the project was at a very low level (17%), but there is still some room for improvement (50% still need to be implemented).

The situation at the beginning of the project was that disclosure was not yet implemented in practice, although regulations were in place, which foresaw a calculation by GSE to exclude tracked green attributes from the national production mix from 2011 onwards. GOs were issued but were issued as paper GOs. The legislation for disclosure foresaw that bilateral contracts could be used as well as GOs, RTS (support schemes) to track green attributes. Imports of GOs were accepted only if they were linked with imports of physical electricity because GOs were used to be exempted from

quota of green electricity imposed on producers and importers. And because disclosure was not implemented in Italy, large volumes of GOs from other EU countries disappeared into the Italian "blackhole".

Figure 24: Italy: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



Source: Raimundo et al. 2012

GSE attended all workshops organized by RE-DISS for participating domains and supported the RE-DISS BPR. In the course of the project, a new decree from 6 July 2012 (art 31) stipulated that only GOs can be used to track green attributes in the supplier mix. At the end of the RE-DISS project, supplier mixes have to be based on GOs, EU 15 ENTSO-E mix for imports, or the national residual mix calculated by GSE for purchases on the market.

Another area of progress was made in the regulation of imports. Imports of GOs will be accepted independently from imports of physical electricity as of disclosure related to year 2012.

At the end of the RE-DISS project, the issuance of GOs under the EECS format was under discussion. GSE is already an AIB member for RECS and is contemplating phasing out RECS certificates in Italy.

Luxembourg

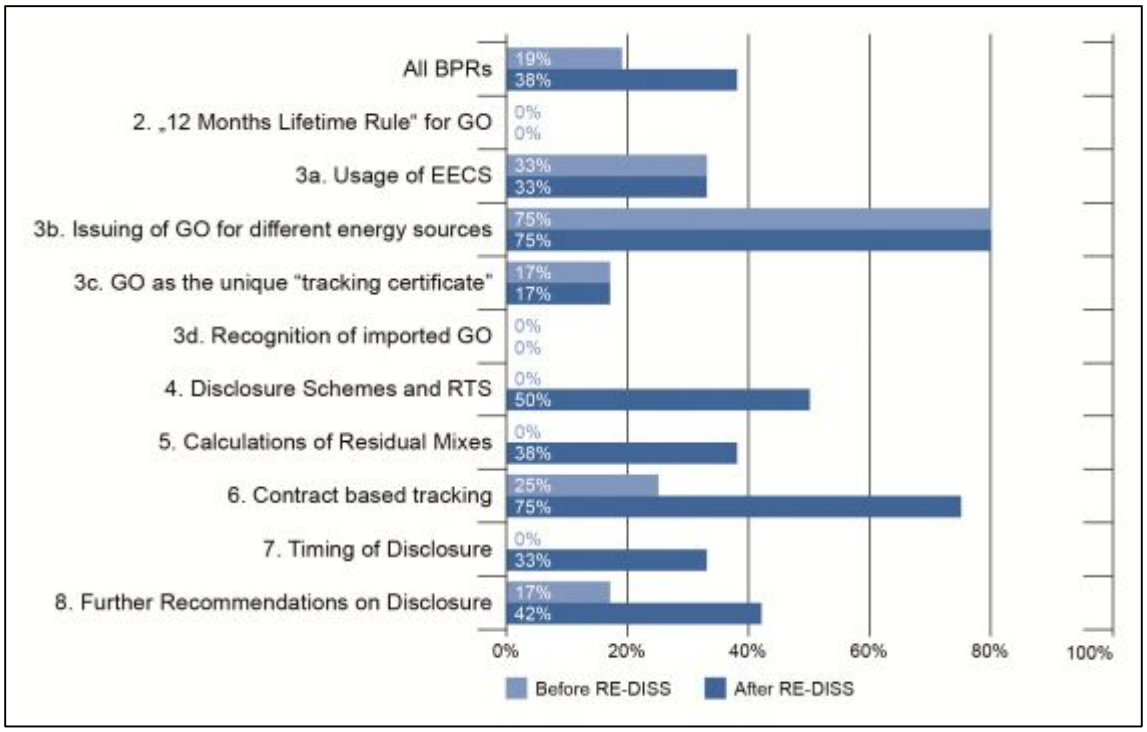
In Luxembourg, neither a disclosure nor a CHP-GO system had been implemented before RE-DISS. However, at that time existing legislation already referred to the rules for the specification of disclosure as being in preparation and appointed Institut Luxembourgeois de Régulation (LLR) as the competent body for both disclosure and GOs. Although the legislation underlying the RES-GO system was compliant with the 2001 Directive and not the 2009 RES-Directive, a national RES GO system was already implemented within EECS with the national regulator ILR as the officially appointed competent body.

During the project, and through regulation that entered in force in September 2010, a disclosure system was put in place requiring suppliers to disclose product mix, supplier mix and national reference mix (for RES, fossil, nuclear and unknown origin) for the calendar year until 1 September of the following year. In terms of the GO system, no improvements with respect to the RE-DISS BPR have been registered during the project as a CHP-GO system is not yet in place and the RES-GO legislation continues to be based on the 2001 Directive rather than the 2009 RES-Directive. However, the technical requirements of the 2009 Directive are fulfilled.

Figure 25 shows the improvements in the implementation of the BPR in Luxembourg. Although no major overall improvement was registered (before the project 19% of the BPRs were in place and after the project 38%), improvements have been made in terms of the adoption of a residual mix calculation, disclosure schemes and RTS, contract-based tracking, timing for disclosure as well as in the implementation of some of the further recommendation on disclosure. These improvements were mainly due to the implementation of the disclosure system in Luxembourg.

In terms of the residual mix, Luxembourg did not fully adopt the methodology proposed by RE-DISS during the project. It uses the ENTSO-E mix with all RES being deducted for implicit disclosure. This likewise excludes double-counting of RES attributes. Nonetheless, and although Luxembourg does not make use of the European Residual Mix calculated by the project, it has supported the project team in data collection for the RE-DISS European Residual Mix calculations.

Figure 25: Luxembourg: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



Source: Raimundo et al. 2012

Netherlands

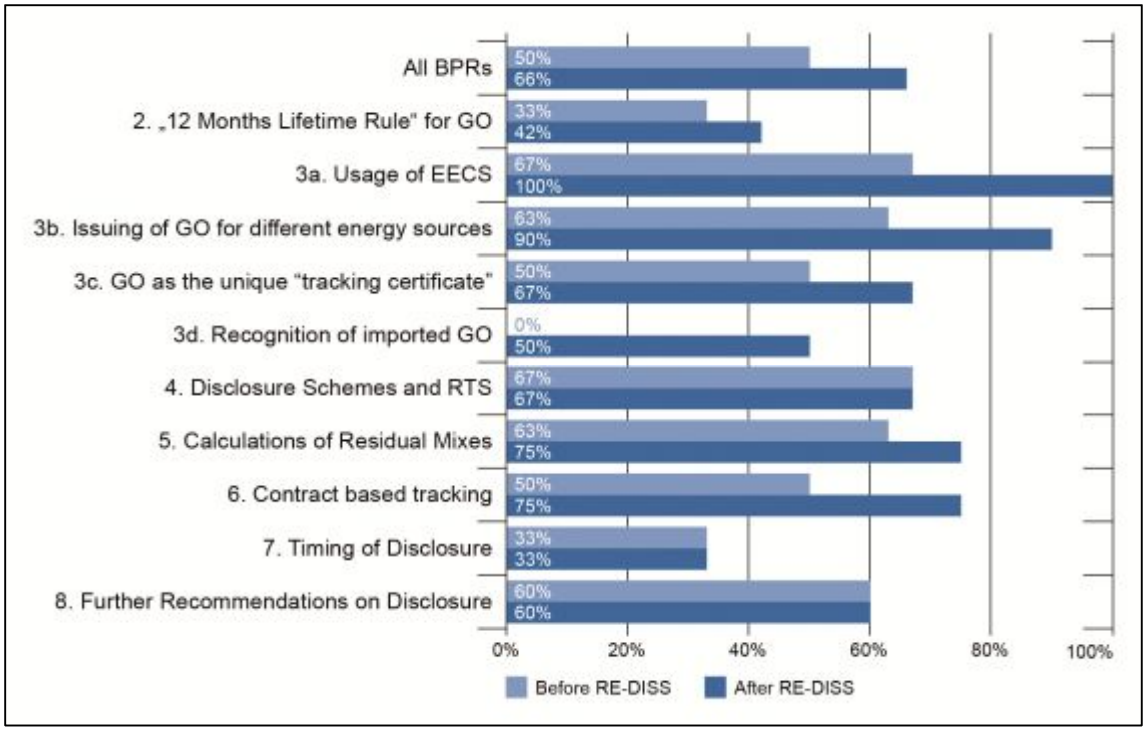
Prior to the project the Netherlands already had systems in place for disclosure, RES-GO and CHP-GO. At the beginning of the project the Netherlands had already implemented half of the BPRs proposed, whereas no complete set of BPR was fully in place. Through the duration of the project, a further moderate progress was made in terms of the adoption of the BPRs (66% of the BPR were in place after RE-DISS, see Figure 26).

During RE-DISS the Netherlands have banned ex-domain cancellations apart from in cases where there is no possibility for a secure electronic transfer and there is an agreement between the competent bodies explicitly allowing for such ex-domain cancellations. The Netherlands also provide statistical data on all ex-domain cancellations to support the residual mix calculations. Furthermore, the GO system in place was in principle extended beyond RES and HE-CHP to all types of energy generation having at the end of the project a full disclosure scheme based on EECS (besides CHP).

The Netherlands have made efforts in regulating contract-based tracking and have improved the calculation of the Netherlands residual mix by clarifying the way in which contract-based tracking was used in the calculation. Further progress has been made in the implementation of the BPRs for recognition of GOs imported from other coun-

tries, and in the implementation of the 12 month lifetime rule, which was not formally in place before the project.

Figure 26: Netherlands: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



Source: Raimundo et al. 2012

Sweden

During the project the legislation on disclosure and GOs has been amended in order to harmonise the Swedish disclosure scheme with the other countries across Europe, and implement some of the recommendations of the project.

In terms of the implementation of the BPR, as can be seen in Figure 27, Sweden had already implemented half of the proposed BPRs (51%) at the beginning of the project, having implemented at that time all BPRs related with the issuance of GO for different energy sources (set 3b). During RE-DISS Sweden managed to improve substantially its disclosure and GO systems, having adopted 85% of the project recommendations at the end of the project. Sweden has been a frontrunner in the implementation of the BPR and an active participant on the project.

The improvements shown in Figure 27 are due to implementation of:

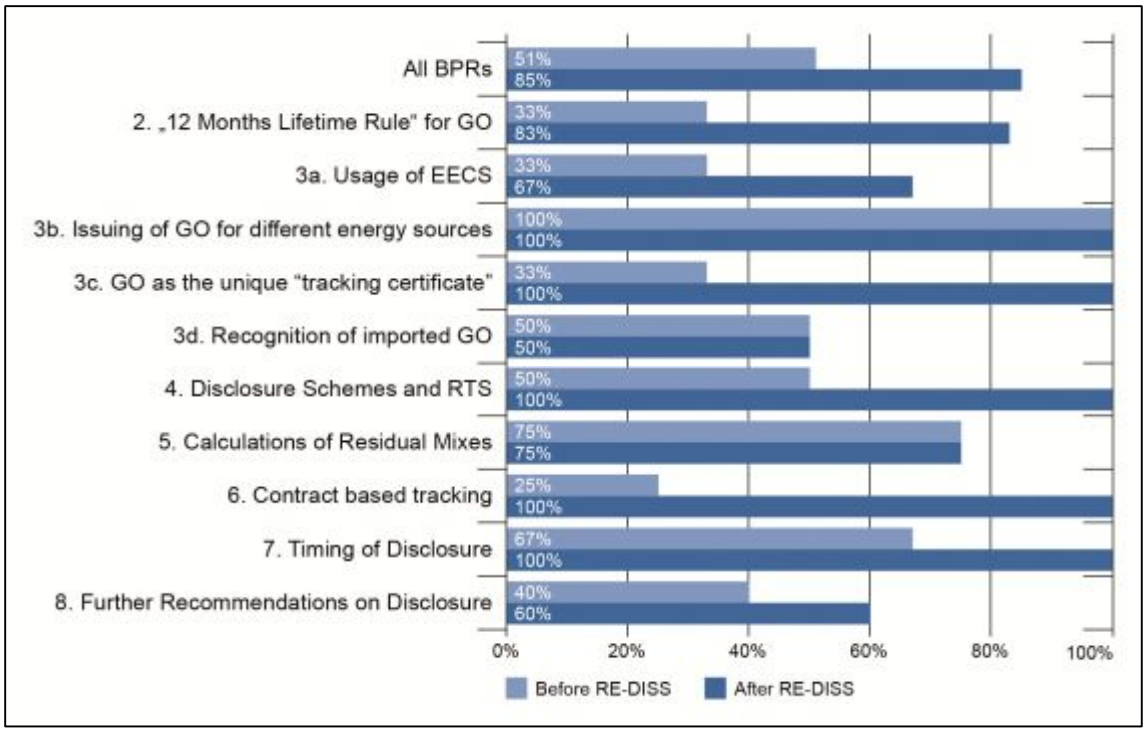
- 12 month lifetime rule of GOs. At first this was implemented as 12 months from the beginning of the related production period, but this was later changed to refer to the end of the production period according to RE-DISS BPR [3].

- Disclosure deadline for previous calendar year consumption, according to RE-DISS Best Practices.
- GO as the sole disclosure mechanism for the energy origin of electricity. This means that no other tracking systems (e.g. contract-based tracking) can be used for proving that a certain share or quantity of electricity originated from a specified energy source.

Furthermore, Sweden has banned ex-domain cancellations to EECS domains during the RE-DISS project, due to adherence to the EECS rules.

In terms of quantified errors in the total supplier mix of Sweden according to the RE-DISS Report on improvements achieved by the project (Raimundo et al. 2012), a substantial error still remains, due to the fact that Sweden uses the Nordic residual mix for implicit disclosure instead to the national one. Since the Nordic residual mix contains less renewables than the Swedish national one, RES is under-represented in the total Swedish disclosure by 13,3 TWh. The RE-DISS BPR allows for a regional approach to be taken for the residual mix calculation in case the region has a very unified power market (such as the Nordic region), but only in the case that all countries in the area agree to use the common mix.

Figure 27: Sweden: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



Source: Raimundo et al. 2012

Norway

At the beginning of the project Norway had already an operational disclosure and RES-GO system. Before RE-DISS, CHP-GO was implemented by primary legislation, but no system had been put in operation. During RE-DISS, the Norwegian CHP-GO became at least in principle operational.

With the RES-GO system already having been quite advanced before RE-DISS, legislation was passed in Norway during the project to make the system comply with the RES-Directive requirements.

The disclosure system and GO system in place in Norway already corresponds to many of the RE-DISS BPR. Prior to RE-DISS the systems already contemplated the adoption of 68% of the RE-DISS BPR and at the end of the project 79%, as shown in Figure 28.

During the project, Norway has banned ex-domain cancellation except for cases in which no technical transfer is possible and provided that there is an explicit agreement between the two affected competent bodies allowing for such ex-domain cancellation. Moreover, Norway has clarified the separation between the support scheme for RES, which was launched in 2012, and GOs and disclosure schemes. Norway has also introduced expiry for GOs 12 months after end of production period.

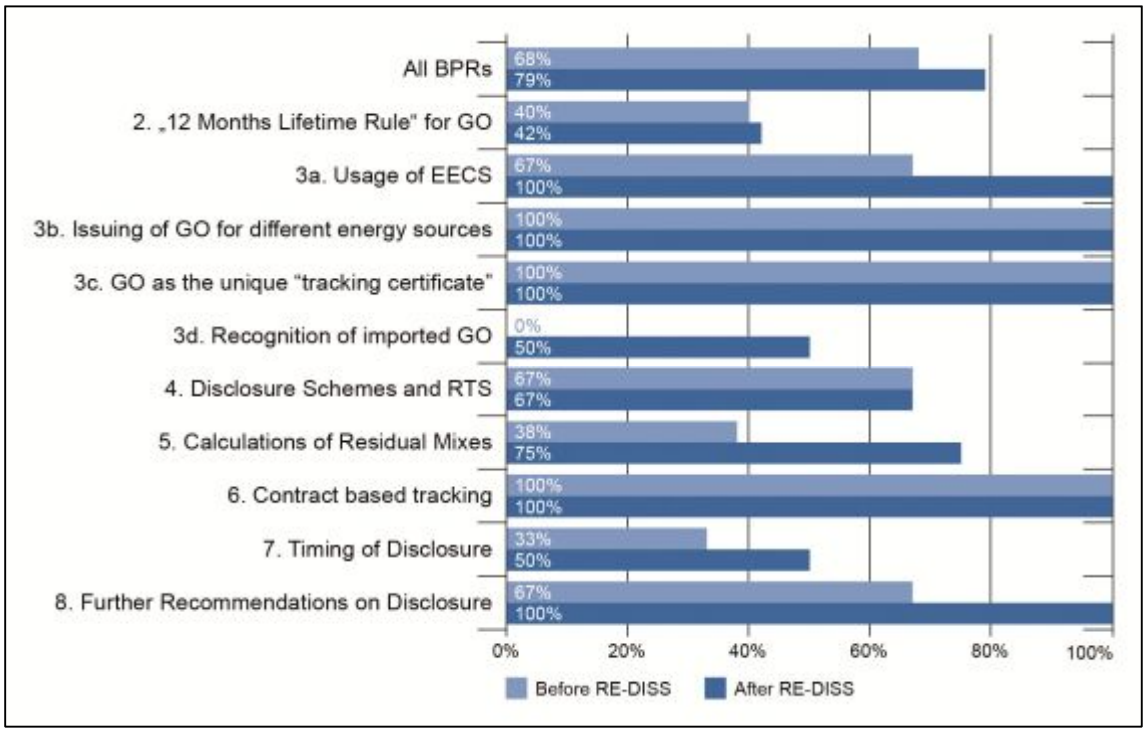
Before the project, the country already calculated a residual mix. However, this calculation was not harmonised: missing attributes were disclosed as unknown and no environmental parameters were disclosed. During the project the residual mix calculations were improved significantly by taking RE-DISS Residual Mix figures into account, which removed the high shares of energy with unknown origin which occurred in previous years. Furthermore, until the disclosure year 2011 the national residual mix as calculated by the regulator NVE included all active GOs in the Norwegian registry after the deadline of 28 February without implementing their expiry at that time, thus leaving the possibility of these GO being double-counted if they are exported and disclosed abroad. This has led to a limited risk of double counting and caused a temporary block of imports of certain Norwegian GOs from production year 2011 to some domains. NVE has announced that the procedure of treating GOs after the disclosure deadline will be changed as of disclosure year 2012, and thus the double counting risk should now be banned.

The timing of calculation of the national residual mix until the year 2011 did not allow inclusion of RE-DISS European residual mix figures in the first publication by NVE (for disclosure of year X the first publication of disclosure information was carried out in April of year X+1), and they were included only in a later publication in June X+1. From disclosure year 2012 onwards the timing for disclosure will be changed: the deadline for the cancellation of GOs will be moved to 31 March of the year X+1 as recommended by the RE-DISS BPR and the disclosure figures will be published only once and will include the European residual mix figures.

During the project Norway clarified that rejection of imported GOs should only relate to the actual use of cancelled GO for disclosure purposes in the respective country and that it does not restrict the transfers of GO between the registries of different countries. At the moment there are still no criteria established for rejecting GOs in Norway.

The provision of electricity disclosure information to consumers in Norway is still falling behind the requirements of the Internal Energy Market Directive because disclosure information is provided to consumers on or with the electricity bills only if they buy a specific product with claims regarding the origin of electricity. All other consumers just receive a notification that their disclosure information (the Norwegian residual mix) can be found on the NVE website. This practice is not fully in line with the requirements in the directive and might support a lack of consumer awareness of the fact that Norway exports high shares of its renewable energy production to other countries.

Figure 28: Norway: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



Source: Raimundo et al. 2012

Switzerland

Before RE-DISS Switzerland had already implemented systems for disclosure and for RES-GOs. However, the disclosure system in place was not fully in line with the requisites of the new RES-Directive, as it did not (and still does not) consider disclosure of environmental indicators.

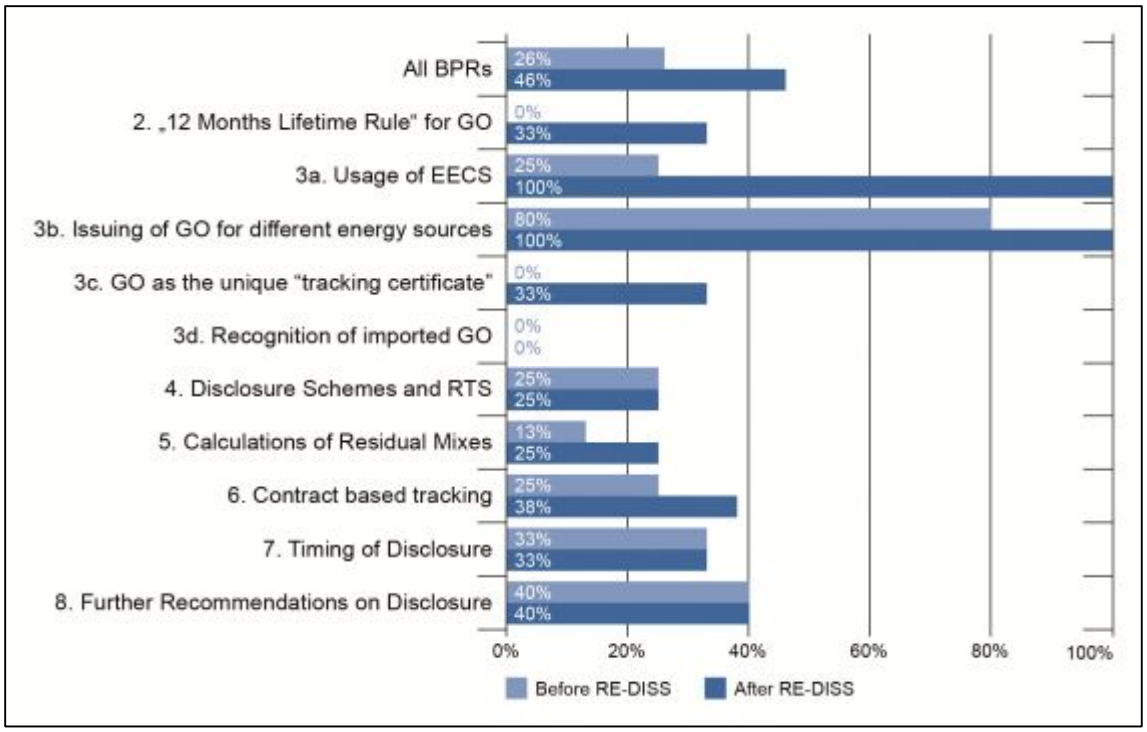
In terms of an improved implementation of the BPR, and as can be seen in Figure 29, improvements have been registered in Switzerland during RE-DISS; before the project 26% of the proposed BPRs were already implemented and at the end of the project 46% were implemented.

During the project, the issuing of GOs for different energy sources was implemented by a new legislation that will enter into force from 2013 onwards. The GO system is planned to be mandatorily extended to all sources of energy (including nuclear and fossil, so also CHP production is covered by GOs) for production over 30 kVA from 2013 onwards. By that time these GOs will have to be registered in the national GO system. These GOs will fulfil the general requirements for GOs stipulated in Article 15 of the RES-Directive as well as conform to 2004/8/EC Article 5, except that they do not contain the calculation of the primary energy savings. At the end of the project there was a separate national RES-GO system and a registry with a connection to EECS for international transfers in place. Ex-domain cancellations have been banned and there are no linkages to registries besides EECS for GO transfers.

Further improvements were also made in terms of the implementation of the 12 month lifetime rule. At the end of the project generators could choose between production periods of one month, one quarter and one calendar year. However, for plants >30kVA it was mandatory to have metering of one calendar month; and GOs were issued directly after the production period. Nevertheless, GOs for production in the first quarter of a year in Switzerland after RE-DISS remain valid for more than one year after the end of the production period (at least until the end of April of the following calendar year) after which, if not cancelled, they expire. This contradicts the recommendation for a 12 month lifetime of the GO as proposed under this BPR made by RE-DISS.

Moreover, Switzerland has implemented a disclosure system which only takes explicit tracking into account. However, as there is no limitation on GOs and other RTS, but with, for example, contract-based tracking still being permitted, this development is not covered as progress in implementation of RE-DISS BPR. Still, this attempt to increase market differentiation by allowing only for explicit tracking in the national disclosure scheme can nevertheless be considered a generally positive approach.

Figure 29: Switzerland: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS

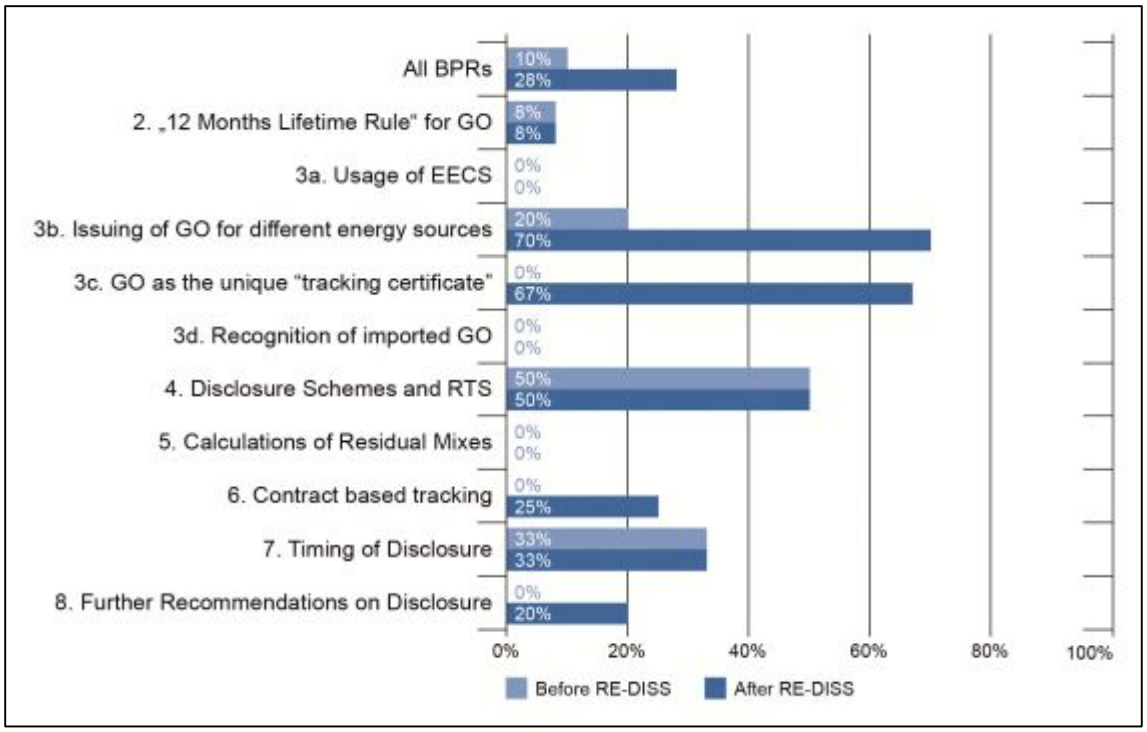


Source: Raimundo et al. 2012

France

At the beginning of the project, the situation in France in terms of disclosure and GOs showed an almost complete lack of implementation of BPRs (10%). At the end of the project, some progress had been made (28% of BPRs implemented) but much still has to be done. In terms of disclosure, the obligation was transposed and disclosure implemented by the suppliers. However, no regulations were issued and suppliers could use contracts, GOs, RECS or labels such as TÜV to disclose green attributes. No residual mix existed. There was no integration of product mix disclosure with supplier mix disclosure. GOs were not issued under the EECS format and the registry did not allow for imports.

Figure 30: France: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



Source: Raimundo et al. 2012

In the course of the RE-DISS progress, the French government transposed Directive 2009/28 which led to some improvement with regard to GOs. These improvements are also partly due to the consultation that the RE-DISS team carried out on the draft decree and ordinance for the transposition. As a result, the secondary legislation provides for a GO which corresponds to the requirements of the Directive and can be compatible to an issuing under the EECS format. Its implementation depends, however, on the choice of the issuing body which has to be published by the ministry following a call for tender for this responsibility which was closed in March 2012. Until new body is designated, RTE continues to ensure issuing of GOs.

Another major improvement is that GO is clearly linked to disclosure and is now the only tracking tool allowed for disclosure of green attributes in commercial offers (which should account for supplier mix and products). RECS certificates which supported almost all offers prior to that cannot be used for energy produced after 1st January 2012.

No improvement was made regarding implicit tracking. At the end of the project, there was still no residual mix in France. Contract-based tracking is still not regulated.

Further improvements are to be expected on the side of GO with the choice of the new issuing body since the known candidates have presented an offer foreseeing the use of the AIB hub for international transfers and so implying that GOs will be standardised along the EECS provisions.

Germany

Before RE-DISS, Germany had already implemented disclosure and a GO system (for both RES and CHP) which where aligned with the directives in place prior to the new RES-Directive.

During the project, the RES Directive was transposed to national legislation through the amendment of the national legislation for disclosure and RES-GOs and changes have been implemented to both systems. In these amendments the competent body for RES-GO has changed and now the Federal Environment Agency UBA is the appointed competent body for RES-GO in Germany.

In terms of the RE-DISS BPR, and as can be seen in Figure 31, Germany had implemented 36% of the BPRs before the project began. During the project some improvements were made to the systems, with 51% of all of RE-DISS BPR having been implemented at the end of the project. The small overall improvement registered was due to the implementation of some of the BPRs in the system as well as to some setbacks in the implementation of some of the BPRs in place before the project

During RE-DISS, Germany implemented the 12 month lifetime rule. Furthermore, the metered production periods for the issuance of GOs have been set to be (in standard cases) no longer than one calendar month and to not run across disclosure periods; issuance of GOs have been set to be done directly after the end of each production period; and GOs have been set to expire 12 months after the end of the production period.

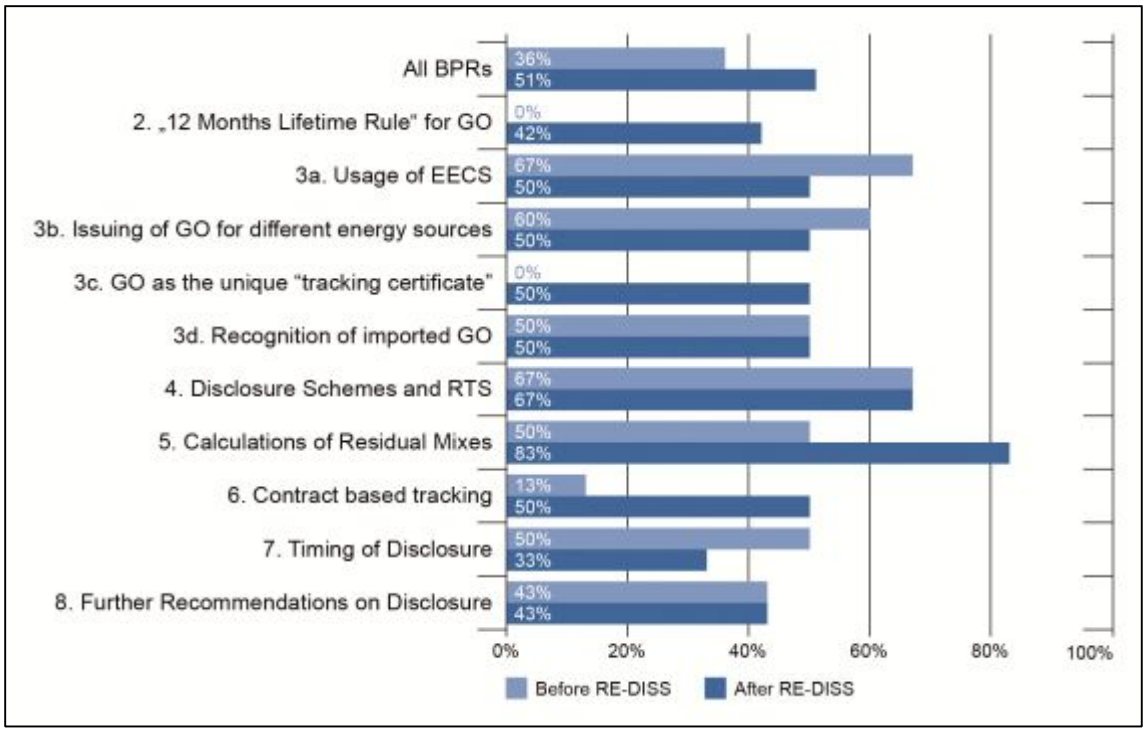
Through the new laws, from January 2013 onwards, RES can only be disclosed based on GO, or based on pro-rata allocation of the RES volumes which have been supported by the feed-in tariff or the market premium scheme. For production until end of 2012, different other certificates (e.g. from TÜV) can also be used for RES disclosure.

Although Germany did not legally put in place a national residual mix calculation methodology for the purposes of disclosure, the current regulations and applied methods require the exclusion of RES-GO and feed-in energy from the national mix so that it can be used for implicit disclosure. Thus, the default mix is currently the national generation, minus all RES generation. Before RE-DISS, the ENTSO-e generation mix minus German feed-in energy was used as the default mix.

Furthermore, at the end of the project there were already rules (set up by the branch association's guidelines) on contract-based tracking; however these rules are not binding; double counting of RES is currently prevented by removing all RES from the default mix (although there is not a full national residual mix calculation in place); and from 2013 onwards RES products must use GOs to fulfil claims of renewable electricity products.

Setbacks have been registered at the end of the project in terms of the implementation of EECS.

Figure 31: Germany: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



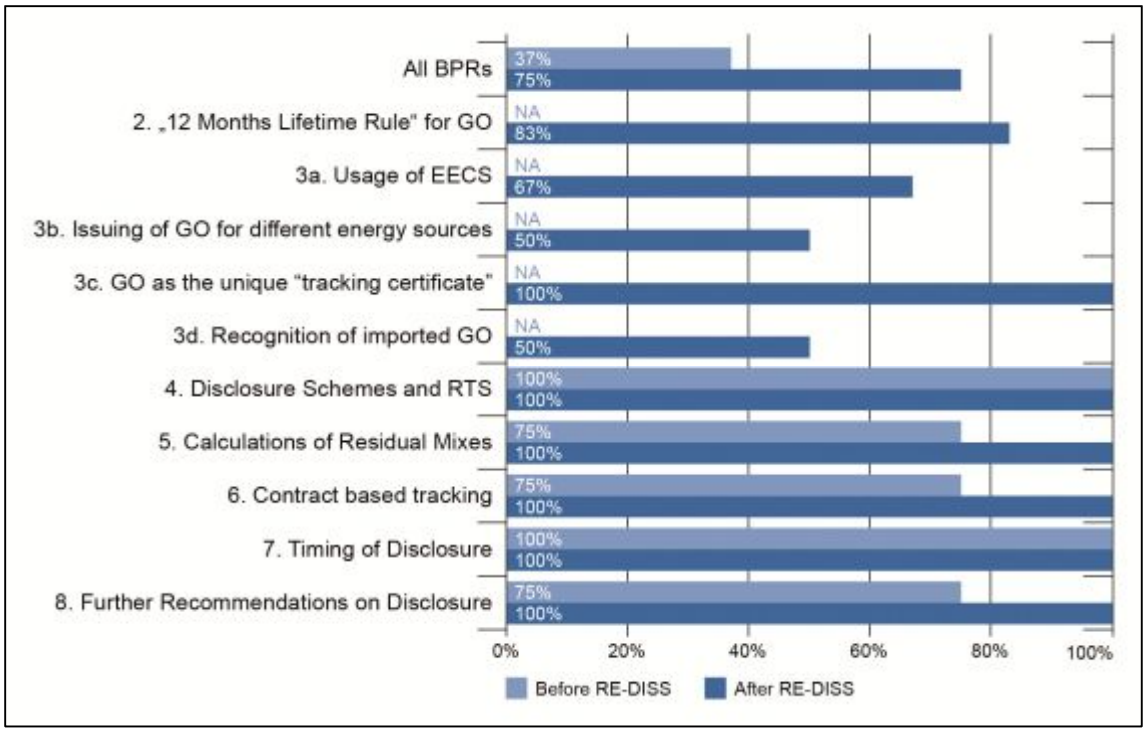
Source: Raimundo et al. 2012

Ireland

During RE-DISS Ireland improved its disclosure system and implemented a RES-GO system through the passage of national legislation that transposed the RES-Directive. This resulted in the implementation of 75% of all RE-DISS BPR, as shown in Figure 32. Nevertheless, after the project, no CHP-GO was in place in Ireland as CHP is a technology and not a fuel source/type and thus Ireland considers that it is something that is not appropriate for fuel mix disclosure.

After the end of the projects, BPR set 3c was fully implemented, GOs were the unique tracking certificate used for disclosure or RES. Disclosure of other sources of energy was done by using a reliable tracking system (contract-based tracking). Besides GOs and contracts, a national residual mix was used and the European Residual Mix filled the deficit of attributes.

Figure 32: Ireland: Actual improvements in the implementation of the Best Practice Recommendations during the project



NA = not applicable

Source: Raimundo et al. 2012

During the project Ireland introduced a national residual mix calculation based on the project's methodology (as opposed to the national one that was used before the project) and the both the competent bodies for disclosure and RES-GO have participated in the collection of data for the residual mix calculation. For the calculation of the 2011 residual mix figures, Ireland already made use of the European Residua Mix for purposes of cross-border transfers. Indeed, the calculation of the national residual mix, as described in the Irish Statutory Instrument 147 of 2011, has been inspired by RE-DISS, and this instrument makes reference to the use of the RE-DISS European Residual Mix. The introduction of a harmonised residual mix calculation made Ireland achieve significant improvements in terms of implicit disclosure error.

Significant improvements were also registered in terms of the implementation of the full sets of BPR 6 and 8. Set 6 of the BPR became fully implemented through setting GOs as the unique tracking system for RES and set 8 by clearly regulating how claims by suppliers and consumers of green or other low-carbon energy relating to carbon emissions or carbon reductions should be made.

The introduction of a RES-GO system in Ireland during the project led to the implementation of most part of the recommendation related with GO included in sets 2, 3a, 3b and 3c. After the project RES-GOs were being issued for metering periods no longer than one calendar month and the issuing was done quarterly; they had a 12 month

lifetime after which they expire and are collected into the residual mix; they were cancelled according to the timing proposed by the RE-DISS project; all GOs in Ireland were handled on a comprehensive registry system and were all linked to disclosure; and although not based on EECS, Ireland had in place appropriate connections that allowed transfers of GOs with EECS and non-EECS systems and tracked all transfers of attributes (thus far, Ireland has received transfers from Northern Ireland and Norway).

Moreover, as disclosure in Ireland comprises both Ireland and Northern Ireland (Northern Ireland GOs are issued in a different register and operated by a different competent body) during the project procedures have been put in place between Ireland and Northern Ireland so that disclosure is made for all Ireland based on both GOs (for electricity generated from renewable energy sources from both registries) and contracts (for the other sources of electricity generation).

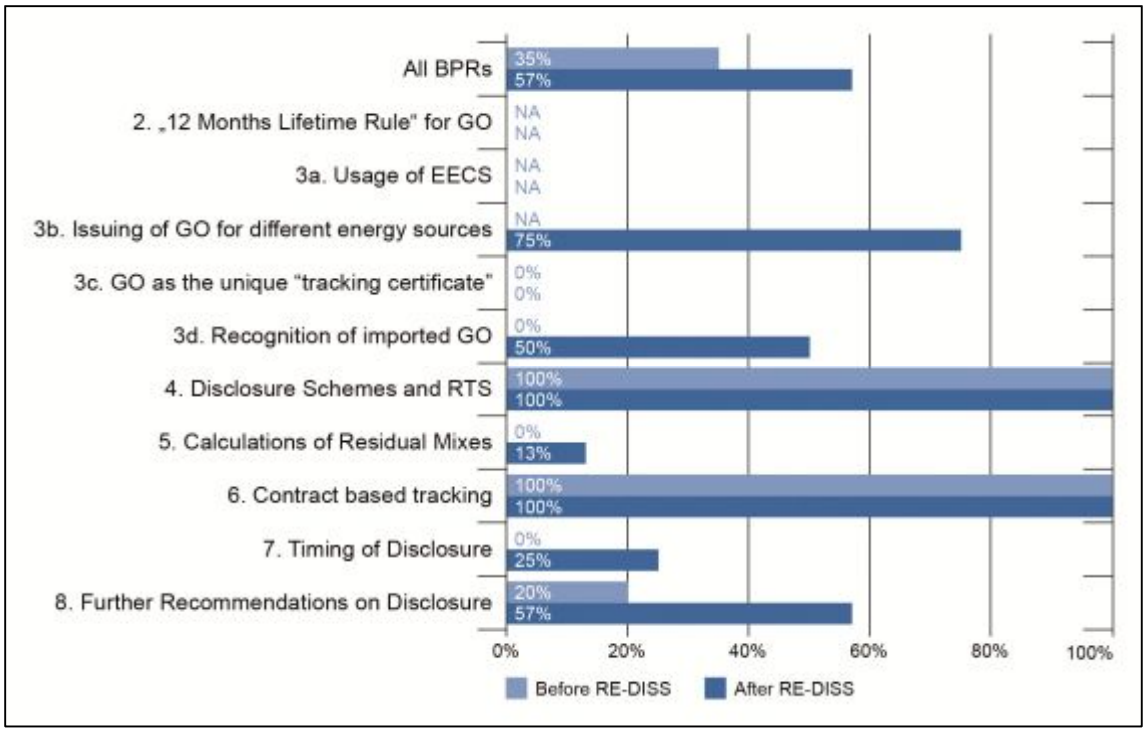
Thus major improvements have been registered in Ireland, through the implementation of a RES-GO system and improvement of the existent disclosure system. Although these improvements have been made through the passage of national legislation that transposed the RES-Directive into national legislation, some of these have been inspired by the project (residual mix calculation and the use of the European Residual Mix). Ireland has been quite involved in the project, through the participation of CER and SEMO representatives in most of the RE-DISS domain workshops and by having bilateral meetings with some of the RE-DISS partners to discuss the transposition of the RES-Directive and the implementation of a national residual mix calculation. Moreover the RE-DISS team also reviewed and provided comments on the draft of the Statutory Instrument 147 of 2011 to ensure the incorporation of some of the RE-DISS BPRs. Nevertheless small improvements still need to be made so that the systems become fully aligned with the BPRs.

Portugal

At the beginning of the RE-DISS project, Portugal did not have GO systems in place. Secondary legislation for CHP-GOs had just been passed (March 2010) and there was no operational registry. As far as RES GOs are concerned, no legislation was in place, which explains why all BPRs related to GOs were not implemented.

Disclosure guidelines were developed in 2008 and implemented by ERSE, the regulator. Disclosure was made on a 12 month rolling period, so they had to be done on a monthly basis. Feed-in tariff electricity was attributed to suppliers on the basis of the number of consumers on low voltage. Suppliers were also to use information from the MIBEL for electricity bought on the market or contract information (which is followed by REN, the TSO). Nuclear waste was not disclosed.

Figure 33: Portugal: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



NA = not applicable

Source: Raimundo et al. 2012

No residual mix was in place, the balance of attributes for trade with Spain was made on an assumption of production mix of Spain, which did not lead to the same calculation that Spain was making. RECS certificates were being used for exports and were not deducted from the market mix. On the side of disclosure, the implementation rate of BPR were already at a high level since RTS as support systems and contract tracking were well managed, which explains the overall score of 35% of BPRs implemented.

At the end of the project, Portugal reached the score of 57% of BPRs implemented. Primary legislation was passed for GOs, and brought about improvements on the status of GOs coming from the transposition of the directive (linkage with disclosure, recognition of foreign GOs). A competent body was chosen. However, secondary legislation, regulations and registry were still pending.

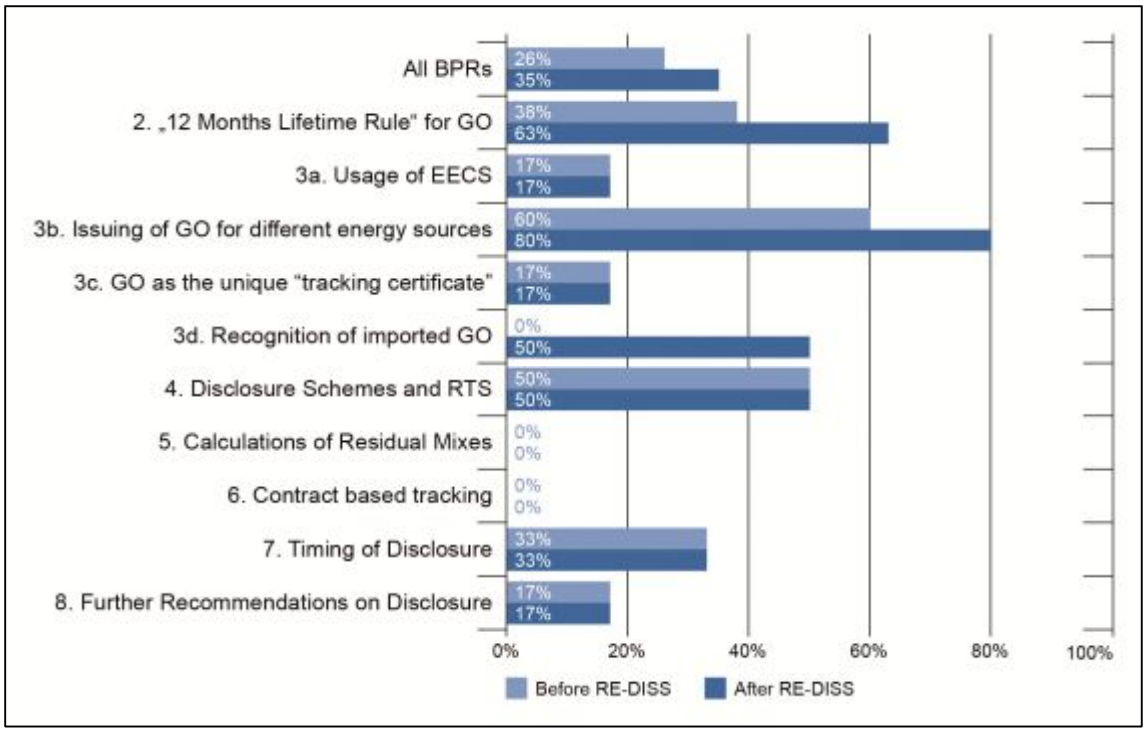
On the disclosure side, RE-DISS recommendations were used (which was explicitly stated in the document explaining the revision made by ERSE of the disclosure guidelines). The RE-DISS team had 3 meetings with competent authorities in Portugal. The calendar year was adopted as the disclosure period. An approach to residual mix was adopted in which the energy bought in OMIE or in bilateral contracts corresponds to a national production mix from which GOs and other tracking systems have been deducted (support schemes, RECS and other voluntary schemes), effectively reducing the error impact. ERSE provides on its website all data for calculations to be made by

suppliers. Consumers have to receive disclosure of their own product mix (even in the case that this is a default product); the supplier mix is disclosed in public communications.

Slovenia

Both disclosure and GO systems in Slovenia moderately improved during the project; before RE-DISS 26% of all BPRs were in place and after the project 35% of the BPRs were in place in the country (see Figure 34). The registered improvement was introduced by the amendments to the preceding legislation on disclosure and GOs, which transposed the requirements of the RES-Directive in relation to these systems.

Figure 34: Slovenia: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



Source: Raimundo et al. 2012

The GO system in place in Slovenia improved during RE-DISS with: the limitation of the lifetime of the GOs to 12 months instead of the 5 year period that were used before the project; the amendment of the unit of energy for which GOs was being issued (now one GO is issued for each 1MWh of produced electricity); the amendment of the legislation regarding the recognition of GOs so that the rejection of GOs do not prevent imports.

Regarding implicit disclosure, as Slovenia had no residual mix in place before or after the project, explicitly tracked attributes were not and are not removed from implicit disclosure. Hence RES is being over-reflected in the total supplier mix: according to the

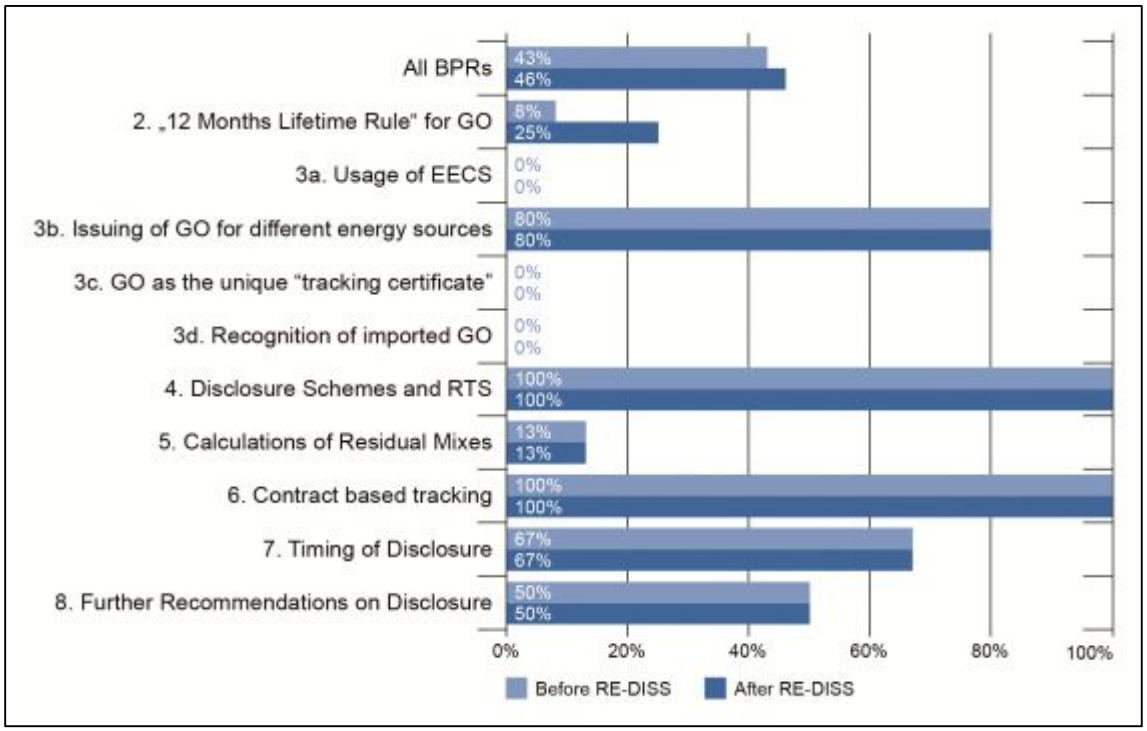
RE-DISS estimate of RES in the total supplier mix Slovenia is disclosing 5 TWh of RES instead of 2,6 TWh which Slovenia should disclose in the total supplier mix if a harmonised residual mix had been introduced (Raimundo et al. 2012).

Although the RE-DISS partners have worked closely together with AGEN-RS throughout the project, not much improvement has been registered during the project in terms of the implementation of the BPRs.

Spain

Spain already had quite a developed tracking scheme at the beginning of the RE-DISS project with 43% of BPRs implemented. All regulations were issued and operational RES GO and CHP GO systems in place and managed by CNE, the regulator.

Figure 35: Spain: Actual improvements in the implementation of the Best Practice Recommendations during RE-DISS



Source: Raimundo et al. 2012

The registries were not EECS-compatible, hence market players used RECS certificates for exports. These exports were not accounted for in the residual mix calculations made by CNE. Contract-based tracking was not allowed, which explains the high scores on sets 4 and 6 of the BPR. CNE calculated a national residual mix, which had to be used by all suppliers for the volumes of electricity sold for which they did not have a GO. The calculation of the residual mix did not take into account potential imbalances between available attributes and volumes of electricity consumed. Suppliers were only able to use GOs to green their mix. GOs had to be used for calendar year X until March

of year X+1. Issued GOs sitting on the registry and not used were attributed by CNE to the suppliers that owned them.

In the course of the project, no improvements were made except with regard to the issuing of GOs which are now expressed in MWh rather than kWh. A draft text law was produced after summer 2012 which foresees changes in GOs and brings improvements.

At the time of writing of this report, a draft circular on guarantees of origin was being discussed, containing improvements which relate to:

- The possible issuing of GOs for the calendar month of production;
- Regarding imports, GOs should not cover periods of two different calendar years;
- Expiry regulations for GOs;
- Producers who are asking for a GO: they should specify if these GOs are meant to be exported. In this case they cannot be redeemed in Spain. This will solve the problem of active GOs that could be used once in Spain (by sitting on the suppliers account by 31 March because these would be counted in the suppliers mix) and once in a country of export (in theory because there was no export of GOs).

Other countries

Beside the 17 domains for which improvements have been analysed in depth in the RE-DISS Report on improvements achieved (Raimundo et al. 2012) and which have been summarised above, other domains have also improved their disclosure and GO systems during the project:

- Great Britain has improved its disclosure and GO system by starting to issue GOs for each 1 MWh of electricity (instead of each kWh) and by making GO the unique tracking system for disclosure of electricity from RES.
- Poland has issued a draft law on energy for the transposition of directive 2009/28. In January 2012, the government ran a consultation process to which answers from the RE-DISS team and the AIB were made. The latest version of this draft law dates from 9 October 2012. Chapter 6 of this law deals with the transposition of article 15 of Directive 2009/28. GOs are explicitly linked to disclosure and explicitly not linked with support (which was one of the pieces of advice provided in the letter) whereas prior to that they were used for support. They are an electronic document representing 1 MWh of RES electricity (CHP is not mentioned). An expiry date should be included in the information carried by the GO, and is to be calculated as 12 months after the end of the production period (which conforms to RE-DISS BPRs and the recommendation made during the consultation). The competent authority is still the regulator, ERO, who

manages the registry. It is foreseen that this registry should record imports of GOs from other member states or EFTA countries.

- The Czech electricity and gas market operator OTE, competent authority for GOs, applied for the status of observer in the AIB following a meeting with the RE-DISS team, with a view to putting in place an EECS-compatible GOs.
- Following several meetings with the RE-DISS team, the last one taking place in July 2012, Greece renewed its interest in the EECS standard and indicated that it wanted to join the AIB meetings. It also drafted a new supply code in which it integrated several of the RE-DISS BPRs, the details of which were not known at the time of this report being written.
- During the time frame of the project, Iceland participated in several workshops for competent authorities. Iceland implemented a sound framework for RES GO and disclosure. Iceland has implemented a GO system under the EECS standard as of January 2012. The competent authority is Landsnet, the TSO. On 13 September 2012, a law transposing an obligation of disclosure was implemented. It provides for the obligation put on electricity suppliers to disclose their supply mix either through cancelled GOs or through a national residual mix calculated by the National Energy Authority. The timing of disclosure follows the RE-DISS recommendations.
- Estonia via Elering (TSO and competent authority for GOs) participated in several domain workshops and announced that it would join the AIB in order to issue EECS GOs. Elering is currently waiting for the law which will transpose article 15 of Directive 2009/28.

Notes

Notes

Imprint

RE-DISS Project Coordinator

Christof Timpe

Öko-Institut e.V.,
Freiburg, Germany

www.oeko.de

Graphics Design

gestalter.de, Tobias Binnig,
Freiburg, Germany

Print

schwarz auf weiss Litho- und Druck GmbH,
Freiburg, Germany

Printed on 100 percent recycled paper.

Credits

Picture on front and back cover:
© twystydigi – Fotolia.com

www.reliable-disclosure.org