Bundesministerium für
Wirtschaft, Familie und Jugend

Federal Ministry of Economic Affairs,

Family and Youth, Austria

AUSTRIA

Report for the year 2011

pursuant to Article 3(3)

and Article 5(5) of

Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market

Energie-Control GmbH

Rudolfsplatz 13a, 1010 Vienna

www.e-control.at

October 2011

Contents

1 PREFACE 6

2 OVERVIEW 7

3 ELECTRICITY PRODUCTION IN AUSTRIA 9

4 CLIMATIC CONDITIONS AND RESOURCE AVAILABILITY 12

4.1 HYDROELECTRIC POWER 12

4.2 WIND POWER 14

5 ACHIEVING THE TARGETS LAID DOWN IN DIRECTIVE 2001/77/EC 17

6 EVALUATION OF GREEN ELECTRICITY PRODUCTION AND CO2 REDUCTION FROM THE VIEWPOINT OF NATIONAL CLIMATE CHANGE 21

7 THE GUARANTEE OF ORIGIN SYSTEM IN AUSTRIA 22

7.1 OVERVIEW 22

7.2 LEGAL BASES 22

7.2.1 Issue of the guarantee of origin 23

7.2.1.1 General quality criteria 23

7.2.1.2 Transposition in Austria 24

7.2.2 Transfer of guarantees of origin 25

7.2.2.1 General quality criteria 25

7.2.2.2 Transposition in Austria 25

7.2.3 Use of the guarantee of origin 26

7.2.3.1 General quality criteria 26

7.2.3.2 Transposition in Austria 26

Figures

Figure 1: Share of renewable energy sources in gross domestic electricity consumption in Austria and EU-25 9
Figure 2: Share of primary energy sources and electricity consumption from 1980 to 2010 in Austria (public grid) 10
Figure 3: Monthly production coefficient of run-of-river plants in 2009 and 2010 13
Figure 4: Wind resources in Europe – average full load hours at 80 metres height onshore (120 metres height offshore) 15

Tables

Table 1: Average production coefficients of run-of-river plants from 2000 to 2010.....14
Table 2: Average full load hours of hydroelectric power from 2007 to 2010.....15
Table 3: Extent to which the indicative target value in Directive 2001/77/EC has been attained 19

1 Preface

Articles 3(3) and 5(5) of Directive 2001/77/EC of 27 September 2001 on the promotion of electricity production from renewable energy sources lay down reporting requirements for the Member States. This report has been drawn up on the basis of those requirements.

Article 3(3) of Directive 2001/77/EC states the following:

> *Member States shall publish, for the first time not later than 27 October 2003 and thereafter every two years, a report which includes an analysis of success in meeting the national indicative targets taking account, in particular, of climatic factors likely to affect the achievement of those targets and which indicates to what extent the measures taken are consistent with the national climate change commitment*.

With regard to the guarantee of origin system, Article 5(5) of Directive 2001/77/EC states the following:

> *Member States or the competent bodies shall put in place appropriate mechanisms to ensure that guarantees of origin are both accurate and reliable and they shall outline in the report referred to in Article 3(3) the measures taken to ensure the reliability of the guarantee system.*

The Federal Ministry of Economic Affairs, Family and Youth has asked Energie-Control Austria to prepare this report. It contains information based on the data available and focuses on the development of electricity production from renewable sources from 1997 to 2010.

For the assessment of the above-mentioned fields, the analyses are preceded by a detailed description of the legal bases and the current trends.

Comprehensive calculations of electricity production from renewable sources in Austria are given in the annual Green Electricity Report produced by Energie-Control Austria. These can be downloaded from Energie-Control Austria's website at www.e-control.at.

2 Overview

Austria is the EU Member State with the highest proportion of electricity produced from renewable energy sources. Compared with gross national electricity consumption of 56 083 GWh, a share of 66% of production from renewable energy sources – 37 002 GWh – (excluding energy produced from pumped water) was achieved as early as 1997.

Historically, there has been a strong trend above all towards hydroelectric power in Austria – approximately 40 TWh of hydroelectric power are currently produced each year in Austria.

Until 2002 the production of electricity from 'renewable' energy sources (wind energy, biomass, biogas and photovoltaic energy) was promoted in Austria by means of various schemes in the individual provinces. Since 2003 these technologies have been promoted on a nationwide basis by means of the 2002 Green Electricity Act (*Ökostromgesetz*) and its subsequent amendments. The centralised, standardised support system has led to a sharp rise in the production of electricity from 'new' renewable energy sources – in 2010 the figure was 4 647 GWh.

Compared with gross national electric production in 1997, this has resulted in an increase in the production of electricity from renewable sources of 8% and, compared with gross national electricity production in 2010 (73 405 GWh, provisional figure), an increase in the production of electricity from renewable sources of 7%.

A large number of investments have been made and support programmes have been implemented in Austria in compliance with Directive 2001/77/EC of 27 September 2001, as a result of which the production of electricity from renewable sources has risen again very sharply above the high initial level already attained in 1997. Including electricity from renewable sources which is not fed into the public electricity grid, a total of 43 865 GWh of electricity was produced in 2010, 6 863 GWh more than in 1997 (37 002 GWh).

Funding was made available for this development, in particular for the production of electricity from 'new' renewable energy sources, feed-in tariffs being the instrument introduced. The tariffs are set at different rates depending on the technology used and are

constantly re-evaluated. In total, some €250 to €320 million a year are spent on providing this support (the figure varies according to the price of electricity on the market and thus the difference between the feed-in tariff and that price), which has to be guaranteed over the long term in view of the guarantee periods for the feed-in tariffs.

To calculate the climate protection effects, it is assumed that the production of electricity from renewable energy sources replaces production from a CCGT gas-fired power plant – to determine the total effect, it is assumed that 0.44 t CO_2 are avoided per MWh produced.

Electricity production from renewable energy sources of 43 865 GWh therefore avoids an average of 19.3 million tonnes of CO_2 emissions a year which would otherwise be emitted if the same amount of electricity were produced by CCGT gas-fired power stations.

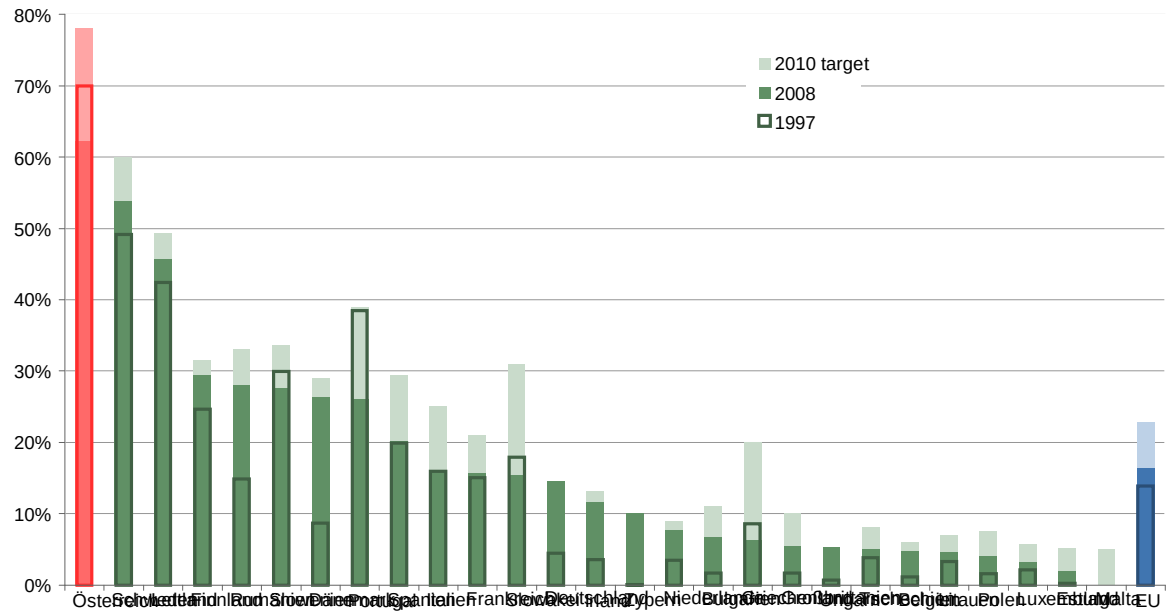
The CO_2 avoided by producing electricity from renewable sources in Austria is significant compared with total CO_2 emissions in Austria (80.1 million tonnes CO_2 equivalent or 88 million tonnes of CO_2 in 2009).

At mostly less than € 20 per tonne of CO_2, the support given for the production of electricity from hydroelectric power is relatively low. For electricity production from wind power it is about € 50 per tonne of CO_2 of reduction. For the production of electricity from biomass/biogas (on average about € 180 per tonne of CO_2 reduction) and photovoltaic power (in 2009 support of about € 1 300 given per tonne of CO_2 reduction for existing facilities), the figure is significantly higher and thus a multiple of the current price of CO_2 under the emissions trading system (about € 13 per tonne of CO_2 reduction, as at April 2010).

3 Electricity production in Austria

For 2010, Directive 2001/77/EC lays down an indicative (non-binding) national target for Austria of 78 % of electricity to be produced from renewable energy sources compared with electricity consumption before that year. A footnote in the Directive states that Austria can attain this figure provided that it is based on electricity consumption of 56.1 TWh. To achieve that target, the total electricity produced from renewable energy sources counts, including large-scale hydropower, own consumption and renewable energy sources which are not promoted under the Green Electricity Act, such as biomass for own consumption facilities.

Austria's electricity production is characterised by a large share of renewable energy sources, particularly hydroelectric power. Figure 1 below shows the high proportion of electricity produced in Austria from renewable energy sources compared with other European countries.



[Sources: Energie-Control Austria, Directive 2001/77, EurObserv'ER; 2008: estimeated figurese]

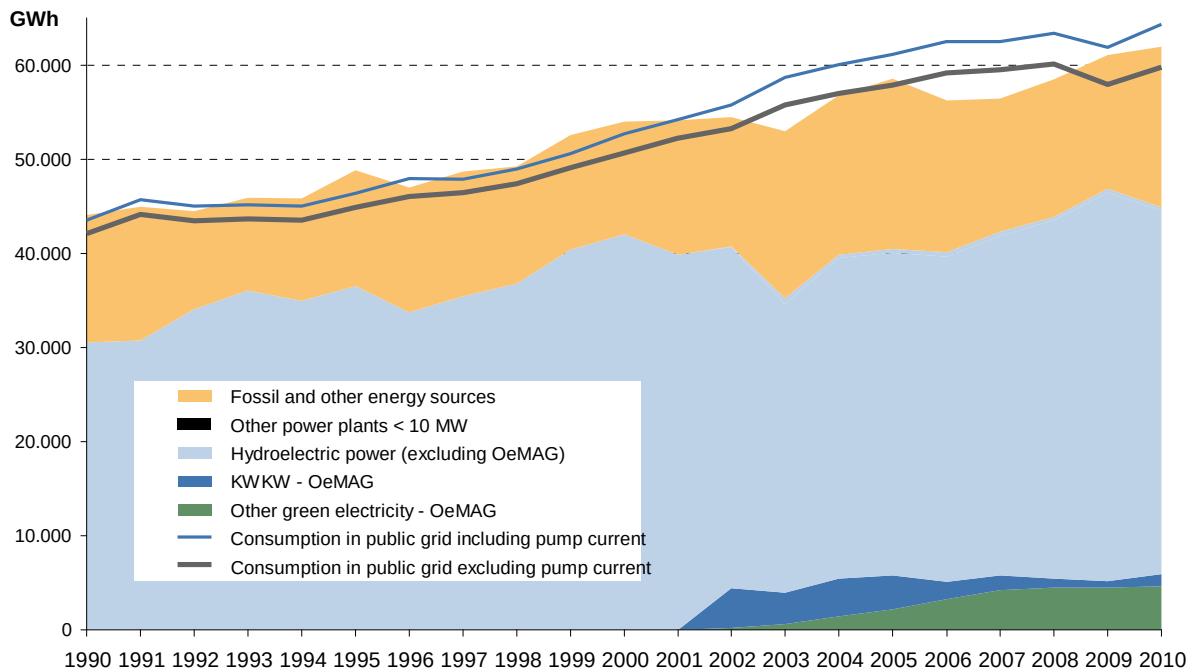
Legend:

Reading from left to right:

Austria, Sweden, Latvia, Finland, Romania, Slovenia, Denmark, Portugal, Spain, Italy, France, Slovakia, Germany, Ireland, Cyprus, Netherlands, Bulgaria, Greece, United Kingdom, Hungary, Czech Republic, Belgium, Lithuania, Poland, Luxembourg, Estonia, Malta, EU

Figure 1: Share of renewable energy in gross national electricity consumption in Austria and EU-25

The high share of hydroelectric power means that the electricity production mix is highly dependent on climatic conditions, as can be seen from Figure 2 below.



[Source: Energie-Control Austria]

Figure 2: Share of primary energy sources and electricity consumption from 1980 to 2010 in Austria (public grid)

Figure 2 shows the composition of electricity production in its entirety from 1990 to 2010 and the shares of gross national electricity consumption cannot be directly derived from this. However, it is clear that the share of hydroelectric power immediately fell sharply in 2003, for example, which was an extremely dry year. The same fall can be seen in 2010.

In the past, both electricity consumption and the amounts produced have increased in Austria. Electricity demand has risen continually in all sectors. The biggest increase has been in manufacturing, followed by homes and the services sector. Despite mandatory systems to increase efficiency, electricity demand is projected to rise further in the future.

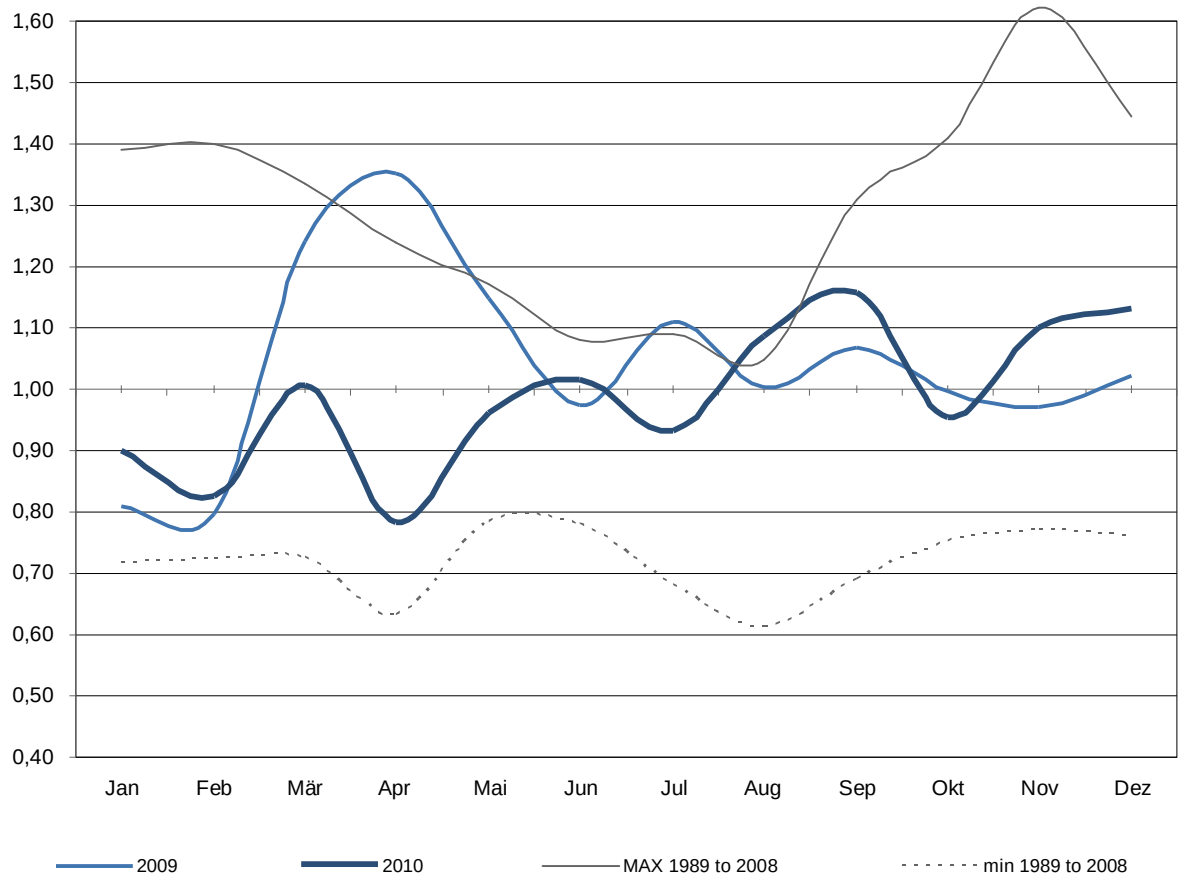
4 Climatic conditions and resource availability

The climatic conditions have a major, direct impact in terms of two technologies which are relevant for electricity production in Austria: hydroelectric power and wind power. There is also a direct impact as far as photovoltaic energy is concerned. However, that form of energy is of minor importance in terms of supply in Austria (current share only 0.05%) and will therefore not be discussed in detail in this report. It is, however, covered in the annual Green Electricity Report.

4.1 Hydroelectric power

Electricity production in hydroelectric power stations largely depends on the climatic conditions. Events such as a lack of snow, drought or floods significantly reduce the production.

Figure 3 shows how production can vary from one month to another in different years.



Source: Energie-Control Austria

Figure 3: Monthly production coefficients of run-of-river power plants in 2009 and 2010

Table 1 below shows the annual production coefficients of run-of-river power plants in Austria from 2000 to 2010.

Production coefficients of run-of-river power plants	
2000	1.16
2001	1.11
2002	1.09
2003	0.87
2004	1.00
2005	0.98
2006	0.96
2007	0.96
2008	1.00
2009	1.06
2010	0.99

Source: Energie-Control Austria

Table 1: annual production coefficients of run-of-river power plants from 2000 to 2010

Some hydroelectric power plants have been modernised in recent years, thereby reducing a bottleneck.

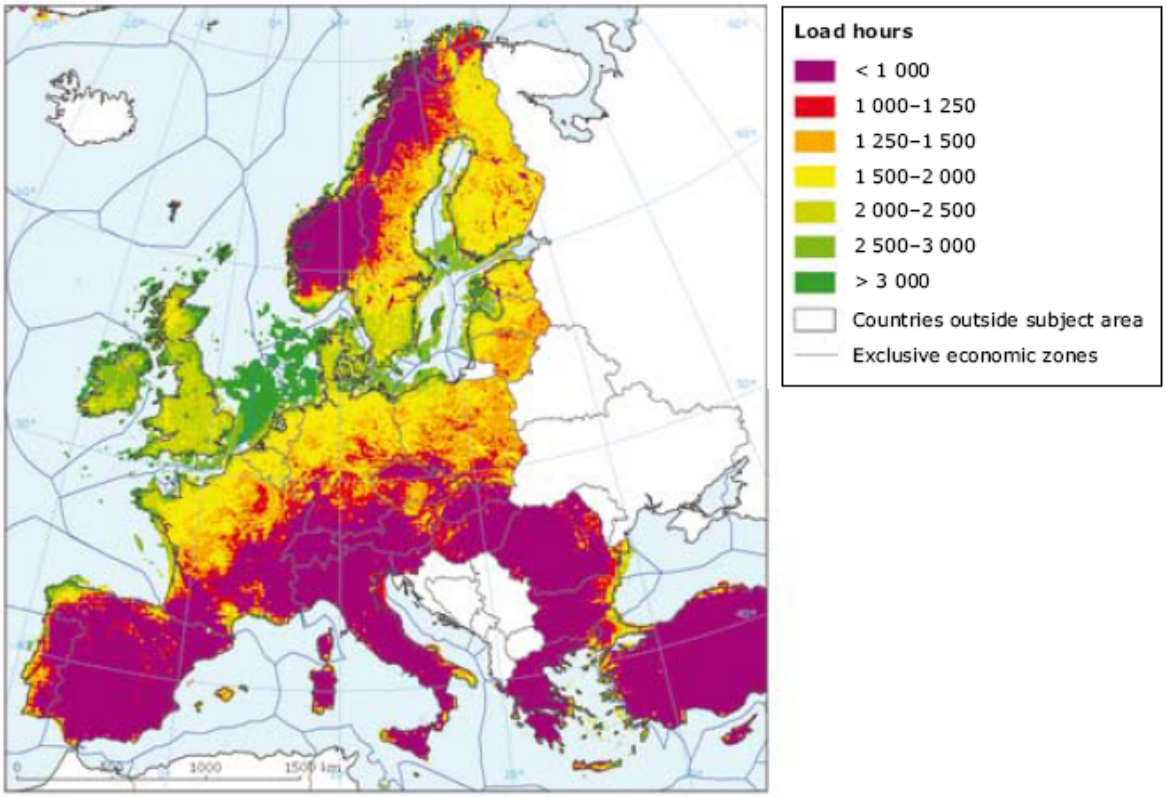
While further expansion is possible, it has been made more difficult by the entry into force of the Water Framework Directive, on the one hand, and the falling level of acceptance among the general public, on the other.

Both the Green Electricity Act as amended in BGBl I No 104/2009 and the 2012 Green Electricity Act lay down targets for the further expansion of hydroelectric power from 700 MW to 3 500 GWh of electricity production by 2015.

4.2 Wind power

The average number of full load hours which can be attained in Austria is lower than in coastal areas with strong winds and therefore requires higher specific production costs in Austria than in other European countries (see distribution of full load hours in Figure 4).

Map 3.2 **Distribution of full load hours in Europe (80 m hub height onshore, 120 m hub height offshore)**



Source: EEA, 2008.

Figure 4: Wind resources in Europe – average full load hours at height of 80 metres onshore (120 metres offshore)

The annual full load hours in Austria are shown in Table 2..

Average full load hours of wind power	2007	2008	2009	2010	Average
Best third (performance-related)	2 383	2 436	2 330	2 445	2 399
Mean third (performance-related)	2 039	2 024	1 936	2 054	2 013
Worst third (performance-related)	1 694	1 604	1 532	1 580	1 602
All plants	2 039	2 021	1 932	2 026	2 005
[Source: Energie-Control Austria 2011 | Electricity production database]					

Table 2: Average full load hours for wind energy from 2007 to 2010

Following the entry into force of the Green Electricity Act in 2003, the production of electricity from wind power increased significantly despite the fact that Austria is a landlocked country with adverse conditions for wind power. At the end of 2010 some 980 MW of production capacity using wind power was operating in Austria and about a further 1 850 MW was approved.

These plants produced more than 2 TWh of electricity in Austria in 2010. That is about 4% of the supply to final consumers in Austria from public grids.

The latest amendment to the Green Electricity Act lays down a target of further expanding wind power from 700 MW to 1 500 GWh of electricity production by 2015. These higher figures are also laid down in the 2012 Green Electricity Act.

5 Achieving the targets laid down in Directive 2001/77/EC

Directive 2001/77/EC states that the Member States must adopt measures to increase electricity production from renewable sources.

Under the terms of Directive 2001/77/EC of 27 September 2001, numerous investments have therefore been made and support programmes implemented as a result of which electricity from renewable sources has increased very significantly beyond the high level already reached in 1997. In 2010, with overall production totalling 43 865 GWh, including electricity from renewables which is not fed into the public grid, 6 863 GWh more electricity was produced than in 1997 (when the figure was 37 002 GWh).

Indicative targets for the individual Member States are set out in the Annex to the Directive. Austria occupies an extraordinary position in this respect since it is the only country which, with a figure of about 70% as its basis for 1997, has in this reference year already produced more than 50% of its electricity from renewable sources, primarily wind power.[1] Consequently, as regards the indicative target, the footnote for Austria in the Annex to the Directive reads as follows:

'Austria states that 78.1 % would be a realistic figure, on the assumption that in 2010 gross national electricity consumption will be 56.1 TWh.'

In 2010, electricity production from renewable sources in Austria was 43 865 (78.19% of the reference figure of 56.1 TWh). Austria has therefore met the target of 78% laid down in Directive 2001/77/EC.

Given that Austria's baseline figure for electricity from renewables was significantly higher than that of other EU Member States, failure to take account of that reference value would result in clear discriminatory treatment: Austria would have to expand electricity production much further than other Member States would have to do in overall terms to achieve the indicative target even just to maintain the share of 70%.

[1] Second place: Sweden at 49.1%; third place: Portugal at 38.5 %; fourth place: Spain at 19.9%.

In contrast to the subtargets laid down for small-scale hydroelectric power and other forms of electricity from renewables promoted in the Austrian Green Electricity Act, what counts with regard to the attainment of this target is the total electricity produced from renewable energy sources, including large-scale hydroelectric power, own consumption and the renewable energy sources which are not promoted under the Green Electricity Act, such as biomass for plants producing for own consumption.

The dynamising effect of the high baseline value of 70% in a situation of increasing electricity demand (a high level of additional production of electricity from renewables is needed simply to maintain the baseline figure of 70% if electricity demand is rising) means that, if demand for electricity in Austria increases, it will not be possible to produce 78.1% of electricity from renewables relative to gross national electricity consumption in 2010.

Table 3 below shows the trend in electricity production from renewable energy sources in 1997 and 2010 and compares it with gross national electricity consumption. In addition, there is a forecast up to 2010 based on the changes to the Green Electricity Act. These figures for Austria are compared with the average figures for the European Union.

Electricity produced from renewable energy sources as a share of consumption	1997*	2009	2010 (provisional figures)
	GWh	GWh	GWh
National electricity consumption (incl. own supply,, incl. pumped-storage electricity consumption)	56 083	69 843	73 405
Public grids – Supply to final consumers	42 391	53 291	54 985
Large-scale hydroelectric power (> 10 MW). excl. pumped-storage electricity**	31 400	34 706***	32 024
Small-scale hydroelectric power (< 10 MW)	4 152	5 099	4 983
Average-level hydroelectric power (10 - 20 MW, promoted with investments under the amended Green Electricity Act)			146
'Other' forms of green electricity promoted (wind power, biomass, biogas, etc.), feed-ins	605	4 503	4 647
5% of own consumption of green electricity promoted with feed-in tariffs		225	232
'Other' forms of green electricity not promoted (spent lye, etc., statistically incomplete recording)	845	1 719	1 832
Total electricity produced from renewables	37 002	46 252	43 865
Share of 56 100 GWh of renewables **	66%	82%	78%
Share of renewables in national electricity consumption	66%	66%	60%

* Data for smallscale hydroelectric power and biomass taken from 1998 operating statistics.

** The basic figure in the Directive of 70% in 1997 was probably calculated with the inadvertent inclusion of pûmped-storage electricity. Production in storage power stations (after deducting pumped-storage electricity) can vary from about 9.5 TWh a year to about 10.8 TWh a year. The degree of efficiency assumed when calculating the figure for pumped-storage electricity is 70%.

*** Unlike in previous reports, this figure is based on the actual volume produced.

Table 3: Extent to which the indicative target value in 2001/77/EC has been attained

This trend means that in 2010 Austria will be producing 6 863 GWh more electrical power from renewable sources than in 1997.

Electricity consumption has risen above average in Austria since 1997 also as a result of external influences. Due to the changes in central and eastern Europe, the population of Austria has increased; this has been coupled with job growth and an increase in industrial production.

6 Evaluation of green electricity production and CO2 reduction from the viewpoint of national climate change

The effect on climate change of producing electricity from renewable energy sources can be calculated by comparing the production which would be necessary to meet demand if the former were not available. If electricity production from CCGT gas-fired power plants is taken as the basis of comparison, such a plant would emit an average of about 0.44 tonnes of CO_2 per MWh of electricity produced.

The production of 43 865 GWh of electricity from renewable sources therefore avoids 19.3 million tonnes of CO_2 emissions which would have been emitted if the same amount of electricity had been produced by CCGT gas-fired power stations.

Even if only the additional electricity produced in Austria from renewable energy sources since 1997 is considered, significant CO_2 emissions have been avoided: the additional amount of electricity of 6 863 GWh produced from renewable energy sources avoids 3.02 million tonnes of CO_2 emissions which would have been emitted if that amount had been produced by CCGT gas-fired power stations.

The CO_2 emissions avoided by producing electricity from renewable energy sources in Austria constitute a considerable share of the total CO_2 emissions in Austria (80.1 million tonnes of CO_2 equivalent or 74 million tonnes of CO_2 in 2007).

7 The guarantee of origin system in Austria

7.1 Overview

According to Directive 2001/77/EC, the provisions relating to the guarantee of origin were to be transposed by the Member States by mid-2004. Transposition was completed in Austria with the entry into force of the Green Electricity Act on 1 January 2003. The guarantee of origin system in operation is an effective one and incorporates an electronic electricity guarantee database.

The conventional processes of production, sale and consumption and the cancellation of certificates for the designation of electricity are shown in the Austrian electricity guarantee database operated by E-Control. These processes are shown from a commercial viewpoint rather than a physical one. The database indicates from which power plant the electricity supplied or sold by the electricity trader, or any other supplier, originated.

7.2 Legal bases

Section 8 of the Green Electricity Act transposes the requirements for the issue of certificates of origin in Article 5 of Directive 2001/77/EC. On that basis, any operator of a plant producing electricity from renewables has the right to obtain a certificate of origin of energy fed into the grid from the operator to whose grid the plant is connected.

The supervisory authority for the issue of certificates of origin is the provincial governor.

The requirements for certificates of origin and the designation of electricity in Directives 2009/28/EC and 2009/72/EC will be included in Section 10 of the 2012 Green Electricity Act. On top of the legislation (in particular ElWOG 2010), Energie-Control Austria adopted a Regulation on the designation of electricity in September 2011.

Article 15 of Directive 2009/28/EC on the promotion of the use of energy from renewable energy sources in particular stresses the importance of electronic certificates of origin for

recording the designation of electricity. These requirements have been transposed in Austria (Section 78/79 ElWOG 2010, Section 10 ÖSG 2012, Regulation on the designation of electricity).

The reliability of the certificate of origin system largely depends on the accuracy of the information made available. This accuracy can relate to several stages of the information transfer:

1. The issue of the certificate of origin
    a) Record of the energy produced
    b) Record of the energy sources used
2. Transfer of the certificate or origin
3. Use of the certificate of origin

According to Section § 79(7) ElWOG 2010, certificates must contain information about the primary energy sources with which the electrical power was produced, the place and time of production and the name and address of the producer and must be confirmed by a supervisory, testing or certification body approved under the Accreditation Act. They must furthermore have been issued or recognised in accordance with the implementing legislation of the provinces relating to Sections 72 and 73 ElWOG 2010. Certificates for renewable energy sources are certificates of origin in accordance with the Green Electricity Act and Article 15 of Directive 2009/28/EC.

7.2.1 Issue of the guarantee of origin

7.2.1.1 General quality criteria

At the first level of the information transfer, a distinction is made between two areas in which erroneous information could arise. Such information could concern, firstly, the amount of energy produced and, secondly, the primary energy sources used. To avoid erroneous information in these sectors, it is essential to have the information confirmed by an independent third party (e.g. the regulator or certification agencies). In addition to this requirement, it is important whether certificates are issued by one or more bodies. Having a

monopoly for the issue of certificates is concerned avoids potential errors which might occur if several issuing bodies had to be coordinated.

7.2.1.2 Transposition in Austria

In 2004, Energie-Control GmbH set up the electricity guarantee database for issuing the guarantees of origin. For all power managed by OeMAG, the guarantees of origin are automatically generated for every month in the database and are automatically transferred to the electricity suppliers' accounts as transfers are made to the end users. Every electricity supplier therefore obtains the same share of renewable energy.[2]

In addition to the management of these amounts of energy, the database can also be used on a voluntary basis by every grid operator or accreditation body for issuing guarantees of origin and certificates in accordance with Section 79(7) ElWOG 2010. Grid operators have made use of this scope and Austrian electricity production is almost exclusively managed via the electricity guarantee database. This increases confidence in both the guarantees of origin and the designation of the electricity as it means that the risk of fraud, such as the dual issuing of the guarantees of origin in a database, can be avoided.

In Austria, two independent bodies are responsible for the quality of the information required for the issue of guarantees of origin. The use of (different) primary energy sources is confirmed by means of a notice from the relevant provincial governor. Confirmation of the amount of energy is confirmed by the grid operator and thus again by an independent body which also has a territorial monopoly. This means that there can only ever be one competent authority which issues guarantees of origin for a particular plant in Austria. As regards the quality of the information required for issuing the guarantee, Austria has therefore already attained a very high level.

[2] For more information see https://www.stromnachweis.at.

7.2.2 Transfer of guarantees of origin

7.2.2.1 General quality criteria

In the European context guarantees of origin are used for different purposes. These can be the following:

- As a guarantee for the designation of electricity
- For the transfer of electricity from renewables between Member States for inclusion in indicative targets under Directive 2001/77/EC
- As a basis for obtaining state support (feed-in tariffs, quota models)
- As a guarantee for a quality label
- For marketing purposes

As guarantees of origin are already given a market value, it is important that the same information cannot be 'sold' several times over. To avoid multiple selling, the technical features of the guarantee of origin system are especially important. The duplication of information in an electronic database is practically impossible. If the guarantees are issued on other media (paper), there is a potential for multiple selling.

7.2.2.2 Transposition in Austria

Section 8 of the Green Electricity Act does not specify what medium the grid operator must use when issuing guarantees of origin. Both the database referred to above and paper can be used when issuing them. This choice of options means that any potential double transfer is avoided by law. Directive 2009/28/EC allows scope for improvement as it specifies the electronic transfer of guarantees. This provision has been transposed into national law in ElWOG 2010 and the Regulation on the designation of electricity.

7.2.3 Use of the guarantee of origin

7.2.3.1 General quality criteria

A danger closely associated with the possibility of a (potential) multiple transfer is that of the dual use of a guarantee of origin (e.g. for both the designation of electricity and for a quality label which exists independently of it). It should be borne in mind that different market players may be involved when it comes to the use of guarantees of origin (e.g. the plant operator applies for a feed-in tariff, the electricity trader applies for a tax reduction). It is this in particular which leads to potential interface problems, again making the technical features of the guarantee of origin system especially important. In a database a guarantee of origin can only be used for one possible use and not for several. Several systems can of course be operated in parallel with a guarantee of origin (for example, if support is given it does not mean that it cannot be used for the designation of electricity). However, a clear delineation is needed within the database and above all at interfaces with other systems.

7.2.3.2 Transposition in Austria

The principal area is which guarantees of origin are used in Austria is for the designation of electricity.

The requirement that guarantees of origin must be displayed electronically in a database (Directive 2009/28/EC) minimises the risk of fraud associated with dual use. What is important in this context is a requirement to make the electronic transfer of guarantees mandatory in all European countries in order to make the interfaces with other systems more transparent.

The Regulation on the designation of electricity published in September 2011 provides increased transparency for the final customer as far as designation is concerned and is an important asset for the credibility of and confidence in the system.