gaia

*Innovative Solutions for Sustainability*

# Guarantees of origin and eco-labeling of electricity in the Nordic countries

Final Report

13.6.2011

Marika Bröckl, Aki Pesola, Iivo Vehviläinen, Paula Tommila

Gaia Consulting Oy

# Table of Contents

# List of abbreviations

| | |
|---|---|
| AIB | Association of Issuing Bodies |
| CEN | European Committee for Standardisation |
| CMO | Central Monitoring Office |
| EECS | European Energy Certification System |
| EMV | Finnish Energy Market Authority |
| EPED | European Platform for Electricity Disclosure |
| FANC | Finnish Association for Nature Conservation |
| FSC | FSC-labelled forestry |
| GO | Guarantees of Origin |
| IB | Issuing Body |
| NGO | Non-governmental organisation |
| NVE | Norges Vassdrags og Energiverk |
| PRO | Principles and Rules of Operation of the European Energy Certificate System (EECS) |
| RECS | Renewable Energy Certificate System |
| RES-CHP | Renewable energy from combined heat and power production |
| RE-DISS | Reliable Disclosure Systems for Europe |
| RTS | Reliable tracking System |
| SSNC | Swedish Society for Nature Conservation |
| TSO | Transmission Services Operator |

# 1 Introduction

## 1.1 Background

Renewable electricity generation is one of the key alternatives to reduce greenhouse gas emissions and potentially reduce other harmful impacts of electricity generation to the environment. As an acknowledgement of these factors, EU has set a target to increase the share of renewable energy within the Union to 20 % by the year 2020. Member States have a binding obligation to reach the country specific targets by increasing the use of renewable energy sources.

As various stakeholders strive to improve their carbon balances and as consumer interest in the origin of electricity has grown, renewable electricity has also become a marketed commodity. Various systems provide verification and certification of the origin of the electricity. Marketing of renewable electricity to end users is also done in the form of various voluntary third party eco-labels. The system of Guarantees of origin exists for the sole purpose of proving to end-users that the electricity has been produced from renewable sources.

EU Member States are in 2010–2011 in the process of applying the new directives which regulate guarantees of origin (GO) of electricity. The new directives call for elimination of double counting, clearer responsibilities and harmonized handling of issuing, transferring and cancelling guarantees of origin.

EU regulations do not automatically guarantee a harmonized system for the handling of guarantees of origin within the EU or the Nordic countries, or correct and transparent disclosure of the source of consumed energy to customers. Diverse practices exist for the handling of guarantees of origin at present. Most countries have developed practices and processes independently of each other over a long time span, and from their own starting points. Increased harmonizing of the use of and simpler processes for the handling of guarantees of origin on a European level is called for to ensure a good development of a common energy market and market for renewable production as well as to provide transparency and the possibility of making informed choices for the end-user.

## 1.2 Goal and scope of the study

### 1.2.1 Goal of the Study

The main goal of the study is to give an overview of the practices for handling guarantees of origin for electricity as well as of the status of the disclosure to customers in the different Nordic countries. A second goal is to describe the different eco-labeling schemes in existence in the Nordic countries. A third goal is to potentially identify actions for harmonizing the handling of guarantees of origin and the disclosure of the origin of energy sold to customers as well as for practices for eco-labeling in the Nordic countries.

### 1.2.2 Scope of the study

The framework for the study is presented in Figure 1.1.

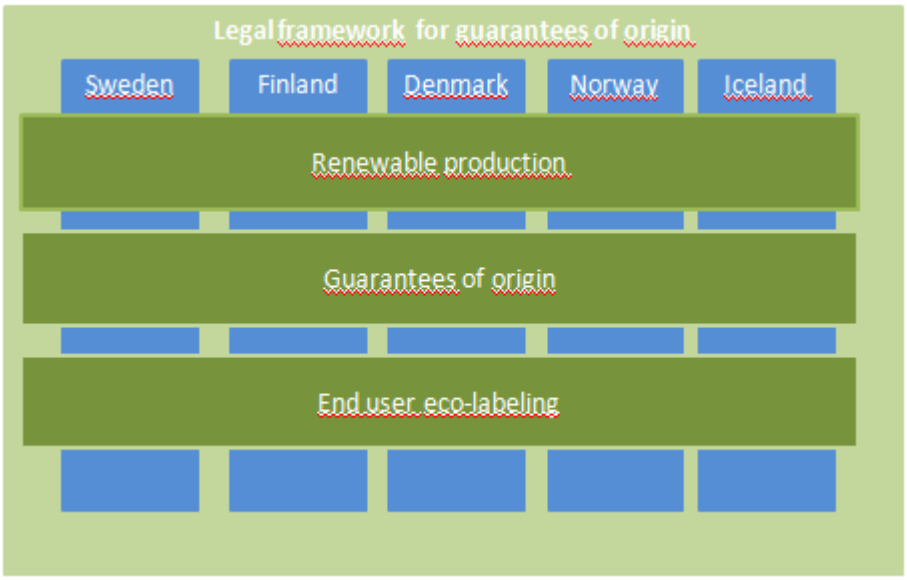


*Figure 1.1 Framework of the study.*

***Legal framework for guarantees of origin***

In the study the relevant EU and legal framework impacting the implementation of guarantees of origin for electricity is described. The relevant work for harmonizing practices and developing standards within different bodies in Europe, such as for instance AIB (Association of Issuing Bodies), is summarized. The summary of the status of the implementation of the EU-legislation relevant for guarantees of origin in the Nordic countries is also provided for each country.

***System for guarantees of origin in the Nordic countries***

The system for regulating, issuing, transferring and cancelling guarantees of origin is described and an overview of trade in guarantees of origin in quantitative terms will be provided. An overview is provided on the different practices for disclosure of the origin of the energy consumed by customers. Light is given to different practices used by the Nordic countries as regards to residual-mix calculation of electricity. The foreseen development of the residual-mix calculation practices is also discussed.

***Third party eco-labels in the Nordic countries and the market for eco-labelled electricity***

The different environmental labels in use in the different Nordic countries are described and an estimation of the market for eco-labeled energy is given where available. An overview of the development of the volumes sold to end users is provided as available for the different markets.

***Preliminary recommendations***

Recommendations for the potential need for harmonizing rules and regulations for implementing guarantees of origin and eco-labeling in the Nordic countries will be made based on the desk study and interviews of key stakeholders in the Nordic countries. Tentative recommendations for harmonized practices for disclosure of the origin of electricity to end customers will also be given.

## 1.3 Methodology

This study has been carried out by an independent expert organization, Gaia Consulting Oy, from Finland. The work has been guided by the Nordic working group for renewable energy and Nordic Energy Research. The study was based on a desk study followed by interviews of key people involved with the guarantees of origin systems or disclosure and eco labeling of electricity in the Nordic countries. A list of interviewees is provided in Appendix 1. The steering group members were Bjarne Juul-Kristensen (Denmark), Petteri Kuuva (Finland), Kathinka Thielert (Norway), Truls Borgström (Sweden) and Helga Barðadóttir (Iceland).

## 1.4 Definitions

A **guarantee of origin** (GO) carries information, which tells the consumer essential facts about the product. European Guarantees of origin for renewable energy have the sole function of proving to a final customer that a given share or quantity of energy was produced from renewable sources[1]. Guarantees of origin can be used for disclosure and product differentiation. Guarantees of origin are issued electronically for a controlled quantity of electricity generation (1 GO per MWh), traded and cancelled (used) by suppliers as evidence to their customers of the origin of the delivered electricity. Controlling the information and the accuracy of the guarantee of origin is therefore of critical importance. A unique body (e.g. an electricity regulator or a transmission system operator) is usually granted this authority for a given domain or geographic area. The trading of guarantees of origin represents a possibility to sell/buy the environmental advantages given by renewable energy, regardless of where the actual production takes place. Hence the guarantees of origin do not follow a physical delivery, but are independent of the localization of physical production. However, it is possible to re-bundle the guarantee of origin with an electricity contract, if desired.

**RECS system** (Renewable Energy Certification System) is a voluntary system for approval of renewable power production and issuing, trade and cancellation of certificates for renewable energy. A RECS certificate is basically the same thing as a guarantee of origin and proves to a final customer that a given share of energy has been produced from renewable sources. RECS are still used widely in Europe as some countries have yet to adopt the guarantee of origin legislation and electronic systems. RECS in their current format will most likely be phased out as more countries adopt the guarantees of origin system.

**Eco-energy labeling schemes** (by NGOs) should not be confused with guarantees of origin. Both provide consumers with information about the origin of their power (transparency). However Eco-energy labeling schemes usually go further than only verifying the origin and source of production by requiring some type of additionality and/or ecological eligibility criteria. Eco-energy labeling schemes are private initiatives whereas guarantees of origin arise from European regulations. Most eco-labels are backed by guarantees of origin in the Nordic countries.

**Elcert** is the Swedish national electricity certificate trading scheme for supporting electricity production from renewable energy resources. The Elcert is a so called **green certificate and is not a guaran-**

[1] EC, Directive

**tee of origin**. Elcert is based on a system that supports investments in renewable energy but it does not guarantee that the electricity bought is produced from renewable resources. Elcerts can't be used for disclosure or product differentiation.[2] From the beginning of 2012 there will be a common Elcert support system for Sweden and Norway.[3]

# 2 Background of guarantees of origin

## 2.1 Guarantees of origin in EU and description of the relevant EU directives

EU has adopted several directives to enforce its renewable energy policy. The requirements for guarantees of origin to be accurate, reliable and fraud-resistant are set out in the Directives for the promotion of the use of energy from renewable sources[4] and the promotion of cogeneration[5]. The requirement for disclosure information to be reliable is set out in the Directive on the internal electricity market[6]. The following section outlines the relevant content of the directives.

### *Guarantees of origin*

To ensure that the origin of electricity produced from renewable energy sources the reporting of Member States shall be objective, transparent and non-discriminatory. A guarantee of origin is issued in response to a request from a producer of electricity from renewable sources. In addition 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. Such an arrangement may be made subject to a minimum capacity limit. A guarantee of origin shall be of the standard size of 1 MWh. Member States shall ensure that the same unit of energy from renewable sources is taken into account only once.

A guarantee of origin can be transferred, independently of the energy to which it relates, from one holder to another. Yet, any use of a guarantee of origin shall take place within 12 months of production of the corresponding energy unit. A guarantee of origin is cancelled once it has been used[7]. Energy from renewable sources in relation to which the accompanying guarantee of origin has been sold separately by the producer should not be disclosed or sold to the final customer as energy from renewable sources.

---

[2] http://www.naturskyddsforeningen.se/bra-miljoval/el/jamforelser/elcertifikat/

[3] Thor Heiberg, Ann Christine Austang, Statnett, Interview

[4] EU Directive 2009/28/EC, and previously by the 2001/77/EC

[5] EU Directive 2004/8/EC

[6] EU Directive 2009/72/EC, and previously by the Directive 2003/54/EC. RE-DISS Best Practice recommendations, December 2010

[7] The amount of energy from renewable sources corresponding to guarantees of origin transferred by an electricity supplier to a third party shall be deducted from the share of energy from renewable sources in its energy mix.

Member States or designated competent bodies shall supervise the issuance, transfer and cancellation of guarantees of origin. The designated competent bodies have non-overlapping geographical responsibilities, and are independent of production, trade and supply activities. Responsible parties shall put in place appropriate mechanisms to ensure that guarantees of origin shall be issued, transferred and cancelled electronically and are accurate, reliable and fraud-resistant. The issuing body is always responsible for the guarantee of origin registry, but does not necessarily need to operate it himself.

A guarantee of origin shall specify at least a) the energy source from which the energy was produced and the start and end dates of production, b) whether it relates to electricity, heating or cooling, c) the identity, location, type and capacity of the installation where the energy was produced, d) whether and to what extent the installation has benefited from any kind of subsidy or support scheme, whether and to what extent the unit of energy has benefited in any other way from a national support scheme, and the type of support scheme, e) the date on which the installation became operational, and f) the date and country of issue and a unique identification number.

Member States shall recognize guarantees of origin issued by other Member States. A Member State may refuse to recognize a guarantee of origin only when it has well-founded doubts about its accuracy, reliability or veracity. The Member State shall notify the Commission of such a refusal and its justification. If the Commission finds that a refusal to recognize a guarantee of origin is unfounded, the Commission may adopt a decision requiring the Member State in question to recognize it[8].

Where energy suppliers market energy from renewable sources to consumers with a reference to environmental or other benefits of energy from renewable sources, Member States may require those energy suppliers to make available, in summary form, information on the amount or share of energy from renewable sources that comes from installations or increased capacity that became operational after 25 June 2009[9].

### *EU Directive for disclosure[10]*

Member States shall ensure that electricity suppliers specify in or with the bills and in promotional materials made available to final customers: (a) the contribution of each energy source to the overall fuel mix of the supplier over the preceding year in a comprehensible and, at a national level, clearly comparable manner; (b) at least the reference to existing reference sources, such as web pages, where information on the environmental impact, in terms of at least CO2 emissions and the radioactive waste, resulting from the electricity produced by the overall fuel mix of the supplier over the preceding year is publicly available.

---

[8] Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources.

[9] In order to improve the quality of that information to consumers, in particular as regards the amount of energy from renewable sources produced by new installations, the Commission should assess the effectiveness of the measures taken by Member States.

[10] Directive 2009/72/EC

Regarding electricity obtained via an electricity exchange or imported from outside the Community, aggregate figures provided by the exchange or the undertaking in question over the preceding year may be used.

The regulatory authority or another competent national authority shall take the necessary steps to ensure that the information provided by suppliers to their customers is reliable and is provided, at a national level, in a clearly comparable manner.

## 2.2 Guarantee of origin system

The European Energy Certification System (EECS) is a harmonized system for trading energy certificates, which provides standards for the operation of public and commercial certificate systems. The EECS has been developed by the Association of Issuing Bodies (AIB), which is an association under Belgian law. The AIB promotes the use of a harmonized European system to ensure the reliable operation of international energy certificate systems. This system offers a set of agreed standards, known as the Principles and Rules of Operation (PRO) which ensures that the systems of its member organizations are compatible with each other.[11]

The certificate issuing activities of members of the AIB are regulated by means of the Principles and Rules of Operation ("the PRO") of the European Energy Certificate System (EECS) at an international level. The Domain Protocols set out how the EECS PRO has been implemented in a specific domain, which can be a region or a country[12]. An overview of the legal framework is provided in Figure 2.1 below. A revised EECS standard has been available from December 2010. It is fully in line with the 2009 RES Directive and can be used by all countries interested[13].

[11] Calculation of Residual Electricity Mixes when Accounting for the EECS (European Electricity Certificate System) — the Need for a Harmonised System, Hanne Lerche Raadal *, Cecilia Askham Nyland and Ole Jørgen Hanssen

[12] www.aib.net.org

[13] "Making Guarantees of Origin and Electricity Disclosure in Europe more reliable", DRAFT Minutes of the third Domain Workshop organised by the European Platform for Disclosure (EPED) and the project "Reliable Disclosure Systems for Europe (RE-DISS)" 11 October 2010, Brussels

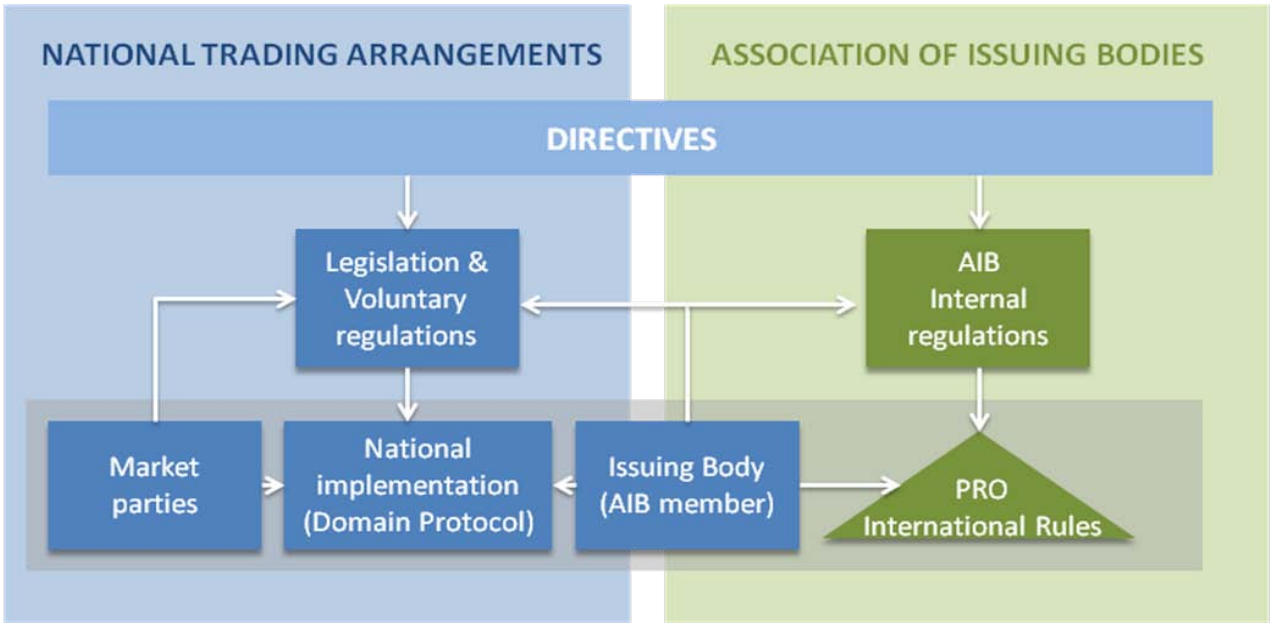


***Figure 2.1*** *European Energy Certification Structure (EECS) legal framework* [14]

The Association of Issuing Bodies (AIB) and the Renewable Energy Certficate System (RECS) have developed a standardized system for guarantees of origin: the European Energy Certificate System (EECS). EECS is based on harmonized structures and procedures, including a standard format for the interface between national registries, facilitating international trade in standardized guarantees of origin without the danger of double counting and double selling.

The AIB monitors the volumes of certificates issued and redeemed within EECS, as well as the certificates exported and imported within the system. Within EECS both guarantees of origin ('EECS GO') and RECS ('EECS RECS') certificates exist. Within the statistics of AIB / RECS International no exact distinction can be made between EECS guarantees of origin and EECS RECS certificates.

Most of the guarantees of origin registries are originally based on the RECS system as the RECS system predates the guarantee of origin system. In most cases the registries are combined and also serve the guarantees of origin system. Within the regulations of the AIB the guarantee of origin system and the RECS system exclude each other, so it is impossible for members of the AIB to issue double certificates. If the guarantee of origin is also eligible for the RECS system the guarantee of origin is ‘flagged’. This opens the possibility to transfer a guarantee of origin to a RECS system. Most registries publish statistics: total volumes of issued, transferred and cancelled certificates. The published statistics do not make individual trades visible for reasons of privacy of the market players.

[14] AIB

## 2.3 Tracking renewable production

### 2.3.1 Tracking and disclosure of renewable energy

The Electricity Market Directive 2009/72/EC[15] requires that suppliers of electricity disclose their electricity portfolio regarding energy source and environmental impacts. The objective is to provide consumers with relevant information about power generation and to allow informed consumers to choose suppliers not only based on electricity prices.

When a customer buys electricity without any specific requirements or "labelling", the delivered electricity will consist of a mix of electricity generated from several different energy sources. This electricity mix represents the "**residual mix**", or a typical consumption mix, for an average customer in the specified area. The disclosed indicators, which are the energy sources, emissions of CO2 and the production of radioactive waste, are often called **generated attributes** and they represent environmental information associated with the electricity generation processes.

National and international statistics for the electricity generation, which are compensated for import and export of physical electricity, create the basis for the residual-mix calculation. What complicates the calculation is the trading of guarantees of origin and other certificates for tracking electricity from renewable sources. Trade has increased rapidly over the last years. Complicating the matter further is the bilateral trade of contracts with environmental attributes. The import and export of the guarantees of origin as well as contract based transactions have to be taken into account when calculating the residual electricity mix.[16]

If for instance a net flow of guarantees of origin is exported or imported, it will impact the electricity mix in both the importing country where the guarantees of origin are cancelled and the exporting country. This means that the attributes for the amount of electricity that have been **traded explicitly** have to be excluded from the overall residual electricity mix calculation to avoid double counting of the attributes[17]. This also applies for contract based transactions.

### 2.3.2 Standardisation of practices on a European level

The work for the standardization of practices for the disclosure of the origin of electricity to end users takes place in two European initiatives[18].

1. Reliable Disclosure Systems for Europe (RE-DISS)
2. European Platform for Electricity Disclosure or EPED

[15] Which replaces 2003/54/EC, Article 3(6)

[16] RE-DISS Best Practices Recommendations

[17] The potential role of GO (Guarantees of Origin) in creating a consumer-based demand for renewable energy, Hanne Lerche Raadala, Ostfold Research

[18] Both based on the E-Track project, which ended in 2010

## *The Reliable Disclosure Systems for Europe (RE-DISS)*

The RE-DISS project is supported and financed by the European Union. It aims at improving significantly the reliability and accuracy of the information given to consumers of electricity in Europe regarding the origin of the electricity they are consuming. Such information is to be given to all consumers through the regime of electricity source disclosure, which is required for all European suppliers of electricity.

The background of the project is that there is a need to find common rules and practices for implementing guarantees of origin for electricity from renewable sources (RES) and from high-efficient cogeneration (CHP), as defined by European Directives. The project aims to support European countries in implementing the requirements set out in the new RES Directive 2009/28/EC as well as in the Cogeneration Directive and the Internal Energy Market Directive. The project supports a group of "Competent Bodies" which have been designated by major European countries and which are dedicated to improving the procedures and practices for issuing, trading and cancelling guarantees of origin and improving the reliability of electricity disclosure in their countries.

The RE-DISS project was launched in mid April 2010 and will terminate in October 2012. The project builds on the results and recommendations from the E-TRACK project (www.e-track-project.org), which has developed a standard for systems tracking electricity attributes in Europe for the purpose of disclosure[19].

The RE-DISS project will provide calculation results for the Residual Mixes of all European countries based on best available information for the years 2009, 2010 and 2011 in April/May of the following year. For later years, the EPED platform might take over this function.[20]

Further guidance for implementing guarantees of origin will be given in the future by a CEN standard on guarantees of origin for electricity. It is currently under development and it is expected to reflect the achievements of EECS.[21]

***European Platform for Electricity Disclosure - EPED***

EPED is a platform for competent bodies that is establishing a European standard for electricity disclosure. The core of the disclosure standard is the calculation of the residual mix for electricity. It has been seen that in order to eliminate double counting, the approaches should be coordinated across Europe. Double counting should be minimized in order to protect consumers against offers from suppliers based on false or misleading fuel mix calculations[22]. One goal of EPED is to create a common European Attribute Mix, based on the methodology developed in the E-TRACK and RE-DISS projects, allowing countries to transfer surpluses to the mix, and to cover shortages from the mix.

[19] www.reliable-disclosure.org, RE-DISS project,

[20] EPED/RE-DISS – Third Domain Workshop Notes – 11 Oct 2010

[21] RE-DISS Best Practice Recommendations

[22] EPED webb page

### 2.3.3 Description of the recommendations for disclosure by RE-DISS and EPED

The fundamental principle is that disclosure may only be based on information from guarantees of origin, reliable tracking systems, which need to meet certain criteria, and the residual mix.

In the EPED model there are basically two choices which can be made when choosing how to calculate the residual-mix used for disclosure for a domain. **The residual-mix can be calculated for a single domain or a region consisting of several domains**. A domain, usually a nation, can calculate a residual-mix on a national basis, exchanging attributes with the European attribute mix. The other option is creating a Region consisting of several domains or nations who agree to become one Region using a common residual-mix that exchanges attributes with The European Attribute Mix. In the second option, however, all nations forming a common Region will have to adopt common calculation methods and standards. This is to ensure the elimination of double counting of renewable attributes. One such region could for example be the Nordic area (former Nordel area), which already in many ways forms a common Nordic market and will possibly be further integrated in the future as a common Nordic retail market.

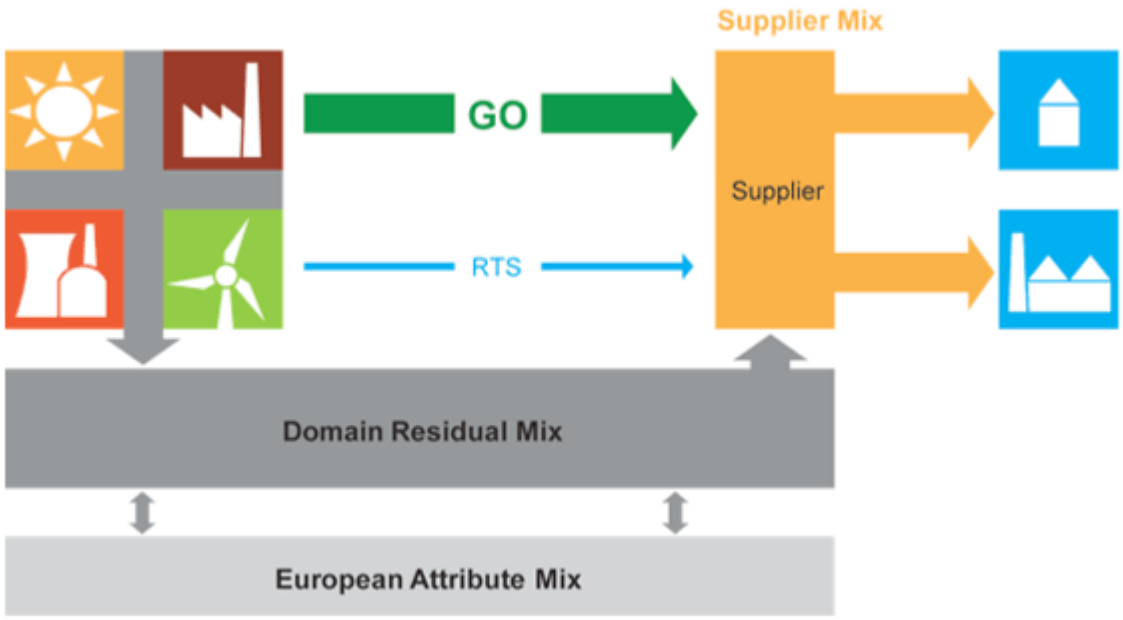


***Figure 2.1*** *Illustration of the principles for disclosure of the origin of electricity.*[23]

#### *Domain residual-mix calculation principles*

The calculation principles for residual-mix for disclosure for **one domain** or geographical area are described as follows:

- **Step 1:** Preliminary residual mix in a Domain
- **Step 2:** Determination of Attribute Surplus / Deficit

[23] RE-DISS webb pages

- **Step 3:** Exchange with the European Attribute Mix
- **Step 4:** Final residual mix for the Domain

Starting Point: Net Generation Statistics in a Domain (geographic region)
(excluding pumped hydro)

**Corrections:**

- Add attributes of GO which have been imported
- Subtract attributes of cancelled GO
- Subtract attributes of exported GO
- Subtract attributes already allocated by other reliable tracking mechanisms (RTS)

**Result:** Preliminary Residual Mix in the Domain

The implementation follows an approach where the calculations are improved step by step. Data quality is in general improved and contract-based tracking is improved as it becomes available.

**Regional residual-mix calculation principles**

In the following the calculation principles for the residual mix for a **region** are described:

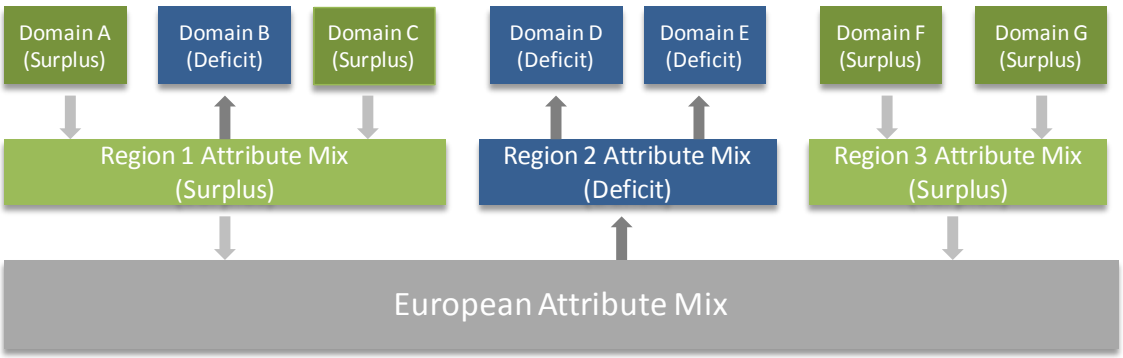


***Figure 2.2*** *Overview of the principles for determining regional residual-mixes for the disclosure of the origin of electricity to end users.*

The attributes of domains included within a Region are first balanced using a regional attribute mix. Then the regional attribute mixes are balanced using the common European attribute mix. The regional residual-mix can then be calculated and the result can then be used for disclosure to end customers in each domain included within the region.

Different practices for calculating the disclosure are at present in place in different European countries. This has led to double counting of renewable attributes. Double counting is seen as undermining the transparency of the market and as detrimental to the development of a reliable market for guarantees of origin. The new directive makes it possible to disqualify guarantees of origin of one

country if there is proof of double counting.[24] Figure 2.3 illustrates why the disclosure issue is important in general and for the Nordic area. It also shows the difference in the volumes for physical export and export of guarantees of origin.[25]


***Figure 2.3*** *Physical export and export of guarantees of origin from the Nordic area for 2009.*[26]

### 2.3.4 Future development and scope of the guarantees of origin system

In time the goal is that guarantees of origin should be used as the only tracking mechanism for renewable energy in Europe. In practice this means that a natural development will be that in time guarantees of origins will replace the current RECS system and other reliable tracking systems used in Europe, leading to a more harmonized system.

One view of the future is also that guarantees of origin should be regarded as the building block for all labels in the Member States, including NGO eco-labels. While guarantees of origin are facilitating the accounting of energy volumes from generation to consumption, eco-labels create added value to the consumer by using the information contained on the guarantee of origin for the respective environmental claims.

If this development becomes a reality, as a first prerequisite, all Member States would have to implement electronic guarantees of origin systems which are interconnected at the EU level. This would take a few years, since there are currently many differences between the countries. Secondly, all green power labels would have to be convinced to facilitate their information through the guarantee of origin system. This would most likely take several years, as the label organizations would need to be convinced to accept the practices one by one[27].

[24] RE-DISS Best Practice Recommendations

[25] RE-DISS, EPED, The EPED platform and the RE-DISS project, Dubrovnik, 1 October 2010

[26] RE-DISS project

[27] "Making Guarantees of Origin and Electricity Disclosure in Europe

# 3 Guarantees of origin in the Nordic countries

## 3.1 Nordic electricity markets

Nordic countries enjoy a relatively high proportion of renewable electricity generation from the total electricity consumption. Together Denmark, Finland, Norway and Sweden have formed a common liberated power market that has its roots in the 1990s. The distribution of electricity generation and consumption flows for the Nordic countries for 2009 is illustrated in Table 3.1 below.

***Table 3.1.*** *Generation, import and export in the Nordic countries for 2009.*

| Production and Foreign Trade of Electricity, 2009 | Finland | Sweden | Denmark | Norway | Iceland | |
|---|---|---|---|---|---|---|
| Hydro | 12,6 | 65,2 | 0,0 | 127,1 | 12,2 | TWh |
| Wind / Geothermal/ Solar /Other | 0,3 | 2,5 | 6,7 | 1,0 | 4,4 | TWh |
| Nuclear | 22,6 | 50,0 | 0,0 | 0,0 | 0,0 | TWh |
| Thermal (CHP) | 24,8 | 15,2 | 27,6 | 4,7 | 0,0 | TWh |
| Thermal (Separate) | 9,0 | 0,7 | | | | TWh |
| Import | 15,5 | 13,8 | 11,3 | 5,7 | 0,0 | TWh |
| Export | 3,4 | 9,1 | 10,9 | 14,6 | 0,0 | TWh |
| **Gross production** | **69,2** | **133,6** | **34,3** | **132,8** | **16,6** | **TWh** |
| **Gross consumption** | **81,3** | **138,3** | **34,6** | **123,8** | **16,6** | **TWh** |

The Nordic countries and especially Norway are major players on the market for guarantees of origin for electricity produced from renewable sources. In Europe a total of 217 Million 1 MWh certificates were issued in 2009 of which about 150 Million were cancelled or used. A share of 80 % to 90 % of EECS certificates came from Scandinavian hydro sources in 2008 and 2009. During 2010, this region again issued the majority of EECS certificates.

Figure 3.1 below illustrates the source of the guarantees of origin and where they are used. These charts clearly show the large role that the Nordic region had in this market in 2009. They also demonstrate where certificates come from and where they eventually end up. They originate mostly in the Nordic region and end up in the Netherlands, Belgium, Germany, France and Italy[28]. So far it can be stated that there has, at least for 2009, been an oversupply of issued guarantees of origin compared to the market demand.

more reliable", DRAFT Minutes of the third Domain Workshop organised by the European Platform for Disclosure (EPED) and the project "Reliable Disclosure Systems for Europe (RE-DISS)" 11 October 2010, Brussels

[28] AIB Newsletter 11, 2010

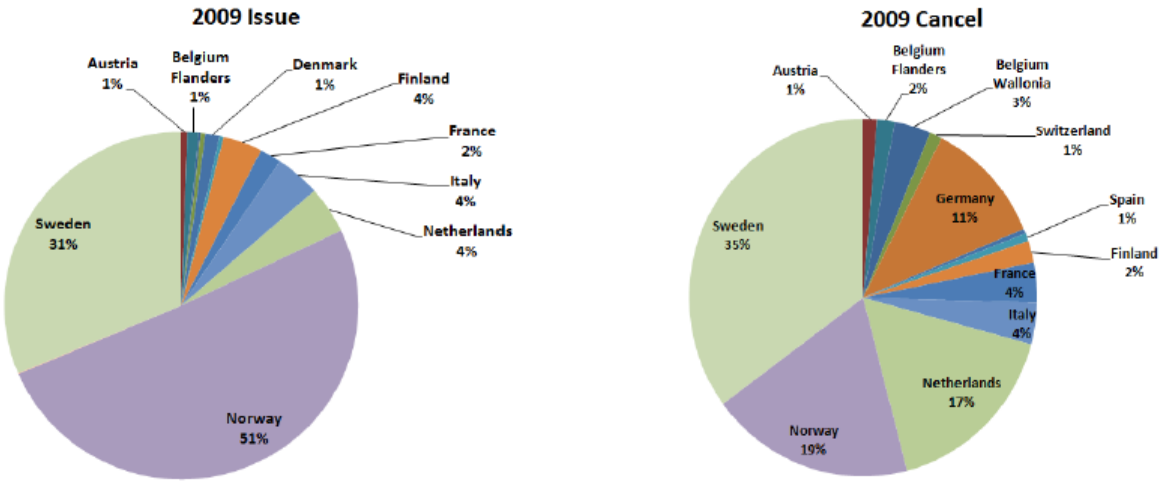


***Figure 3.1.*** *Issued and cancelled guarantees of origin by country for 2009.*[29]

The Nordic countries have been at the forefront of the trade in guarantees of origin. Practices developed and to be adopted in this region in the future have a potential to affect development on the wider European level as well.

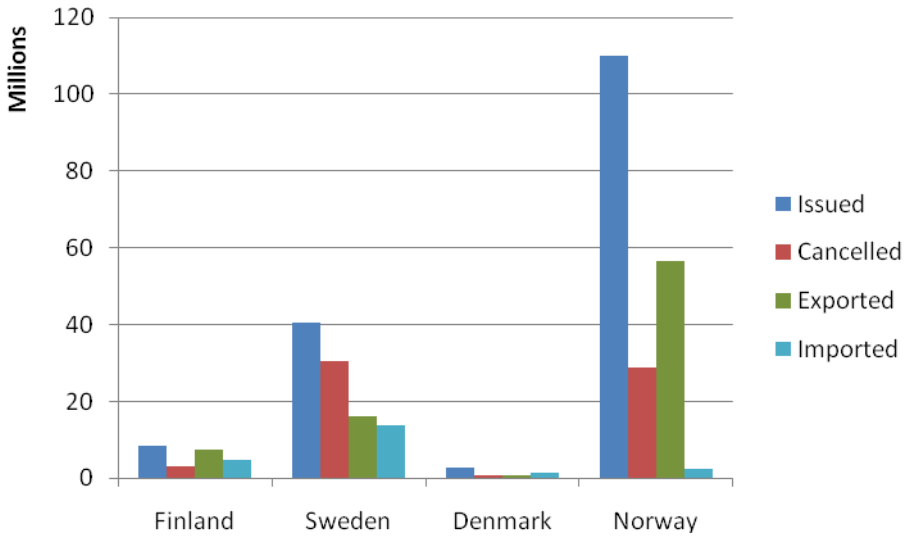


***Figure 3.2.*** *Issued, cancelled, exported and imported guarantees of origin in the Nordic countries.*[30]

Figure 3.2 above illustrates the number of issued, cancelled, exported and imported guarantees of origin for renewable energy in the Nordic countries. In addition to this, guarantees of origin have in Sweden been issued and cancelled for nuclear energy. 27 Million certificates for nuclear energy were

[29] AIB Newsletter 2010

[30] AIB statistics for 2009

issued and approximately 22 Million were cancelled in Sweden in 2009.[31] The tables in Appendix 3 illustrate the difference between supply and demand of guarantees of origin in the different Nordic countries by production source in detail.

## 3.2 Denmark

### 3.2.1 Description of the guarantee of origin system

The RES-E guarantee of origin scheme has been operational since 2004. All Danish EECS certificates for renewable electricity are both guarantees of origin and RECS certificates.

Energinet.dk is responsible for the authorization of certificates and issuing of certificates. Energinet.dk also represents Denmark in AIB and is responsible for developing the Domain Protocol for Denmark. In the registration process of the production facilities the production sites are independently verified by local distribution grid companies[32].[33]

Issuing and transfer of certificates is possible through electronic accounts. Transfer of certificates is possible within Denmark and with cross-border transactions under EECS rules. The database for certificates is accessed on internet[34]. The same database is used by Norway, Finland, Germany, Luxembourg and Sweden, and it is operated by Grexel Solutions Ltd[35]. The guarantees of origin from RES-E can only be issued electronically. Guarantees of origin from cogeneration (not necessarily RES-E) can be issued electronically and on hard copies with a hologram.

Denmark has had separate schemes for guarantees of origin for renewable electricity based on EECS and for CHP guarantees of origin. Although the relative share of CHP production in Denmark is high, only the guarantees of origin for renewable electricity were in use in 2009.[36] Energinet.dk is the issuing body also for CHP guarantees of origin and the certificates are freely transferrable as are those of guarantee of origin for electricity. Energinet.dk has in 2010 developed a EECS domain protocol for cogeneration guarantees of origin. [37]

Only one certificate can be issued for the same amount of electricity, so the same plant can use only guarantees of origin for electricity or CHP guarantees of origin but not both of them[38]. CHP guarantees of origin have so far not been issued as there is no market demand for them[39].

---

[31] AIB statistics for 2009

[32] The distribution grid companies can be found with a GIS solution at the website www.ens.dk

[33] EECS GoO RES-E Domain Protocol for Denmark

[34] http://cmo.grexel.com/

[35] http://cmo.grexel.com/Lists/PublicPages/Info.aspx

[36] The CHP guarantees of origin became operational in 2007 with the Executive Order on guarantees of origin for high efficient CHP electricity called Bekendtgørelse om oprindelsesgaranti for elektricitet fra højeffektiv kraftvarmeproduktion (16 February 2007).

[37] AIB Newsletter 12, 2010

[38] The state of implementation of electricity disclosure and Guarantees of Origin across Europe Annex I - Country Monitoring Reports

[39] Interview, Energistyrelsen

The regulatory authority, Energistyrelsen, approves the guidelines used for the handling of guarantees of origin. Handling of the guarantees of origin is performed by Energinet.dk and the same applies for monitoring the system.[40]

### 3.2.2 Disclosure of the origin of electricity

Regarding disclosure of the origin of electricity for Denmark in 2009, general **electricity labels** were prepared by Energinet.dk separately for Eastern and Western Denmark. These are not residual-mix calculations as specified in the EU Directive. The electricity labels are based on the fuel mixes used in Eastern and Western Denmark. The fuel-mixes are corrected for distribution losses (grid) and net imports from neighbouring countries.[41]

The general declaration of the origin of electricity used for disclosure of the origin of electricity has not been corrected for sales of renewable electricity and issued, transferred and cancelled guarantees of origin. Therefore with these principles of calculation it can include an element of double counting of renewable attributes. The same renewable energy can thus be sold several times. The new directive requires the elimination of double counting and the use of a residual-mix as a base for the disclosure of non labeled electricity to end-users.

Denmark has separate electricity labels for Eastern and Western Denmark. This practice will however soon be changed. The Great Belt cable connecting the areas has been taken into use in 2010.

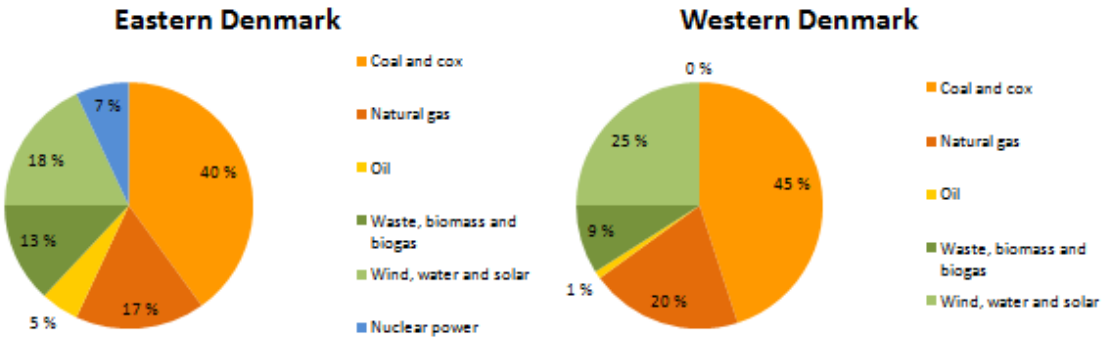


***Figure 3.3**. Electricity labels which are based on fuel-mixes for Eastern and Western Denmark for 2009 with a division into renewable, fossil and nuclear power.42*

Figure 3.3 above illustrates the current Danish disclosure. In the RE-DISS project residual mix calculations were made for Denmark on a national level. The calculations were made according to EPED standards. In these calculations the trade in guarantees of origin was taken into account, as was import and export of energy. The European Attribute Mix was used for deficit/surplus calculation. The results of the calculations are illustrated in Figure 3.4. When the Danish labels in Figure 3.3 are

[40] Energistyrelsen

[41] Miljörapport 2010

[42] Renewable energy includes energy production from waste incineration, which in some cases may not be classified as totally renewable. Data source: Miljörapport 2010.

compared with the EPED standard calculations for residual-mix we can see that there is not a dramatic difference in the outcome for 2009. The reason for this is the relatively minor trade in guarantees of origin for 2009. The share of consumption covered by the residual mix was 97 % for 2009.[43]

Only taking into account physical import and export, as is done in the label calculations, doesn't as yet produce a major discrepancy in the disclosure to end-users regarding the proportion of renewable energy. Increased trade in and use of guarantees of origin can however change this, which means that an adoption of the new EPED standards and recommended methods of calculation is called for.

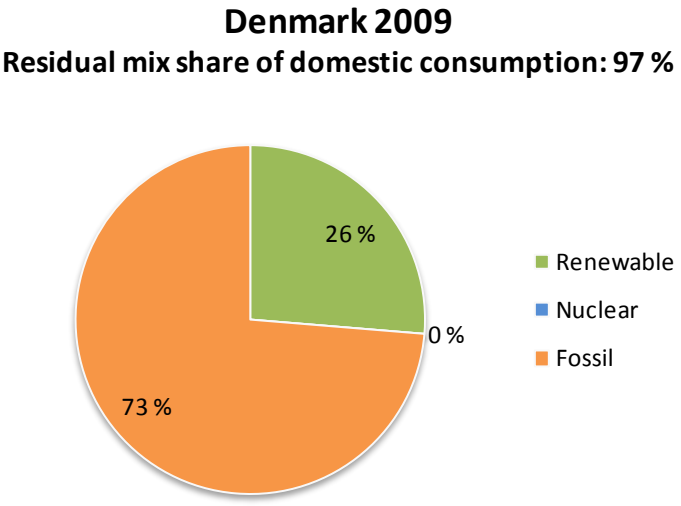


***Figure 3.4.*** *Electricity disclosure for Denmark calculated in the RE-DISS project according to EPED standard for 2009.*

The residual-mix calculation for disclosure for the year 2010 will be done according to the EPED recommendations. It will be declared in the environmental report of 2011. The amount of electricity sold as individual declared electricity products will be taken into account in future calculations. Denmark will base its calculations on a national residual-mix as long as there is no agreement on a Nordic level to base disclosure on a Nordic residual-mix.

One question, which was raised in some interviews, was that if and when there is a common Nordic end-user market, the use of a Nordic residual-mix for disclosure purposes could be a logical and a functioning solution. While awaiting future agreement on the subject, the disclosure for both 2010 and 2011 will be based on a national level residual-mix. The most important thing for the time being is seen to be harmonized and transparent practices to eliminate double counting. If the agreed solution is based on a national level or Nordic level residual mix, calculation isn't seen as the biggest issue. Transparency, reliability and continuity of the chosen solution, whatever it is, is seen as key[44].

[43] RE-DISS project

[44] Mads Lyngby Petersen, Louise Rönne Christensen, Interview, Energinet.dk

### 3.2.3 Legislation

The terms for the Danish EECS guarantee of origin RES-E system were originally given in the Executive Order no. 1 of January 6th 2004 "Bekendtgørelse om oprindelsesgaranti for VE-elektricitet" 1, pursuant to the Electricity Act. Supportive terms are presented in the EECS GO RES-E Domain Protocol for Denmark.[45]

The Directive of 2009 has been incorporated into Danish legislation. Legislation was enacted on 5th of December 2010 as Danish Secondary legislation.[46]

## 3.3 Finland

### 3.3.1 Description of the guarantee of origin system in Finland

The Finnish guarantee of origin system for electricity covers production based on renewable energy sources. The system has been fully operational since 2004 and is in practice based on EECS electronic certificates. It is also possible for producers to choose a paper form guarantee of origin (but not both). Guarantees of origin can also be issued to efficiently produced electricity from CHP plants. These are however so far tradable within Finland only and none have been issued yet.[47]

The competent body according to the primary law is the transmission system operator, Fingrid and the monitoring authority overseeing compliance with the legislation is the Energy Market Authority (EMV). EMV also approves assessment bodies that can carry out verification of the guarantees of origin. The Finnish electricity transmission system operator (TSO) Fingrid is legally responsible for issuing the guarantees of origin for the production of renewable energy[48]. In practice, however, issuance and approval of production devices has been outsourced and the Issuing Body for EECS certificates is in practical terms Grexel, a private service provider. Maintaining the guarantees of origin registry and the registry of qualifying production devices has been outsourced to Grexel [49]. Grexel has been the Central Monitoring Office (CMO) for Finland since 2006 and also represents Finland in AIB and is responsible for creating and updating the Domain Protocol for Finland.[50]

The Finnish guarantee of origin system is outlined in Figure 3.5.

[45] EECS GoO RES-E Domain Protocol for Denmark

[46] Interview , Energistyrelsen

[47] RE-DISS, Country report Finland, 2011

[48] Act on Notification and Verification of Origin of Electricity (1129/2003).

[49] Fingrid, web-pages. www.fingrid.fi.

[50] Guarantee of Origin RES-E and RECS Domain Protocol for Sweden

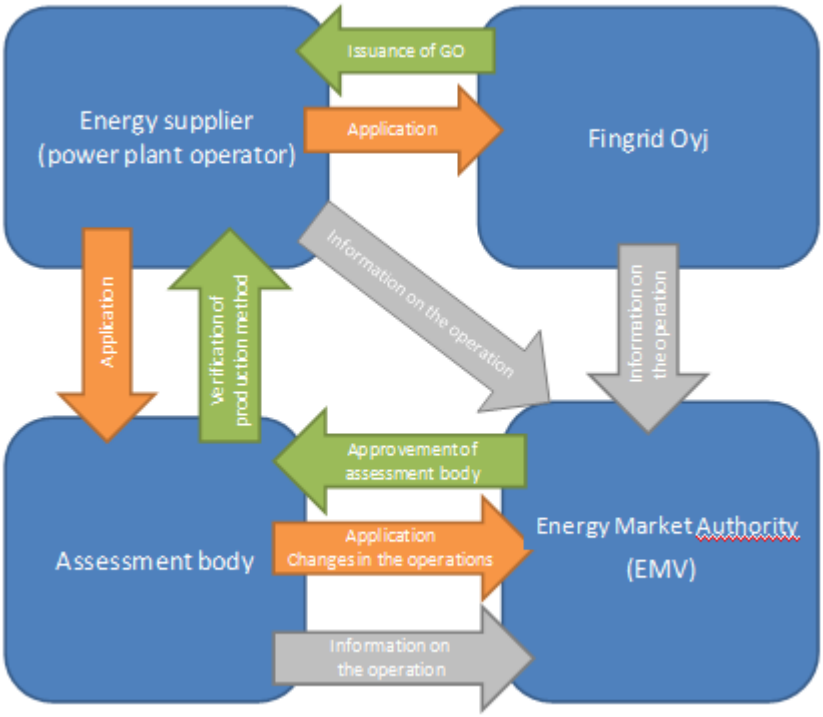


***Figure 3.5.*** *Simplification of the guarantee of origin system in Finland*[51].

Issuing the guarantee of origin requires that the following requirements are met:

1. An assessment body has verified the power plant
2. There is a service agreement with Fingrid
3. The production information is delivered to Fingrid

An assessment body in turn must meet the following requirements:

- The body is operationally and economically independent of parties that hold a direct or an indirect interest in a case
- The personnel of the body possesses good technical and vocational education and sufficiently large-scoped experience in the tasks initiating into the operations
- The body applies a reliable method for ensuring the conformity of the origin of electricity, and appropriate guidelines for the operations and their monitoring.

### 3.3.2 Disclosure of the origin of electricity

Electricity suppliers in Finland are required to disclose the origin of the electricity they are selling. Disclosure is done in connection with electricity bills or in their appendices and in sales promotion material directed to electricity users. The information needs to contain proportions of the energy sources used for generating the electricity sold. Sources are divided into renewable, fossil (including

[51] The Energy Market Authority, web-pages. www.energiamarkkinavirasto.fi.

peat) and nuclear production. There also needs to be a reference to public sources of information on the carbon dioxide emissions and radioactive waste.

The formal monitoring authority for electricity disclosure is the Finnish Energy Market Authority (EMV). Finnish Energy Industries, the branch organization for the industry, has however in the absence of formal guidelines for disclosure given recommendations for how to disclose the origin of electricity. They have also commissioned the calculations for residual-mix, which are used for disclosure purposes. The current guidelines, issued by the Finnish Energy Industries, recommend disclosure according to EPED standards using a Nordic residual-mix. The Nordic residual mix is illustrated in Figure 3.6 on the right. The residual mix share of domestic consumption was 95% for 2009.[52]

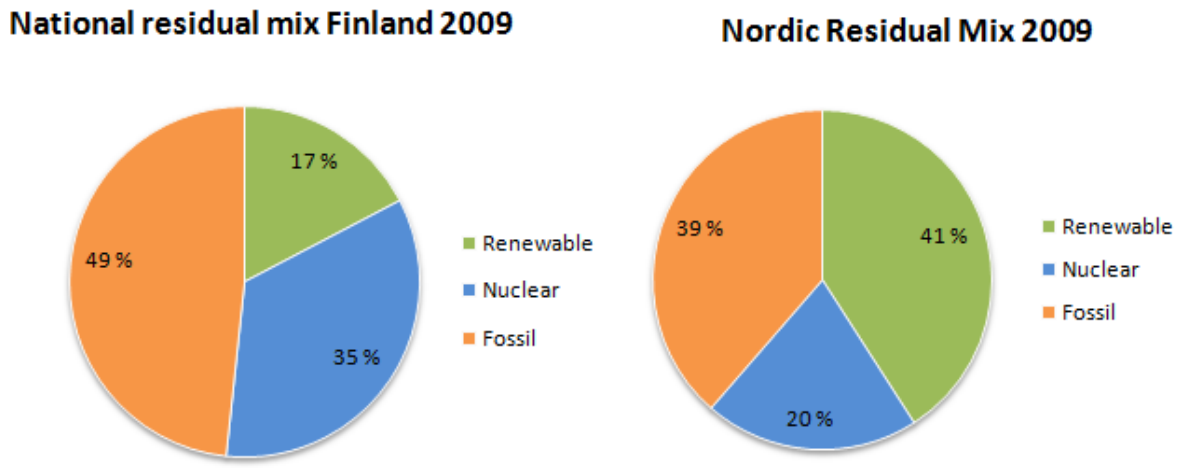


***Figure 3.6.*** *Electricity disclosure for Finland for 2009 based on a Nordic residual mix calculated according to EPED standards (right).[53] The electricity disclosure for Finland on a national level calculated according to EPED standards (left).[54]*

If the disclosure is calculated according to EPED standards on a national level, a residual mix illustrated on the left in Figure 3.6 will be the result. The residual mix would include a reduced amount of renewable production based electricity when compared with the current disclosure, which is based on the Nordic residual mix.

The Finnish Ministry of Employment and the Economy is considering adopting a calculation of the residual-mix for disclosure to end-users according to RE-DISS project best practices recommendations and EPED standards. It is at the moment when this report is written possible that the disclosure calculations for 2011, which would be ready in 2012, could be based on national level calculations instead of on Nordic level calculations. The reason behind this is the current problem with double counting. Present practices, where different Nordic countries haven't yet been able to agree on common practices, can lead to double counting.[55] An adoption of the Nordic residual-mix as a long

[52] AIB newsletter

[53] Energy Industries recommendation for disclosure

[54] RE-DISS project

[55] Markku Kinnunen, TEM

term common solution, would require that the Nordic countries agree on a common solution with harmonized practices. Common practices adopted by Nordic countries[56] would eliminate the risk for double counting.

### 3.3.3 Legislation

The guarantee of origin system in Finland according to the directive 2001/77/EC is set forth by primary law "Act on Verification and Notification of Origin of Electricity"[57]and in secondary legislation by the government decree "Government Decree on Verification of Origin of Electricity"[58]. There is also a change decree[59] to enable cogeneration guarantees of origin. The original regulation entered into force 1 January 2004 and the updated decree on 1 March 2010.[60] The disclosure regulations are implemented by the same law with a government decree[61] on 1 July 2005[62].

The EU directive from 2009 has not yet been applied in Finland and the legislation is in the beginning of 2011 in its drafting phase. The new EU directive will most likely be incorporated into Finnish legislation during late 2011.

The general idea of the legislation, which is being drafted in Finland, is that the guarantee of origin system will be the only accepted system to prove that electricity has been produced from renewable resources. Implementing this system will in all likelihood require a transitional period which makes it possible for the suppliers as well as end-users to adapt to these changes. Heating and cooling are planned to be left out of the guarantees of origin system. Possible support systems for renewable energy will not be incorporated in the legislation for guarantees of origin.

At the beginning of 2011, there are still some issues open in the preparation of the legislation. The question of monitoring body, i.e. who should monitor the issuing, transferring and cancelling of guarantees of origin, is open.[63] One technical question under evaluation relates to how to in practice resolve the requirement that the guarantees of origin be cancelled within 12 months of production. Another question is the matter of resolving disclosure as described in Chapter 3.3.2.

[56] Iceland can be excluded, because it is geographically isolated area.

[57] 1129/2003

[58] 1357/2003

[59] 97/2010

[60] RE-DISS, Country profile for Finland, 2011

[61] 233/2005

[62] RE-DISS, Country profile for Finland

[63] Markku Kinnunen, TEM

## 3.4 Norway

### 3.4.1 Description of the guarantee of origin system

Norges Vassdrags og Energiverk (NVE) is the regulatory authority for the guarantee of origin system in Norway. NVE approves the production facilities that are included in the system.[64] The Norwegian Transmission System Operator, Statnett, is responsible for issuing guarantees of origin to electricity producers. Statnett is also responsible for creating and updating the Domain Protocol for Norway and participates in the Association of Issuing Bodies (AIB) in Europe[65].

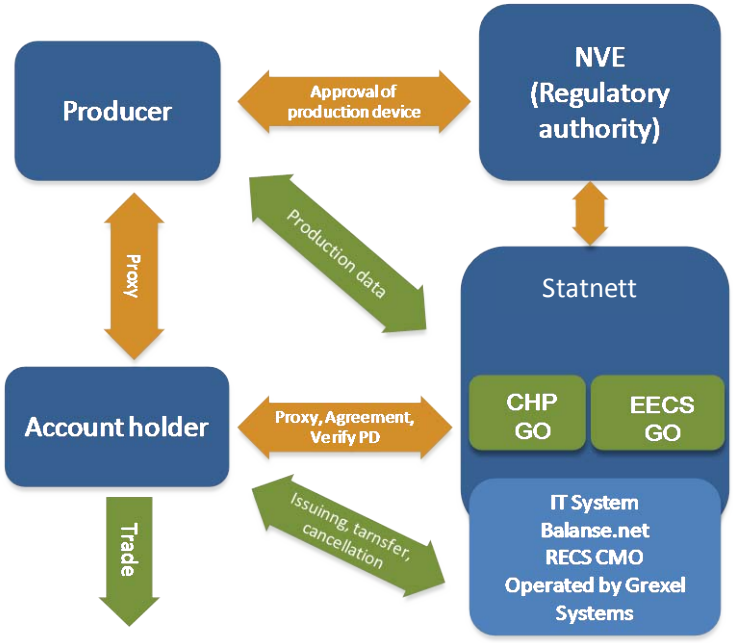


***Figure 3.7.*** *Simplified outline of the Norwegian guarantee of origin system.*[66]

RECS certificates and guarantees of origin are the only electricity certificates that can be officially traded in Norway. Only combined guarantees of origin and RECS certificates are issued for the same volume of energy generated, and the certificates/guarantees can only be used together. Therefore all certificates are both guarantees of origin and RECS[67]. All guarantees of origin are freely transferable within Norway and with cross-border transactions under EECS rules[68]. The certificate transfers can be done electronically through internet based accounts[69].

---

[64] Tor Heiberg, Statnett, Kristin Kolseth, NVE

[65] Statnett webbsite

[66] The outline is based on illustration from NVE. Note: Production data is received via the distribution companies.

[67] http://www.alpiq.no/en/what-we-offer/energy/energy-supply-electricity-sales/green-energy-supply/green-energy-supply.jsp

[68] The state of implementation of electricity disclosure and Guarantees of Origin across Europe Annex I - Country Monitoring Reports

[69] www.recscmo.org, GoO RES-E and RECS Domain Protocol for Norway

RECS CMO is the certificate system used and it administers and maintains the database of qualifying production devices and guarantees of origin certificates for Norway[70]. RECS CMO is operated by Grexel Systems Ltd.

CHP production is not a major source of electricity in Norway. However, general CHP regulation for guarantees of origin is in place in the national regulation for guarantees of origin for electricity.[71] In practice the CHP guarantees of origin scheme is not in use and may not be established at all[72].

### 3.4.2 Disclosure of the origin of electricity

About 96% of all power production in Norway consists of hydropower. Today guarantees of origin are used for both domestic disclosure and for exports in large volumes. Because of the fact that a large part of the renewable attributes are sold, the Norwegian residual-mix has become less renewable. Norway exported a net amount of 57 TWh of guarantees of origin in 2009 (imports 2 TWh, exports 58,9 TWh) to Germany 19,4 TWh, Sweden 17 TWh, Belgium 6,1 TWh and Netherlands 5,5 TWh. Norwegian power producers earned some 60 million euros by exporting guarantees of origin[73].

NVE is the regulatory body that is responsible for disclosure and for the residual-mix calculations for Norway[74]. The domestic disclosure, which is illustrated in Figure 3.8, includes at present mainly hydropower, wind, thermal, gas and unknown sources. In the fuel mix, which is based on national production, the share of exported and cancelled guarantees of origin is replaced by "unknown origin". As a reason for this practice is given that the guarantees of origin are not always cancelled in the country registered as recipient. Therefore the origin of the replacing electricity is defined as unknown.[75] At the moment it is stated by NVE that electricity of unknown origin could be considered as being based on a European electricity mix and that $CO_2$ emissions are also based on the European electricity mix. However the total $CO_2$ emissions have not yet been calculated.[76] For 2009 the disclosure does not yet include information on environmental indicators and the inclusion of $CO_2$ emissions is anticipated for the future[77].

[70] GoO RES-E and RECS Domain Protocol for Norway

[71] "Forskrift om opprinnelsesgarantier for produksjon av elektrisk energi" (FOR 2007-12-14 nr 1652)

[72] The state of implementation of electricity disclosure and Guarantees of Origin across Europe

[73] RECS, Newsletter 18. November 2010

[74] Tor Heiberg, Statnett, Kristin Kolseth, NVE

[75] Power point presentation by Kristin Kolseth, NVE

[76] Kristin Kolseth, NVE

[77] The state of implementation of electricity disclosure and Guarantees of Origin across Europe Annex I - Country Monitoring Reports

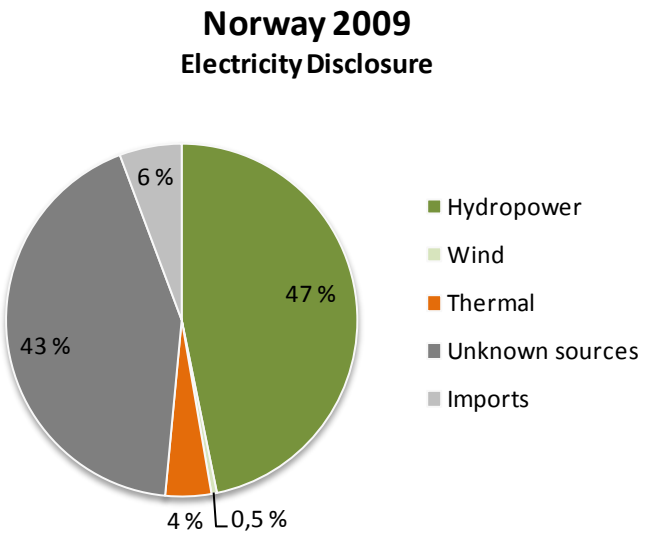


***Figure 3.8.*** *Consumption by energy sources and gross imports for 2009. Disclosure of Norwegian electricity to consumers, who are not buying energy backed by cancelled guarantees of origin.*[78]

When the unknown share in the Norwegian disclosure is compensated using the European Attribute Mix, it can be presented with a division into renewable, nuclear and fossil energy sources. The Norwegian disclosure for 2009 has been calculated using the European Attribute Mix in the RE-DISS project. The results are presented in Figure 3.9. The disclosure figures show that domestic residual mix has become increasingly based on nuclear and fossil production and as a result the Norwegian power balance becomes more like the European. [79] In fact over 50 % of the Norwegian consumption, which is not backed by cancelled guarantees of origin, is based on power from fossil fuels or nuclear power.

For 2010 reliable figures do not exist as of writing of this report, but the share of fossil and nuclear energy in the residual mix is anticipated to further rise as the trade in guarantees of origin has increased to over 100 million issued 1 MWh certificates and exports of guarantees of origin has grown to 80 TWh.[80]

[78] Data source NVE

[79] RECS, Newsletter 18. November 2010

[80] www.grexel.com

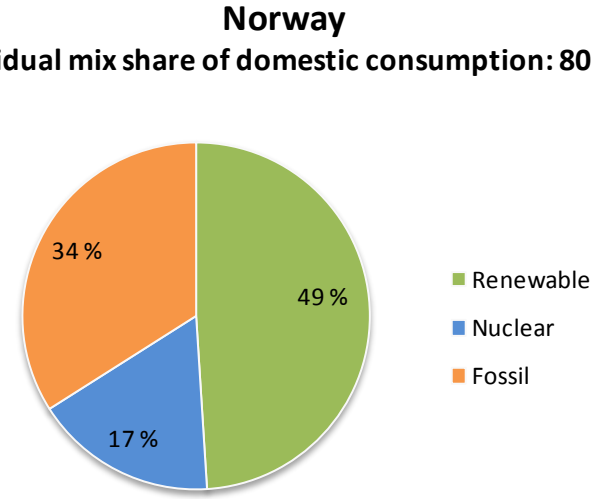


***Figure 3.9.*** *Norwegian national residual-mix calculated according to EPED standards for 2009.*

The regulatory authority in Norway (NVE) sees that some harmonizing of procedures and calculations will be necessary in the future. The adoption of the RE-DISS project recommendations, which means using the EPED standard, will be considered as soon as other countries are following them and the calculations can be considered reliable. One aspect of reliability, which needs further study according to NVE, is the question of how contract based tracking is to be taken into account in the system in a reasonably reliable way.[81]

### 3.4.3 Implementation of relevant EU legislation and future development

Directive 2001/77/EC (RES - Directive) has been valid in Norway since 1 September 2006. Issuing of EECS – guarantees of origin takes place for generation from this date onwards. The legal basis for the guarantees of origin in Norway is the Norwegian Energy Act "Endringer i Energiloven"[82] and the national regulation for Guarantees of Origin from electricity "Forskrift om opprinnelsegarantier for produksjon av elektrisk energi"[83].[84]

The EU directive 2009/28/EC (RES - Directive) will also be implemented in Norway. It is likely that the directive will be implemented in Norway during 2011, because this is a prerequisite for the implementation of the joint Elcert system (green certificate system) decided between Sweden and Norway.[85] The joint Elcert system is planned to start from the beginning of 2012. Norway is in the process of negotiatiating the levels of renewable consumption required by the RES- Directive with EU.

---

[81] Kristin Kolseth, NVE

[82] LOV 1990-06-29 nr 50

[83] FOR 2007-12-14 nr 1652

[84] The state of implementation of electricity disclosure and Guarantees of Origin across Europe Annex I - Country Monitoring Reports

[85] Om en gemensam Svensk-Norsk elcertifikatmarknad, Stockholm 8. December 2010, Protokoll från arbetet mellan september 2009 och december 2010

## 3.5 Sweden

### 3.5.1 Description of the guarantee of origin system

There are two parallel guarantees of origin systems for renewable energy in Sweden. The **national guarantee of origin system** is controlled and monitored by the Swedish Energy Agency, Energimyndigheten. The electricity generator needs to apply for the national guarantee of origin from Energimyndigheten. When the application is approved, guarantees of origin are issued by the Swedish Transmission System Operator, Svenska Kraftnät.[86]

Practically all renewable electricity guarantees of origin in Sweden are also currently issued and traded within the EECS framework.[87] The issuing body for EECS certificates is Grexel, a private company acting together with the account keeping authority Svenska Kraftnät. Grexel has been the Central Monitoring Office (CMO) of EECS guarantees of origin for Sweden since 2006 and also represents Sweden in AIB. Grexel administers and maintains the database qualifying production devices and guarantees of origin in Sweden[88].

Grexel uses the national guarantees of origin to issue EECS certificates according to terms in an agreement with Svenska Kraftnät. In this process, the original national guarantees of origin cease to exist and EECS certificates with identical data are created. The national guarantees of origin are embedded in the EECS certificates and cannot be transferred, cancelled or used in any way separately[89]. This means in practice that double counting is eliminated even though parallel certificate systems are used.

The current domain protocol does cover renewable guarantees of origin for large hydro and disclosure guarantee of origin certificates for nuclear and fossil production but not for e.g. biomass, wind, solar or cogeneration guarantees of origin. The energy sources which the domain protocol does not cover and CHP-GOs are issued as national electronic guarantees of origin tradable only in Sweden. Figure 3.10 gives a simplified illustration over the Swedish guarantee of origin system .

[86] Energimyndighet, Ursprungsgarantier - intyg för att säkerställa elens ursprung, 2010.

[87] RE-DISS, Country report Sweden, January 2011

[88] Guarantee of Origin RES-E and RECS Domain Protocol for Sweden

[89] Guarantee of Origin RES-E and RECS Domain Protocol for Sweden

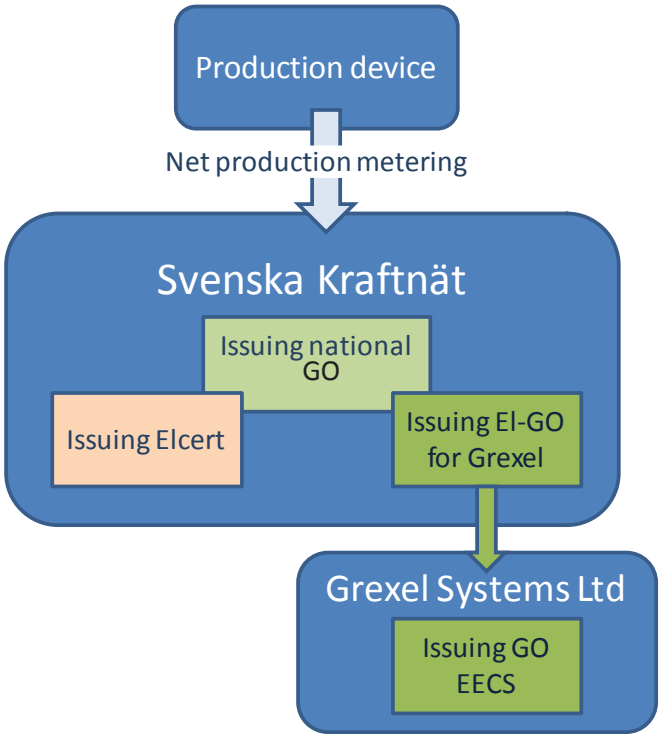


***Figure 3.10.*** *Outline of the Swedish guarantee of origin system.*[90]

Like in other Nordic countries, the EECS guarantees of origin certificates are transferrable in Sweden. The transfers can be done within the same EECS registration database where the account holder has their account or within other EECS registration databases. The transfer actions are done electronically using the Grexel guarantee of origin database. An electronic register system was taken into use on 1 December 2010[91].

### 3.5.2 Elcert system and guarantees of origin

Sweden uses an electricity certificate system to support renewable electricity production. The system is called Elcert and is a based on obligatory end user sales quotas for renewable electricity.

National guarantees of origin can be issued both for plants receiving Elcerts and for plants outside this support system[92]. The same energy unit (MWh) that is eligible for Elcert can also have a national guarantee of origin for renewable energy[93].

EECS guarantees of origin can be assigned for production supported by the Elcert system. Some confusion as to the state of this has existed, possibly because so far mostly large hydro power production not receiving support has had EECS guarantees of origin issued. Information about support from Elcert is registered on the national guarantee of origin.

[90] Guarantee of Origin RES-E and RECS Domain Protocol for Sweden

[91] Interviews with Energi Inspektionen and Energimyndigheten

[92] Johan Karlsson, Energimyndigheten

[93] Guarantee of Origin RES-E and RECS Domain Protocol for Sweden

### 3.5.3 Disclosure of the origin of electricity

All power suppliers are required to disclose their fuel mix to their customers according to Swedish law. The next step will be to define how to interpret the law in detail in specific decrees and schemes. The Energy Market Inspection is working in cooperation with the industry on more detailed regulations on how the directive for disclosure is to be applied in practice and what the recommendations should be. A draft of recommendations is expected to be ready in late 2011.

As official regulations and rules are still under preparation the branch organization Svensk Energi has stepped in to guide the suppliers on how to handle electricity disclosure and how to inform customers about the origin of electricity. The branch organization has decided to follow the results from the European Platform for Electricity Disclosure (EPED). The current recommendation to the suppliers is to base disclosure on the use of the guarantee of origin and other reliable tracking systems in the first place and if needed to use the so-called 'residual mix' which has been calculated at the EPED-platform. The residual mix applied for Sweden is a Nordic residual mix[94]. The residual mix is illustrated in Figure 3.11 on the right.

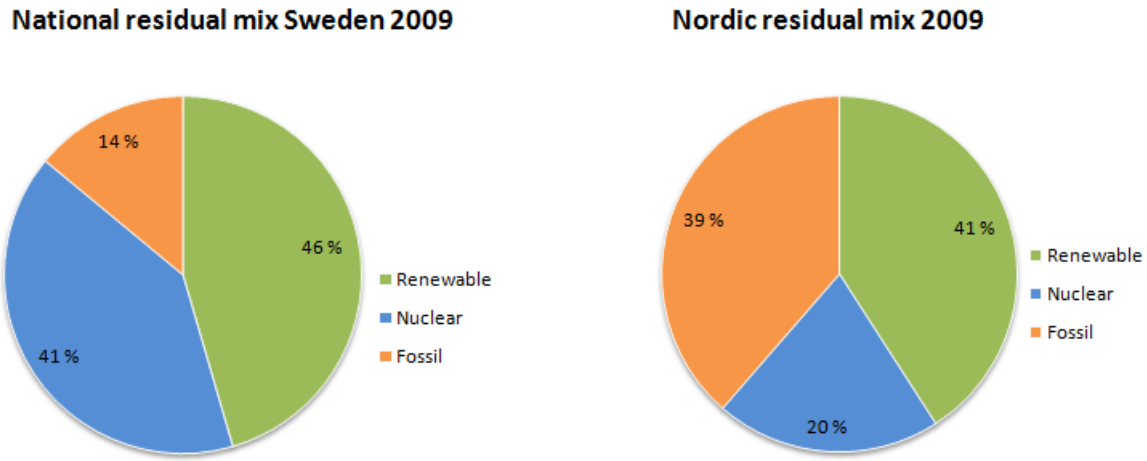


***Figure 3.11.*** *Electricity disclosure for Sweden for 2009 is based on a Nordic residual mix calculated according to EPED standards.95 The national residual mix calculated according to EPED standards is seen on the left.*[96]

If the disclosure is calculated according to EPED standards on a national level, a residual mix illustrated on the left in Figure 3.11 will be the result. The Swedish national residual mix would include a smaller proportion of fossil based electricity. The residual mix share of consumption for 2009 was 54 %.

Suppliers already use guarantees of origin for a large part of their energy mix. Guarantees of origin from renewable production and also nuclear production together cover 40% of all electricity disclosure activities in Sweden. In addition bilateral contracts are used for covering 20 % of the market.[97]

[94] Marie Pålson, Energimarknadsinspektionen

[95] Svensk Energi recommendations for disclosure

[96] RE-DISS project

In the future it is possible that Sweden will continue using the EPED standard calculation, but it will consider basing the future calculation on a national mix pending an agreement between Nordic countries to apply a Nordic residual-mix for the common Nordic market. The use of the Nordic residual-mix would be preferred because many suppliers as well as customers are active in several Nordic countries and there are plans to form a common Nordic retail market as well.[98]

### 3.5.4 Legislation

Sweden has new legislation for the implementation of guarantees of origin as a follow-up of the EU Directives on Renewable energy and on CHP. The guarantee of origin system in Sweden according to the directive 2009/28/EC is set forth by primary law "Act on guarantees of origin for electricity" [99] and in secondary legislation by the government decree "Decree on guarantee of origin for Electricity"[100]. The legislative changes came into force on 1st December 2010[101] and the issuing of guarantees of origin under the new Directive commenced shortly afterwards.[102] The law allows only one guarantee of origin per MWh, meaning that guarantees of origin for renewable energy and CHP must be combined. The law also states that electricity producers have the right to get guarantees of origin for all types of electricity production, not only from renewable sources.

Electricity disclosure in Sweden is implemented by the law "Ellag - Electricity Act".[103] The requirement for electricity disclosure came into force originally in 2005 and was updated on 1st December 2010.

## 3.6 Iceland

### 3.6.1 Description of the guarantee of origin system in Iceland

The National Energy Authority is the official regulatory authority in Iceland and the authority which approves the criteria for issuing of guarantees of origin for renewable energy. Landsnet hf., which is the transmission services operator in Iceland (TSO), is the Issuing Body and is thus responsible for the issuing of guarantees of origin of electricity produced from renewable energy sources. Landsnet issues a guarantee of origin of electricity at the request of a producer. A guarantee of origin is issued in written and/or electronic form. A guarantee of origin can, at the choice of a producer, be issued for the immediately preceding calendar month or for the preceding 3, 6 or 12 calendar months. One guarantee of origin is issued for each MWh produced.

---

[97] RECS, Newsletter June 2010, Interview of Claes Hedenström, Chairman of RECS, Vattenfall

[98] Marie Pålson, Energimarknadsinspektionen

[99] SFS 2010:601

[100] SFS 2010:853

[101] Förordning (2010:853) om ursprungsgarantier för el

[102] Svensk Energi, Interview

[103] 1997:857

Landsnet monitors whether electricity, for which a guarantee of origin has been issued, is in fact produced from renewable energy sources. The monitoring is done according to objective, transparent and non-discriminatory criteria. Landsnet establishes the rules for the registration of information on issued guarantees of origin for electricity produced from renewable energy sources in consultation with electricity producers. The rules are then approved by the National Energy Authority. Landsnet maintains a record of issued guarantees of origin and annually provides the Icelandic National Energy Authority with information on issued guarantees of origin. Landsnet is required to provide government authorities, customers and members of the public with the information necessary for evaluating whether the company has fulfilled its obligations. Landsnet can, subject to the approval of the Minister of Industry, assign its role as the issuer of guarantees of origin.[104]

Landsnet has decided to use the Grexel registry solution currently used by the other Nordic countries as the registry for guarantees of origin.[105]

### 3.6.2 Disclosure of the origin of electricity

The Icelandic production is today almost exclusively based on renewable energy. The generation by energy source is illustrated in Figure 3.12. Iceland does not at the moment calculate a residual-mix used for disclosure.

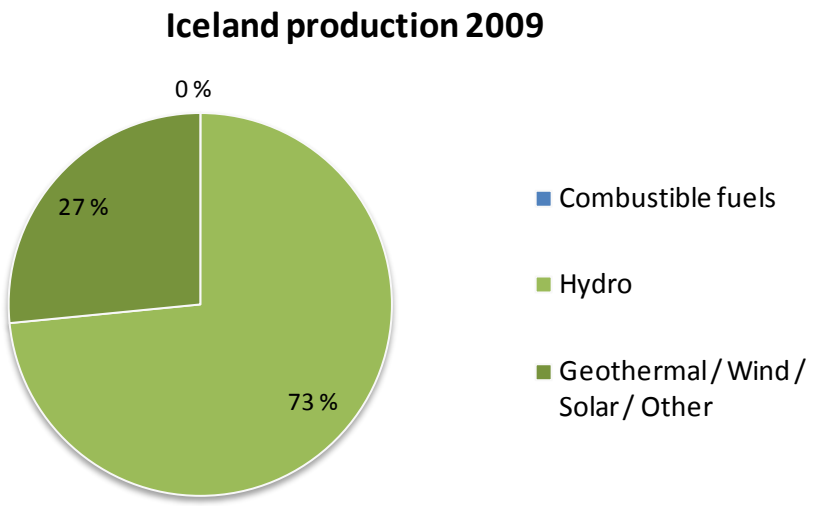


***Figure 3.12*** *Icelandic production of electricity in 2009.*[106]

There is no physical export or import of electricity as Iceland is not connected to the European grid system. Despite this there has been trade in guarantees of origin of electricity. Trade has been relatively limited, at about 1,5 TWh. Trade in guarantees of origin has so far not had a major effect

[104] Ministry of Trade, Energy and Tourism, Iceland, Act on the guarantee of origin of electricity produced from renewable energy sources (Official English translation) Legislation adopted by the Althingi on 7 April 2008.

[105] Garðar Lárusson, Landsnet, (updated information in April 2011)

[106] IEA statistics

on the residual mix in Iceland. The market participants are considering to start trade in guarantees of origin from Iceland to the continent on a larger scale.

If the plans for increased trade are realized, it will in time have a greater impact on disclosure to Icelandic end-users. Trade in guarantees of origin will in time change the Icelandic mix and make it more European even without the physical connection with continental Europe. This will bring the question of transparency of the disclosure to the forefront and the residual-mix calculations will be an issue to be resolved.

Landsvirkjun, who is the only company so far trading with guarantees of origin, will disclose their energy mix as soon as possible in 2011. TÜV Süd, a testing and inspection organization based in Germany, will calculate and verify the energy mix. Landsvirkjun sees that it would be beneficial that a residual mix would be calculated for the whole of Iceland and that legislation be issued on the subject in order to guarantee transparency to customers and to make sure that the EU Directives are followed.[107]

### 3.6.3 Implementation of relevant EU legislation and current development

The legislation on guarantees of origin "Act on the guarantee of origin of electricity produced from renewable energy sources" was passed by the Althingi on April 7 of 2008. Legislation on disclosure does not yet exist.[108]

According to the EEA agreement the EU RES-directive of 2009 has to be implemented in Iceland in 2011 and Iceland is planning to make this into a Bill of Law after the summer break in 2011.[109]

The view in Iceland is that some harmonization of legislation and practices are needed in order to be in line with EU directives. The necessary changes will be incorporated in Icelandic law and the recommended practices will be adopted[110].

# 4 Eco-labeled electricity in the Nordic countries

## 4.1 Connection of eco-labels to guarantees of origin

The environmental impact of the electricity consumption cannot necessarily be immediately or accurately observed by consumers. As a result, consumers must place faith in systems like guarantees of origin and third party verified eco-labels to inform them about the environmental impacts of the labelled products. In order for eco-labels to be credible in the minds of consumers, it helps if

[107] Unnur Maria Thorvaldsdottir, Landsvirkjun

[108] Unnur Maria Thorvaldsdottir, Landsvirkjun

[109] Ingvi Palsson, Ministry of Industry, Energy and Tourism

[110] Ingvi Palsson, Ministry of Industry, Energy and Tourism

they are established and validated by unbiased third parties. Such a process contributes to both increased consumer faith in the labels and increased compliance with environmental standards.

The liberalization of electricity markets has opened up new opportunities for electricity providers to differentiate their products along environmental characteristics. Labelling concepts can be for example straightforward certification schemes, can require rigorous environmental standards, or can promote investments in new renewable capacity and carbon emissions reduction. This chapter gives an overview of the third party validated eco-labels in the different Nordic countries as well as a description of the status of the market for eco-labeled electricity.

## 4.2 Denmark

The market for selling eco-labeled electricity consists of a mix of selling labeled wind-power, geothermal or hydropower and formally third party eco-labeled electricity. Most of the labeled energy sold to consumers has until 2009 been (imported) hydro power based energy. One NGO based eco-label in Denmark has been Bra Miljöval[111].

Sales from renewable-energy products have been on the rise in Denmark. From 2006 to 2009 the sales volumes of these types on eco-labeled products rose from 100 GWh to 925 GWh. Sales of renewable energy products made up about 2,9% of the total consumption in Denmark. Customers could in 2009 chose between mainly hydropower and wind-power. Hydropower made up 2/3 of the sales volume[112].

The marketing of different renewable energy products has, according to the Environmental report of 2010, been under some critique from customers and NGO's as it has been seen that they do not necessarily guarantee that the energy has been produced in an environmentally friendly way and because they do not necessarily guarantee the building of new renewable production. This means in fact that some customers are asking for an element of additionality. Because of this critique, the minister supported the establishment of a Committee to find solutions on how additionality could be included in the system and to find ways in which to influence the balance between supply and demand of renewable energy.

To guarantee the credibility and trustworthiness of electricity products with environmental attributes connected and claims to have additional effects a working group, including NGO's, traders of electricity and authorities and headed by the national organisation for Danish electricity traders (Dansk Elhandel) worked on a standard for green products. Danmarks Naturfredningsforening, Dansk Elhandel, Det Økologiske Råd, Energinet.dk, Energistyrelsen and Forbrugerrådet have published a product declaration, which sets basic criteria for eco-labeled energy.

Suppliers offering these products are to follow these criteria in their description of the products they offer, and they must be able to document the products in a sufficient manner. The declaration has as it goal to set minimum criteria, but at the same time leave the possibility and flexibility for product development. Suppliers can set additional criteria and have the freedom of naming the products as

[111] See also Chapter 4.5.2.

[112] Miljörapport 2010, Bakgrundsrapport, Energinet.dk, Dok. løbenr. 10589/10

they wish as long as the base criteria are met.[113] The working group evaluates new product categories if such are required in the future.

The working group has identified three product categories of which two include some alternatives. All eco-labeled electricity products included in the declaration are linked to the electricity price, based on a consumer paid premium on the top of the electricity retail price. However, only category 3 is based on the guarantees of origin system.

The three identified categories, which all are available on the Danish market, are:

1. $CO_2$-reduction
    a. Annulling of $CO_2$ quotas or credits
    b. Accepted $CO_2$ reductions without UN involvement
2. Contribution to building of new renewable production capacity
3. Buying of guarantees of origin for renewable production
    a. Electricity from renewable production sources which are max 2 years old
    b. Electricity from renewable production sources which are max 10 years old
    c. Electricity from renewable production sources with unlimited age

Category 2 products are based on funds, established through the consumer paid premium on the top of the electricity price. The funds are created in order to build new renewable energy capacity and and are thus created with a specific focus on additionality.

The idea behind the sub categories under category 3 is to influence the balance between supply and demand of renewable energy. If consumers are interested in supporting new renewable capacity, they can choose to buy electricity from renewable sources that is at most 2 years old. This can create a stronger incentive for establishment of new capacity.

As a result of this work and with pressure from NGOs, some suppliers have turned from using guarantees of origin from old hydropower to offering products, which promote the building of new renewable capacity and carbon emissions reductions. This is a trend which has started in 2009 and seems to be continuing. As such the development in Denmark can – so far - be seen as being somewhat unique in the Nordic area and Europe.[114]

[113] Branchdeklaration af elprodukter med klimavalg, Januari 2011

[114] Interview, Ecocouncil

## 4.3 Finland

### 4.3.1 EKOenergy label

EKOenergy is an eco-label managed by the Finnish Association for Nature Conservation (FANC). FANC in Finland launched its eco-label "Norppa" electricity in 1998 and is now operating under the EKOenergy name. It is an indication of sustainable production of renewable energy, consumption of said energy, or energy saving[115]. The Swedish Society for nature Conservation (SSNC) and the Finnish Association for Nature Conservation (FANC) have an agreement of mutual recognition of the environmental labels.

### 4.3.2 Labeling criteria for the EKOenergy label

In order to be accepted, the renewable production must meet the criteria set forth by FANC. The criteria vary according to the production form. At the moment, all solar energy is qualified. Because there are no wave- or tidal power systems in Finland, there is no criteria for them.

For wind power, there is a requirement that wind farms must not be located in provincial, national or international cultural heritage sites (including UNESCO World Heritage Sites) or landscapes of especial beauty; in National Parks or other nature reserves; or in nationally or internationally important bird areas (IBA-areas are specified by Birdlife International or their partner organisations).

The main rule for hydropower generation is that it must have been constructed before 1996. Measures taken after 1996 to boost levels of electricity production will be assessed by FANC on a case-by-case basis. FANC may require the hydropower station to construct a fish pass in order to receive an EKOenergy qualification. In addition, energy companies selling EKOenergy-certified hydropower are required to contribute to the EKOenergy Environmental Fund, which is used to improve the condition of waterways affected by hydropower stations. Energy companies have also a certain reporting and compliance requirements.

The criteria for bio-fuels include a list of acceptable fuel sources. For example wood chips and forest industry side products, agricultural-biomass, and biogas are accepted while waste and peat are not. In multi-fuel plants, the criteria allows for joint combustion of e.g. wood and peat so that the amount of wood used can get the EKOenergy label. There can also be technology criteria, e.g. that new plants need to be able to use 100 % bio-fuels to qualify.

#### 4.2.3 The market size and sales volumes for EKOenergy

Use of EKOenergy has increased during the past ten years as seen in Figure 4.1. Over 300 000 households and around 30 000 companies and other organisations have received EKOenergy in the last years. The total sales volume has been around 3 TWh.

[115] Main source for description in this Chapter is www.ekoenergy.org

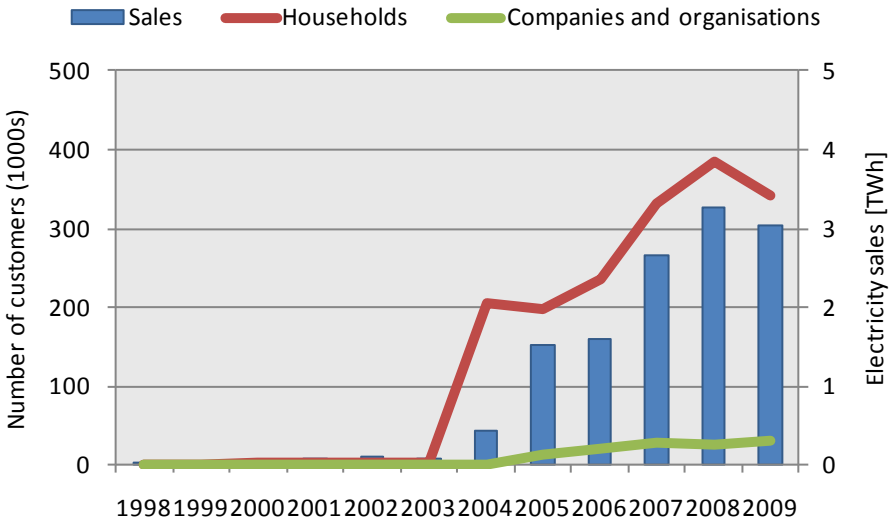


***Figure 4.1.*** *Development of the customer base and sales of EKOenergy*

## 4.4 Norway

Norway does not commonly use eco-labels endorsed by third parties or labels, which would include additionality of some form. At the moment there doesn't seem to be a market for eco-labeled products for which consumers would have to pay more. However sellers of electricity do in fact sell labeled electricity, but this is done by disclosing to customers the origin of electricity as being from hydro power or other renewable sources. The production is usually straightforwardly labeled as hydropower or other renewable energy. The electricity sold to end users as especially earmarked eco-labeled energy is always based on guarantees of origin or other reliable tracking systems and is thus accounted for in the system[116].

An industry norm for disclosing and marketing of renewable electricity has been published in 2007. It has been developed in cooperation with the industry and the Consumer Ombudsman[117] and is in line with the existing norms from the energy regulator. This "Bransjenorm for opprinnelsesgaranterte kraftavtaler i Norge" requires the labeled energy to be backed by guarantees of origin. It states that possible additional environmental attributes, which are used in marketing, should also be registered on the guarantee of origin. Only attributes which are documented on the guarantees of origin can be officially marketed. Companies who wish to use separate eco-labels may only use eco-labels, which have been verified by a third party. Private, non third party eco-labeling by the company itself, is discouraged and has in some cases been banned.[118]

Whether the market for renewable labeled products or products, which would include some form of additionality, will develop in Norway remains to be seen in the future. As more of the renewable

[116] Tor Heiberg, Ann-Christin Austang, Statnett, Interview

[117] Forbrukerombud

[118] "Bransjenorm for opprinnelsesgaranterte kraftavtaler i Norge"

energy attributes are exported to other European countries awareness may be raised of the origin of electricity products sold to the Norwegian end-users. This may contribute in raising an interest in buying electricity with environmental attributes and some form of additionality.

## 4.5 Sweden

### 4.5.1 Market

Of the 121 companies selling electricity in Sweden, about 70 offer eco-labelled electricity. Most of the suppliers who offer renewable energy contracts sell it for an additional cost of 0,4 öre to 2,5 öre per kWh. About half of the contracts sold do not include an additional cost for the renewable energy.

Electricity labeled with Bra Miljöval is today an established product on the market. About 13 percent of electricity contracts sold in 2009 in Sweden were Bra Miljöval labelled.[119] By 1999 about 70 suppliers had a license and today about 55 suppliers sell licensed electricity, which means about 40% of all suppliers in Sweden. The volumes sold have varied from 4 TWh in 1996 to 15 TWh in 2002. Between 2002 and 2004 the volumes were reduced because of more demanding criteria. According to the audits for 2008 sales to end customers were about 7 TWh.[120] The volume is estimated to be about the same for 2009 and for 2010. In 2008 the distribution of licensed electricity was the following:

- Hydropower: 6,5 TWh (93%)
- Bioenergy: 0,2 TWh (3%)
- Windpower 0,3 TWh (4%)
- Solarpower: 0 TWh (0%)

### 4.5.2 Bra Miljöval

The Swedish Society for Nature Conservation (SSNC) created the Bra Miljöval label in 1996, when the electricity market in Sweden was deregulated. Both supply and demand of the labelled services expanded rapidly, also geographically. Presently the Bra Miljöval label is operating in Sweden and to a smaller extent in Norway and Denmark. All suppliers with a license to sell Bra Miljöval are listed on the Swedish Society for Nature Conservation (SSNC) website. In 2007 criteria were launched for district heat and the first license for district heat was issued in March 2008.

Bra Miljöval has additional environmental criteria for the licensing of production. This sets it apart from the guarantees of origin. Guarantees of origin only guarantee that the energy has been produced in a certain type of production facility, without setting specific criteria for how environmentally friendly or sustainable the production is or guaranteeing additionality.

The criteria for Bra Miljöval include specific approved construction years for hydropower, quality criteria for the use of biomass and criteria for other environmental protection related issues. In

[119] "EI R2009:16 Halvårsrapport om elmarknaden april–september 2009"

[120] SSNC

addition all energy companies with a Bra Miljöval sales license contribute to investing in energy efficiency initiatives.

**Licensing of a specific production facility**

From 2009 it is also possible to get a license for a production facility. No costs for additionality are linked with the licensing of a production facility. The license only certifies that the facility is eligible for Bra Miljöval. The licenses for production facility make it possible to trade with the environmental attributes. The license only gives a guarantee that the specific facility clears the requirements set by the Bra Miljöval for a certain type of production. The product facility license does not mean that the product is Bra Miljöval licensed in itself. The Bra Miljöval licensing of the production is done when the additionality is secured for the production in accordance with the licensing criteria for production.

**Additionality requirement of the supply offering of Bra Miljöval**

Additionality is an effect which is created because an active choice of purchasing licensed energy is made. Additionality is a criteria for the Bra Miljöval licensed product. Three types of additional effects can be created:

1. Energy efficiency improvements
2. Environmental projects for hydro power
3. Investments into renewable energy

Electricity produced from hydro power generates money to a foundation, which promotes and supports environmental e.g. projects for waterways.

The term additionality is used both for new investments to additional renewable electricity and for other additional effects. Bra Miljöval includes criteria for addtionality. However, a purchase decision of Bra Miljöval does not necessarily guarantee additional investments to new renewable electricity production.

**Sales of eco-labeled electricity across national borders**

At the present time production from Norway, Denmark and Finland is eligible for Bra Miljöval in addition to the Swedish production. For instance SSNC and the Finnish Association for Nature Conservation (FANC) have an agreement of mutual recognition of the environmental labels. Imports from other countries may be eligible after a consultation with the NGOs in the respective countries. Some of the certified Bra Miljöval electricity is hydropower certified in Norway, which is then sold to Sweden.[121]

## 4.6 Iceland

Iceland does not at the moment have separate eco-labels endorsed by third parties or labels, which would include additionality of some form. There doesn't at the moment seem to be a market for eco-labeled products for which consumers would have to pay more.

[121] SSNC

In practice most of the electricity sold to consumers and end users is produced by either geothermal energy or hydro power. This is seen as given by end-users. Whether the market for renewable labeled products or products which would include some form of additionality will develop in Iceland, remains to be seen.

More and more of the renewable energy attributes can in the future be exported to other European countries and the residual mix in Iceland can become less renewable. In practice this means that the residual-mix will no longer be completely renewable, but will include some European attribute mix. This will add an element of nuclear and fossil production into the Icelandic system. This may have the potential of awakening consumer interest in eco-labelled products.

# 5 Analysis

## 5.1 Overview of the Nordic countries

The guarantees of origin systems in use and the roles of the different parties in the different Nordic countries reflect the fact that the systems for regulating, issuing, transfer and cancellation of guarantees of origin and the use of other reliable tracking systems have evolved independently of each other over time. This is also reflected in the disclosure of the origin of electricity and the different calculation practices chosen for the residual mixes in the different countries. A comparison of key findings of this study is shown in Table 5.1.

***Table 5.1.*** *Comparison of guarantees of origin systems, disclosure practices and eco labeling in the Nordic countries.*[122]

| | Denmark | Finland | Norway | Sweden | Iceland |
|---|---|---|---|---|---|
| **LEGISLATION** | | | | | |
| RES Directive 2009 into national legislation | December 2010 | Expected in 2011 | Expected in 2011 | December 2010 | Expected in 2011 |
| Regulatory authority for GO | Ministry /energinet.dk | Energy Market Authority | NVE | Energy Agency | National Energy Authority |
| Regulations or guidelines for disclosure | energinet.dk | Energy Industries | NVE | Svensk Energi | No regulations |
| Certificates in use | EECS, RECS | EECS, RECS | EECS, RECS | National GO, EECS (via Grexel), RECS | Yes |
| CHP GOs | Possible, but not used | Possible, but not used | Possible, but not used | Possible, but not used | No |
| Issuing Body | energinet.dk | Grexel (Fingrid) | Statnett | (Svenska Kraftnät)Grexel | Landsnet |
| Representation in AIB (CMO) | energinet.dk | Grexel Systems Ltd | Statnett | Grexel Systems Ltd | No |
| Registry in use | Grexel Systems Ltd | Grexel Systems Ltd | Grexel Systems Ltd | Grexel Systems Ltd | Grexel Systems decided upon |
| **DISCLOSURE** | | | | | |
| Residual mix calculation EPED standard 2009 | No, Electricity labels | Yes, Nordic residual-mix | No | Yes, Nordic residual-mix | No |
| Planned residual mix calculation for 2010 | National-mix, EPED standard | Nordic mix, EPED standard (likely) | Current method continued or EPED standard, National mix | Nordic mix, EPED standard (likely) | Landsvirkjun calculates own residual mix |
| Plans for the future | National mix, EPED standard | National mix, EPED standard (most likely) | National mix, EPED standard (most likely) | National mix, EPED standard (most likely) | Possibly national residual mix if legislation in place and Landsvirkjun continues trade |
| **ECO LABELS** | Several labels. (Regulated by branchdeklaration) | EKOenergy and others | Not common | Bra Miljöval and others | No |

## 5.2 Guarantee of origin systems

### *Guarantees of origin and other reliable tracking systems*

Guarantees of origin seem to fulfil their intended purpose within the Nordic countries. A guarantee of origin issued by any Nordic country seems to verify the source of the electricity without ambiguity, as long as they are traded within the guarantee of origin systems. The guarantee of origin system does not solve all issues related to the disclosure and promotion of renewable energy, for example disclosure of bilateral trade with renewable attributes or support to additional renewable production.

Double counting of attributes backed by national guarantees of origin and EECS or RECS guarantees of origin does not seem to pose a problem within the Nordic countries. All systems and practices in use in the different Nordic countries take into account for instance RECS and guarantees of origin, or CHP guarantees of origin, and link these together to eliminate double counting. The same applies for the Swedish national guarantee of origin system.

[122] Plans for the future practices for residual mix calculations describes the situation at the time when the interviews were conducted.

Common IT systems provided by Grexel are used for RECS and EECS guarantees of origin administration in most Nordic countries, which facilitates the elimination of double counting as well. All EECS certificates issued in Finland, Norway, Sweden and Denmark are electronic, which reduces the possibilities of unauthorized activities.

The system for issuing, transferring and cancelling of guarantees of origin is currently seen as working efficiently and with relatively low costs, at least in Norway. This is in great part due to the large volumes traded and handled.[123]

### *Contract based tracking*

Currently, producers and suppliers in most European countries are using an implicit allocation method for disclosure of attributes which follows the bilateral contracts concluded in the electricity market. This means in practice that bilateral contracts are not necessarily backed by guarantees of origin which would make explicit tracking possible.

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 guarantee of origin systems and reliable tracking systems is not clarified, and there are no reliable statistics about the volumes and types of electricity attributes which are tracked through this mechanism. This is also a relevant problem for the Nordic countries. However it needs to be noted that the problem does not seem to apply to third party eco-labelling, which can be considered to be within reliable tracking systems in the Nordic countries[124].

The problems described above make it impossible to generate a completely reliable residual mix and leads to double counting of generation attributes, including those represented by guarantees of origin. In order to establish reliable tracking systems, contract based tracking and the related practices need to be improved significantly by clear regulation and statistics.[125]

### *Towards a common Nordic market*

There are plans to form a common Nordic electricity retail market. A common end user market for electricity can motivate a common market for the environmental and other values backed by the guarantee of origin system. A common system for guarantees of origin should increase the viability of the common electricity market, both from producers, retailers and consumers perspective.

If separate national systems are maintained in a common Nordic electricity market, then at least tighter cooperation between the Nordic systems could be advantageous. There is already cooperation in that the same registry system is being used for registering guarantees of origin. It seems it would be relatively easy to increase cooperation and to harmonize rules. There are many potential levels for cooperation between the Nordic countries, from the use of similar systems and procedures to a common issuing body and Nordic registry for guarantees of origin.

---

[123] Tor Heiberg, Ann Christine Austang, Statnett

[124] Third party eco labels in this context can be for instance Bra Miljöval, Eko.Energia or other established eco lables.

[125] RE-DISS Best Practice Recommendations

A point to consider is that today retailers active in different counties need to cancel the guarantees of origin in different countries. The questions is could this practice be somehow simplified, for example on a Nordic level.

### *Lifetime of guarantees of origin*

Some of the problems within the guarantees of origin system have to do with the time limits for the lifetime of a guarantee of origin. The EU Directive states that the lifetime of a guarantee of origin should be 12 months after production and that the guarantee of origin should be cancelled when used.

If the approach to the guarantee of origin lifetime is not harmonized across Europe, then an option is created for arbitrage deals in the guarantee of origin market. Guarantees of origin 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 guarantee of origin market prices vary from one year to another for instance due to natural variations in renewable energy supply because of dry or wet hydro years, then this might become an issue.[126] Some scrambling for "old" guarantees of origin has already been seen in the European market pending the adoption of stricter regulations.[127]

### *Iceland*

At the moment the Directive makes it possible to trade in guarantees of origin also for island states not connected by a grid to other European countries. The RE-DISS Best Practice recommendations have identified this as a question which would need further clarification.[128]

## 5.3 Disclosure practices and residual mix calculations

### *Unharmonized systems*

Common accepted standards and recommendations, which would have made it easy to apply harmonized practices for especially implicit tracking, have not been in existence very long on a European level. It is thus understandable that different processes and practices have been taken into use in the past. However, standards have been under work on a European level and reasonably reliable calculation and tracking methods have now been produced. Available data on a European level may not be perfect and data quality will be incrementally improved and practices harmonized. Data about bilateral contracts is still seen as a problem by some parties, but in time data will hopefully be collected and calculations corrected taking into account this contract information as well. Thus, harmonizing of practices is now called for on a Nordic and European level and is now more possible than ever.

[126] RE-DISS Best practice recommendations.

[127] Energinet.dk

[128] RE-DISS Best practice recommendations.

### *Tracking and disclosure of the origin of electricity*

In the Nordic countries the need to find common practices is greatest in the area of disclosure or in other words in the implicit tracking of electricity. As was demonstrated in Chapter 3 the Nordic countries follow very different practices for disclosure of the origin of electricity to consumers at the moment.

If the origin of electricity is disclosed with a guarantee of origin (explicit tracking) there are no big problems. The problems lie, as was stated previously, in the area of the residual-mix calculations and contract-based tracking. Practices as to how and at which point in time producers and suppliers disclose the origin of energy to their customers also needs clear rules and harmonising.

For the year 2010 some changes will be implemented, which will harmonize practices to some extent. For instance Denmark will implement residual-mix calculations according to EPED standards. The other countries will most likely continue with the current practices for 2010. The practices were described in Chapter 3.

Continuing with these diverse practices means the disclosure to end users is still not transparent and that there is double counting of renewable attributes in the Nordic region. This has the potential of undermining customers trust in disclosure and has the potential of also being detrimental to the development of trade in guarantees of origin and development of a market for renewable energy.

### *National or Nordic system*

The choice needs to be made whether national tracking, which is the default solution, or regional tracking on a Nordic level according to EPED standards is going to be taken into use. At the moment of writing this report it seemed that residual mix calculation on a national level according to EPED standards was going to be the practice for 2010 for Denmark and at some point in the future for Norway. It seems to be the likely solution for disclosure of 2011 for Finland and possibly Sweden as well. Because the calculation practices can't reasonably be changed every year it also seems very likely that, if adopted, this practice will be continued until the Nordic countries can reach a final agreement on common practices on the long term.

One question can also be the inclusion of a wider geographic area, for example the Baltic countries as they are also becoming more integrated to the Nordic electricity market.

If a common retail market is created it would be a natural step to use a common Nordic residual mix. There have been views presented that the Nordic market is already a common market, with a substantial amount of electricity traded over Nord Pool. There are also suppliers who supply customers in several Nordic countries, who would profit from simplified disclosure practices provided by a common Nordic electricity residual-mix for disclosure purposes. The same applies for customers who are active in more than one Nordic country. It can be worth mentioning that for instance some Norwegian customers use Nordic residual mix as a base for carbon footprint calculations because these numbers are seen as more reliable in this context.

### *Value of guarantees of origin*

One question, which can't be dismissed and which is essential in this context is what the disclosure system is in reality used for today. Guarantees of origin were initially designed purely for disclosure.

The extensive trade in and potential rising value of guarantees of origin has brought focus on the fact that guarantees of origin are now used for other purposes as well.

Suppliers of electricity use this information for marketing purposes. Some companies and organisations use them in carbon footprint calculations and can also use guarantees of origin for the reduction of their carbon footprint of operations and for products. This information is also often used in official sustainability reporting and progress is followed up by sustainability indicators followed up for different years.

Changing calculation methods often is not a good option for end customers or for the continuity and reliability of reporting. The broader adoption of carbon compensation is also one factor which is likely to influence the development of a market for eco-labeled energy or the use of guarantees of origin. This wider than intended use of guarantees of origins needs to be taken into consideration when changes in the systems are made.

### *EPED standard*

Residual-mix calculation that is made according to the EPED standard includes trade with guarantees of origin. This will have an effect on the shares of renewable electricity in the residual mix used for disclosure purposes in comparison to the share of renewable production in Nordic countries. The choice between Nordic and national disclosure practices also affects the share of renewables in the mix, as can be seen in Figure 5.1.

EPED standard residual mix calculations on a national level for each Nordic country as well as for the Nordic region would lead to the following end result for the Nordic countries (excluding Iceland).

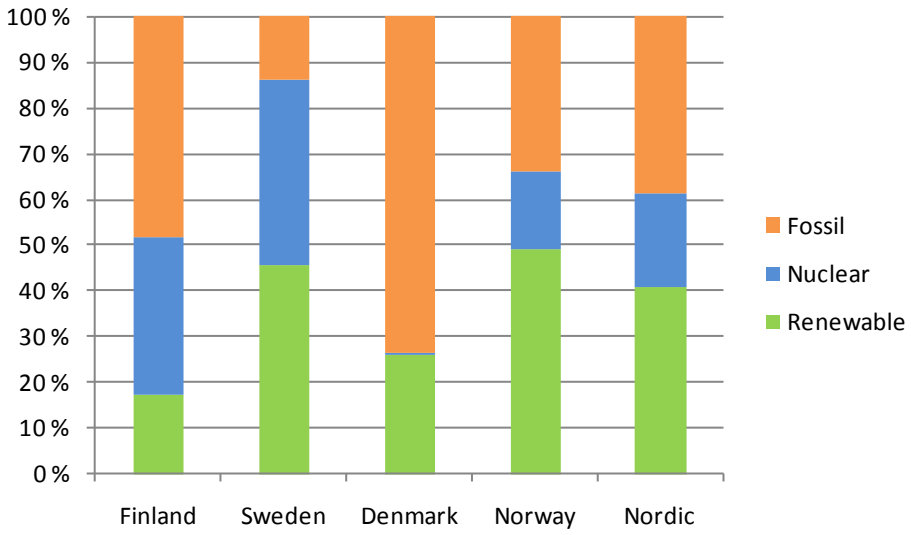


***Figure 5.1*** *Residual-mix calculations for 2009 for Nordic countries (excluding Iceland) on national level and for the Nordic area. Calculations have been performed by the RE-DISS project and are based on RE-DISS/EPED standards for calculation.*[129]

## 5.4 Eco-labeling practices

There are clear differences between the practices and the thinking behind the eco-labelling in the different Nordic countries. In Sweden the Bra Miljöval label endorsed by FANC is strong and established and to some extent the corresponding EKOenergy label in Finland as well. Bra Miljöval focuses on promoting environmental projects and investing in improvements in hydropower waterways. In addition, independent green labelled electricity is sold by suppliers in Sweden and Finland straightforwardly labelled as electricity from hydro or wind power, with or without elements of additionality.

Denmark in turn has a large array of eco-labels, mostly supplier initiatives, which can and usually do include various forms of additionality. This means that investments into new renewable production, mostly wind-power, is supported or that $CO_2$ reduction is promoted. The Bra Miljöval label is in use in Denmark as well but to a minor extent.

In Norway eco-labels endorsed by third parties are not commonly used. The production is straightforwardly labeled as hydropower or wind-power etc. without eco-labelling endorsed by external parties. Additional effects are not commonly considered. The source of Bra Miljöval labeled electricity in Sweden can be hydro power production facilities in Norway. The Bra Miljöval licensed production in Norway is not extensively used for domestic consumption.

Iceland doesn't have eco-labeling of electricity at the moment, as practically all energy marketed to end-users has so far been supplied by renewable energy.

[129] For Nordic residual mix calculation the source has been Energy Industries and Svensk Energi guidelines for 2009, which are based on EPED calculation recommendations dated 8.4.2010 with data collection date 7.7.2010. For the national residual mix calculations the source is data in AIB Newsletter 11 2010

Norway and Iceland are likely to continue and increase the sale of renewable energy attributes to other European countries. As a result their domestic residual electricity mix can become more like the European residual mix. This can increase the end-users' interest in the true origin of supplied energy and its environmental impacts. As long as awareness of the origin of electricity is based on the possible misconception that all energy is renewable, a development of a market for eco-labeled energy or an interest in the attributes of energy or additionality in general is less likely.

# 6 Conclusions and recommendations

### *Guarantees of origin (will) work as intended*

For explicit tracking of electricity, the guarantee of origin systems in the Nordic countries seem to work as intended. A guarantee of origin is associated with the production of electricity. A guarantee of origin issued by any of the Nordic countries should accurately and reliably verify in which production facility the electricity is produced. A guarantee of origin is cancelled when the electricity it is associated with is used. The cancellations should make it impossible for the same renewable electricity to be used twice.

The requirement for guarantee of origin systems has been established by the EU to be able to track renewable energy production and use in a systematic manner. A guarantee of origin system has been implemented or is being implemented in all Nordic countries. All Nordic countries expect to have their national legislation revised at the latest at the end of 2011.

### *Guarantees of origin have wider than intended effects*

Guarantees of origin are becoming a marketing tool for electricity producers, suppliers and end users. Guarantees of origin offer in principle a transparent and reliable tool to track electricity production.

However, attention should be paid to the fact that the use and sale of guarantees of origin affects markets beyond the guarantee of origin system. The share of renewable electricity consumed in a given country or a geographical area depends on the production of renewable electricity and the cross-border trade with renewable electricity attributes. Guarantees of origin can be used to transfer the renewable electricity attribute away from the country it is produced in. This affects the share of renewable electricity attributes both in the exporting and importing countries from the perspective of the residual mix of the country.

Information about the share of renewable electricity in a given area is used for many purposes which can also have an economic value. As an example, many companies and organizations calculate their carbon footprint on the basis of the disclosed national shares of renewable electricity generation, and the related national average greenhouse gas emissions. In these calculations, the carbon content of the electricity should be based on the actual disclosure data provided by suppliers or the residual mix, but not the national generation statistics. Companies and organizations can further make investments decisions to reduce their greenhouse gas emissions on the basis of the disclosed electricity generation source information.

### *Create common disclosure practices for all Nordic countries*

Nordic systems and practices for guarantees of origin and disclosure are not fully harmonized in the beginning of 2011. Continuing with separate national systems for electricity disclosure can have adverse effects in the reliability and usability of the disclosure data that can affect market participant behaviour.

The main harmonization requirement for the Nordic countries is the rules for electricity residual mix disclosure. There are basically two alternatives for a fully transparent and rigorous system. Either all Nordic countries use the common Nordic residual mix, which is currently used by Sweden and Finland, or all Nordic countries use their own national residual mix. A mix of different practices in the Nordic region inevitably leads to double counting of renewable energy, which, among other adverse effects, is forbidden by EU directives.

At the moment, it seems that the Nordic countries are moving towards national residual mix for disclosure after the year 2010. In addition, all Nordic countries seem to be moving towards the best practices formed on a European level in the RE-DISS project and through the EPED standard. As a result of these steps, all Nordic countries should in the future have a reasonably transparent system at their disposal.

### *Consider a common Nordic system together with a common retail market*

There is an on-going consideration for a common Nordic electricity retail market. A common end user market for electricity can motivate a common market for the environmental and other values backed by the guarantees of origin system. This can be an additional point for consideration when the common Nordic retail market is analyzed. In particular, if a common balance accounting is taken into use, then the information required for the guarantees of origin would already be collected in the same place. A shared or a common system for guarantees of origin should increase the viability of the common electricity market, both from producers, retailers and consumers perspective. In addition the recommendations made to the suppliers on how to disclose their electricity mix would need to be harmonized in the Nordic countries.

If separate national systems are maintained in a common Nordic electricity market, then tighter cooperation between the Nordic systems could be beneficial at least for market participants with operations in many Nordic countries. There are many potential levels for cooperation between the Nordic countries, from the use of similar systems and procedures to a common issuing body and registry for the guarantees of origin.

The advantages for having a common system for issuing and cancelling guarantees of origin would possibly be greatest for the retailers and especially in simplifying the process of cancelling of the guarantees of origin.

### *A common Nordic system might promote the use of renewable electricity*

The wider than perhaps intended role of guarantees of origin in the end user market should be recognized when the regulations regarding the system are deliberated. If guarantees of origin can be seen to give competitive advantage to the market participants using them, then the system should be made easily and cost efficiently accessible to all interested renewable energy producers.

To promote the use of renewable electricity, the regulation regarding the guarantees of origin should not create additional barriers for the entry for new renewable electricity investments. Rather, the system should have low administrative requirements for the participants, the costs involved should low or non-existent, and the system should be able to accommodate differentiation needs of the participants. Harmonization and common systems on Nordic level could potentially lead to lower cost because of economics of scale in producing the required services. In addition, market participants in multiple Nordic countries would benefit from a common set of rules.

### *Guarantees of origin system should be made open and attractive*

The guarantee of origin system is one method for the renewable electricity producers to prove the attributes they are selling. From a cost point of view, it would seem to be beneficial to have only one such system. However, it could be harmful for the development of voluntary markets to force one set of rules. Ideally, the regulated guarantee of origin system, that is needed in any case, could facilitate all market needs in a cost-efficient manner.

Additional attributes can be built on the guarantees of origin. To enable new market uses and innovations and to promote new renewable production, it should be ensured that the market rules make it possible to develop products which satisfy end user demands for additionality and which make it possible for flexibility in product development for suppliers. Additional attributes included in the guarantees of origin could in time for instance promote the building of renewable capacity and promote environmental projects.

### *Including bilateral contracts in the tracking*

In addition to renewable electricity that is verified by the guarantees of origin, some bilateral trade of environmental attributes is assumed to take place also in the Nordic countries, especially in Finland and Sweden. This means that the buyers of the environmental attributes are not always verifying the origin of the production with guarantees of origin, but with some other methods. If such trade occurs, it can make the national renewables disclosure misleading. However, how widespread this issue is, is unclear. This issue should further be mitigated as the use of reliable guarantee of origin systems becomes more widespread.

### *A long-term solution is called-for*

Common, stable, reliable, transparent and long term practices need to be adopted to guarantee transparency and a good functioning of the market for products that are building on guarantees of origin. Changing from one way of disclosing to another from year to year creates confusion and can undermine the functioning of the market.

### *Communication*

Guarantees of origin are not necessarily widely recognized by consumers. As the systems become more widely available there is a need to communicate to stakeholders what the system is, how it operates and how guarantees of origin can be used. This is a necessary step to promote the use of guarantees of origin and potentially also the renewable energy market. On the Nordic level, some synergies could be achieved by creating and delivering a common message in all countries. This would also make it easier to establish common terminology that is required if more common systems are strived for.

### *Nordic countries should adopt European standards*

The guarantee of origin system is inherently a European system. Common rules need to be established and followed by all participating countries for the system to work on a European level. Recent work on the EPED standard has established some of these rules. It seems that all Nordic countries have recognized this need and are moving towards the use of these same rules.

Technically there are some details to be resolved in the implementation of the guarantees of origin system, the related disclosure and other rules. These have been studied in detail on European level and are well described in the RE-DISS Best Practice Recommendations document. The recommendations are seen by most parties as applicable for the guarantee of origin systems in all Nordic countries.

### *Nordic leadership potential should be leveraged*

There seems to be a potential for the Nordic countries to co-operate within the wider European system. Although much of the work relating to the guarantees of origin is already taken care of on a national level, there seems to be potential advantages in closer Nordic cooperation especially if the countries are moving towards a common electricity retail market. Nordic countries have been in the forefront of electricity market development, and they could achieve a similar lead position with regard to the guarantee of origin system.

# Appendix 1

The following people were interviewed:

- Mads Lyngby Petersen, Energinet.dk, Denmark
- Louise Rönne Christensen, Energinet.dk, Denmark
- Birgit Gilland, Energistyrelsen, Denmark
- Holger Christensen, Energistyrelsen, Denmark
- Søren Dyck-Madsen, Ecocouncil, Denmark
- Nina Honkanen, Energy Industries, Finland
- Markku Kinnunen, TEM, Finland
- Pertti Säynätjoki, Fingrid, Finland
- Marko Lehtovaara, Grexel, Finland
- Ingvi Mar Pålsson, Ministry of Energy Trade and Tourism, Iceland
- Unnur Maria Thorvaldsdottir, Landsvirkjun, Iceland
- Tor Heiberg, Statnett, Norway
- Kristin Kolseth, NVE, Norway
- Ann Christine Austang,  Statnett, Norway
- Marie Pålsson, Energi Inspektionen, Sweden
- Folke Sjöbohm, Svensk Energi, Sweden
- Jesper Petersen, SSNC, Sweden
- Johan Karlsson, Swedish Energy Agency, Sweden
- Roger Östberg, Swedish Energy Agency, Sweden
- Jenny Fridström, Svenska Kraftnät, Sweden
- Claes Hedenström, Chairman RECS
- Christof Timpe, Oeko Energi, RE-DISS

# Appendix 2

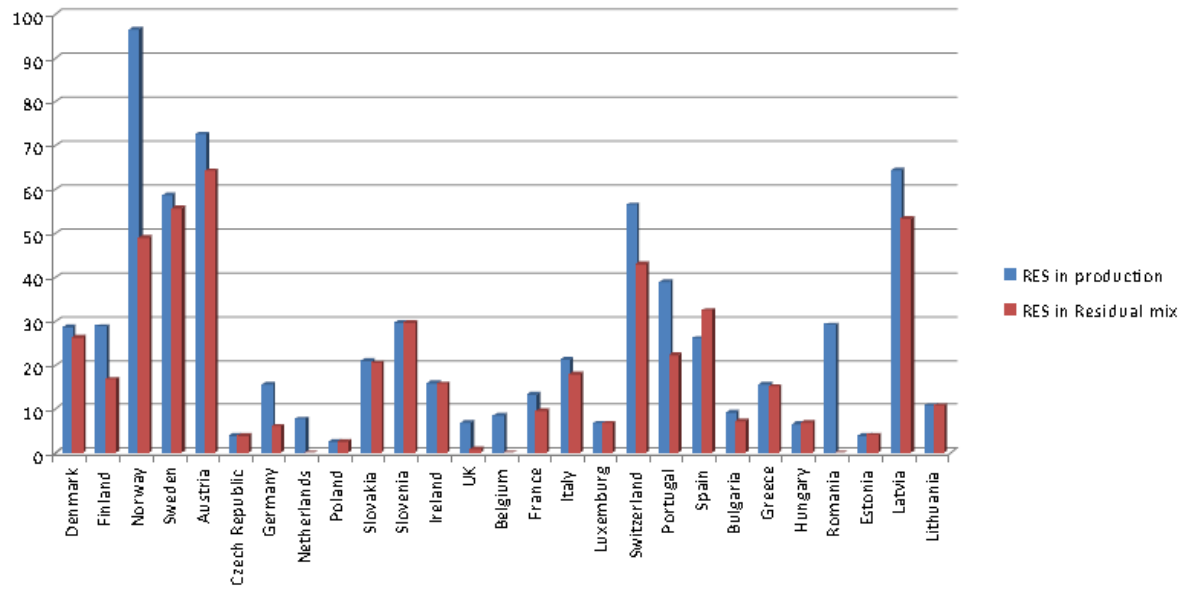


***Figure 1.*** *Renewable energy in production and renewable energy in EPED standard residual mix for 2009. (Source RE-DISS)*

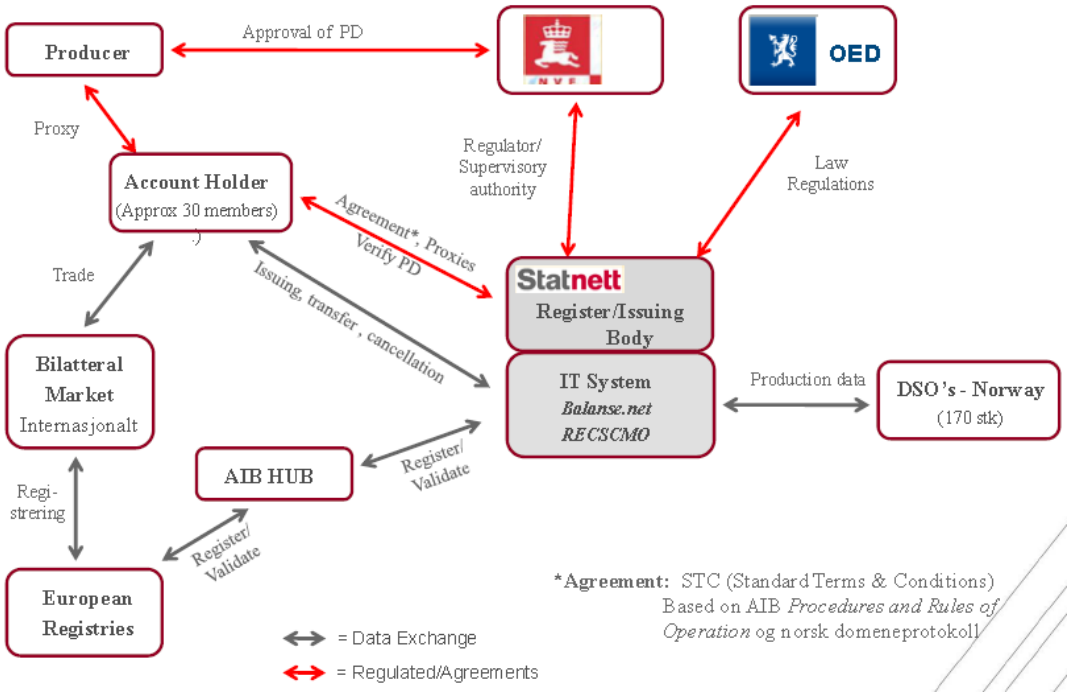


***Figure 2.*** *Overview of the Norwegian system for issuing guarantees of origin, with an outline of the roles of the different parties.*

# Appendix 3

***Table 1.*** *Danish guarantees of origin by production source for 2009. (Source: recscmo.org)*

| Energy source | Issued | Transferred | Redeemed | Exported | Imported |
|---|---|---|---|---|---|
| Wind-onshore | 2 767 379 | 171 968 | 310 293 | 708 928 | 671 433 |
| Wind-offshore | 12 155 | 11 064 | 11 064 | | |
| Hydro | | 319 229 | 335 364 | 187 281 | 631 735 |
| **Burned fuels** | | | | | |
| Forestry/agricultural waste | | | | | |
| Municipal waste | 25 108 | | | | |
| Industrial waste | | | | | |
| **Total** | 2 804 642 | 502 261 | 656 721 | 896 209 | 1 303 168 |

***Table 2.*** *Norwegian guarantees of origin by production source for 2009. (Source: Grexel)*

| Energy source | Issued | Transferred | Redeemed | Exported | Imported |
|---|---|---|---|---|---|
| Wind-onshore | 957 293 | 158 822 | 538 232 | 830 073 | 340 921 |
| Hydro | 109 000 688 | 37 070 860 | 28 224 884 | 55 734 888 | 2 005 502 |
| Solar photovoltaic | | | | 5 | 5 |
| **Burned fuels** | | | | | |
| Forestry/agricultural waste | 541 | 22 520 | | 28 263 | 45 079 |
| Municipal waste | 2 226 | | | | |
| Industrial waste | 11 376 | | | | |
| **Total** | 109 972 124 | 37 252 202 | 28 763 116 | 56 593 229 | 2 391 507 |

***Table 3.*** *Swedish guarantees of origin by production source for 2009. (Source: Grexel)*

| Energy source | Issued | Transferred | Redeemed | Exported | Imported |
|---|---|---|---|---|---|
| Wind-onshore | | 60 357 | 320 064 | 154 934 | 420 068 |
| Hydro | 40 507 340 | 5 265 596 | 30 205 660 | 15 905 429 | 13 423 331 |
| Nuclear | 27 532 162 | | 22 617 997 | | |
| **Burned fuels** | | | | | |
| Forestry/agricultural waste | | | | 677 | 677 |
| Landfill gas | | | | 1 | 1 |
| Biogas other | | | 440 | | |
| **Total** | 68 039 502 | 5 325 953 | 53 144 161 | 16 061 041 | 13 844 077 |

***Table 4.*** *Finnish issued guarantees of origin by production source for 2009. (Source: Grexel) Note: Reliable data for issued, exported imported not available in one database for 2009.*

| Energy source | Issued |
|---|---|
| Hydro power | 7 820 140 |
| Wind off-shore | 63 121 |
| Wind on-shore | 98 771 |
| Forestry and agricultural by-products and waste | 670 871 |
| Biogas Other | - |
| Municipal solid waste | - |
| Energy crops | - |
| Industrial by-products and commercial waste | - |
| Landfill gas | - |
| **Total** | **8 652 903** |