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## **Report**

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

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## 1 Introduction

By letter of 21 June 2005 the Austrian Federal Ministry of Economic Affairs and Labour asked Energie-Control GmbH to draw up a draft for a report in accordance with the requirements of Article 3(3) and 5(5) of Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market (Directive 2001/77/EC). This was done pursuant to Article 24 of the Green Electricity Act (Austrian Federal Law Gazette BGBl. I No. 149/2002) under which the company Energie-Control GmbH is responsible for the continuous monitoring of the attainment of the targets set in the Green Electricity Act. This draft forms the basis for this report.

Article 3(3) of Directive 2001/77/EC provides as follows:

*“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.”*

Article 5(5) of Directive 2001/77/EC provides as follows:

*“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.”*

For the evaluation of the abovementioned sectors, a detailed description of the existing legal bases and current developments is provided first, followed by the analyses. Detailed reports and calculations concerning the development of green electricity in Austria may be consulted on the homepage of Energie-Control GmbH [www.e-control.at](http://www.e-control.at). In particular, it includes a link to the very detailed green electricity report for 2005 drawn up by Energie-Control GmbH, in German and in English.

## 2 Summary

Pursuant to the Green Electricity Act (BGBl. I No. 149/2002) and the Regulation of the Federal Minister of Economic Affairs and Labour laying down the charges (feed-in tariffs) for the take-up of electric energy from green electricity plants (BGBl. II No. 508/2002 as amended in BGBl. II Nr. 254/2005), numerous new green electricity plants were set up and existing small-scale hydroelectric plants were revitalised in 2003, 2004 and 2005. Permits have been issued for about 940 MW wind power, 380 MW solid biomass, 70 MW biogas and more than 1 100 small hydro plants (of which 100 MW new ones). Once they have become operational, these plants will generate more than 8 000 GWh electric energy a year. Depending on the market price for electricity, this energy volume will be supported from charges to consumers amounting to between €210 million and €300 million. For most technologies, the periods for entry into service of plants licensed up to the end of 2004 have been extended to the end of 2007 in order to give the companies establishing the plants more time to complete construction so that they may benefit from the high feed-in tariffs under the Tariffs Regulation (period of validity 13 years).

These basic conditions already ensure that – in spite of the extraordinarily high initial outlay – the expansion of green electricity in Austria will significantly exceed the average development in the European Union between 1997 (base year under Directive 2001/77/EC) and 2010 (target year).

One consequence of the expansion already achieved is that there are saturation effects in respect of further scenarios for expanding green electricity, in particular in the wind energy and biomass sectors.

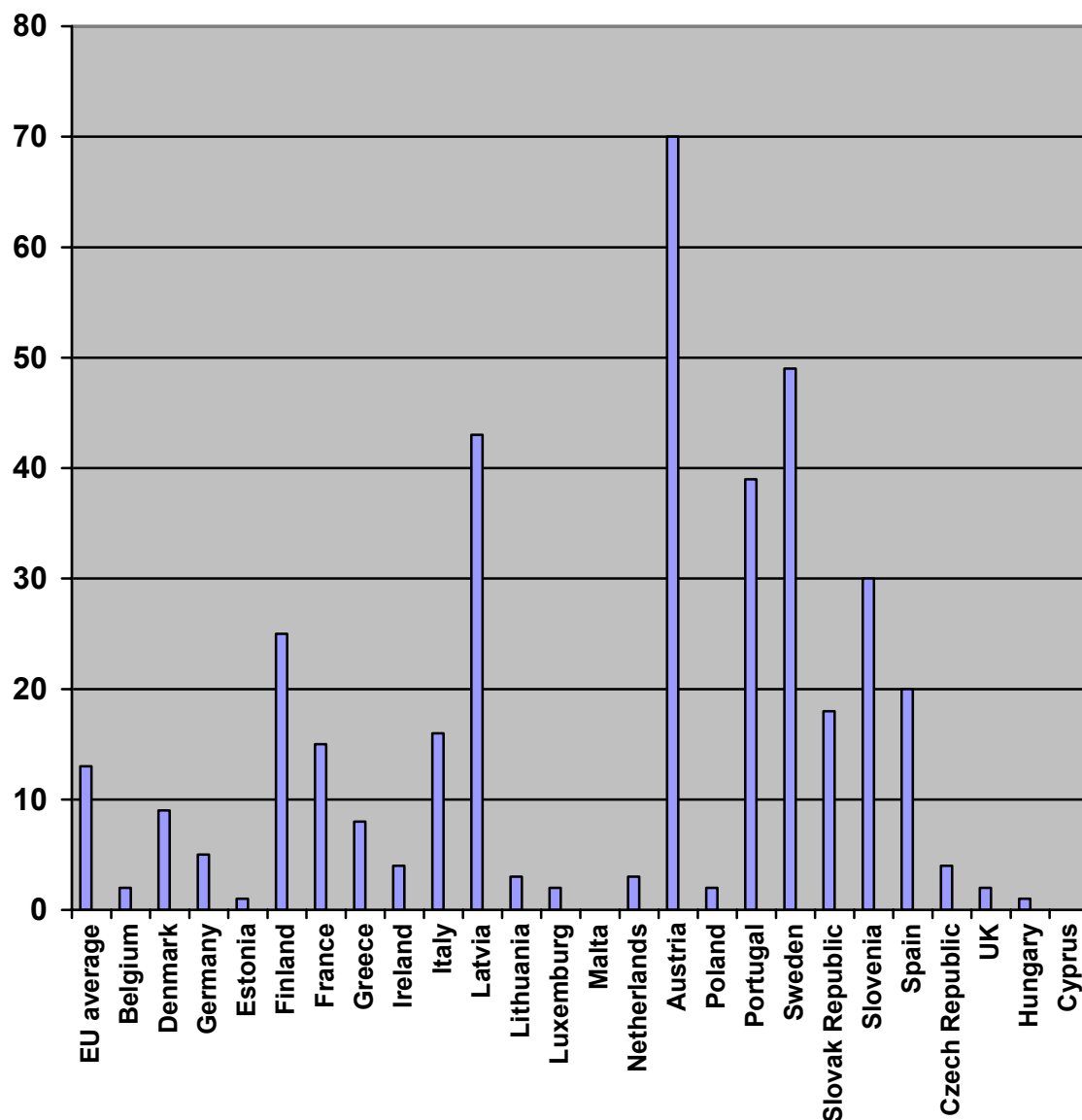
Hydroelectric power will continue to be the most important component in the development of green electricity in Austria. Because of its climate and geographic location, Austria's contribution to the generation of electricity from renewable energy sources will in the following decades also predominantly come from the use of hydroelectric power.

The guarantee-of-origin system in Austria has already been transposed in detail and in a transparent manner. Austria is one of the few countries of the European Union that have transposed the legal bases into national law for guarantees of origin and electricity disclosure and it now has a fully functional guarantee-of-origin system. For a predominant part of green electricity, guarantees of origin are issued in accordance with the standardised uniform databank system based on grid operator notifications which can in the future also be used also for electricity disclosure.

### 3 General conditions

#### 3.1 Electricity production in Austria

Renewable energy sources, in particular large-scale hydroelectric power plants, have a large share in electricity production in Austria. Compared with the rest of the EU, Austria has by far the largest share in electricity generation from renewable energy sources.

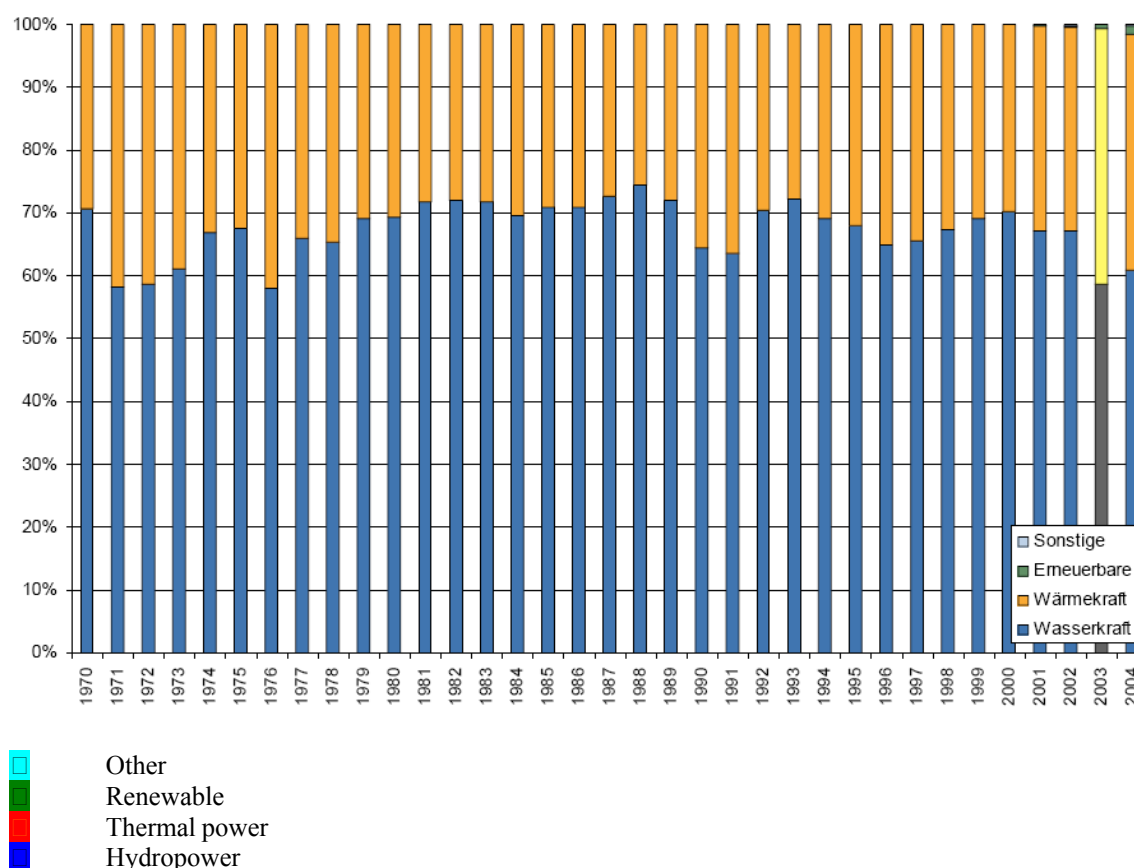


**Figure 1: Reference values of the 1997 base year in accordance with the Annex to Directive 2001/77/EC<sup>1</sup>**

<sup>1</sup>The 70% base value for 1997 laid down in the EU directive may have been calculated by inadvertently including pumping electricity. The production coefficient of run-of-river power plants was 0.98 in 1997 and 0.99 in 2004. Production by storage power plants (after deduction of pumping electricity) may fluctuate from about 9.5 TWh/y to about 10.8 TWh/y. Most of the increase from 1997 to 2004 was accounted for by the power plants at Freudenu (960 GWh more) and Lambach (64 GWh more) and the extra generation from storage power plants (700 GWh more).



This high hydropower share indicates that the electricity mix is strongly dependent on climate conditions, as is also clear from **Figure 2**.

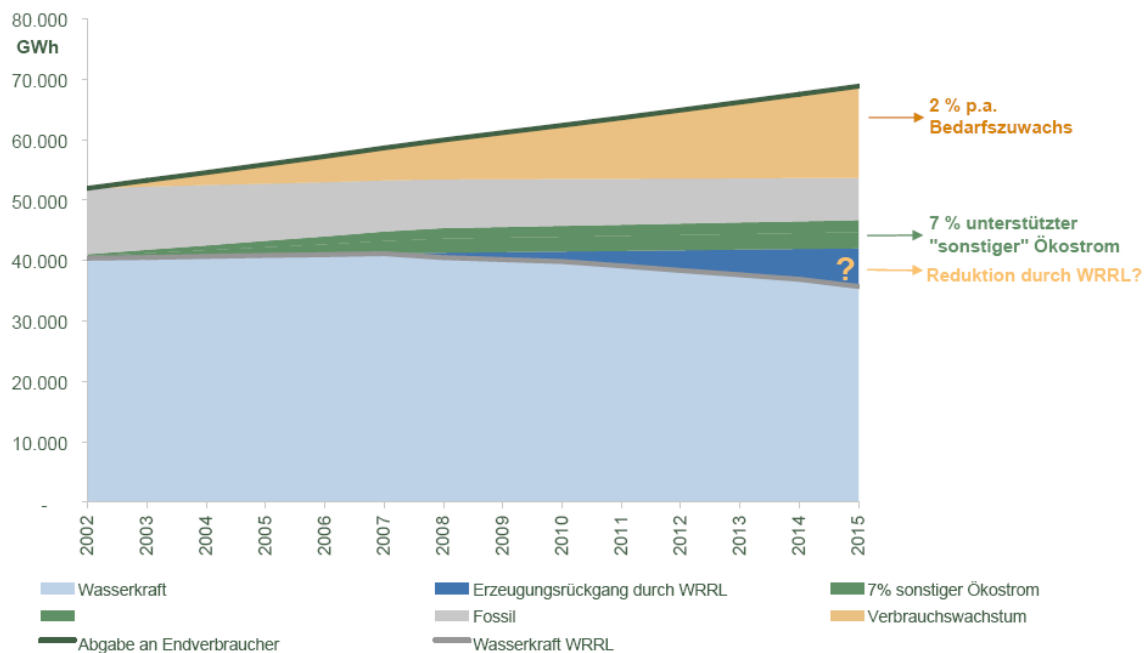


**Figure 2: Share of primary energy sources in the total production mix in Austria in 1970-2004**

**Figure 2** shows the shares in the total production mix which should be distinguished from the shares in gross domestic electricity consumption. However, it is clear that e.g. 2003, which was an unusually dry year, immediately led to a marked reduction in the hydropower share.

Apart from climatic conditions, the share of hydropower will in the future also be significantly affected by the implementation of the Water Framework Directive (Directive 2000/60/EC). Depending on the intensity of any requirements on dismantling hydropower installations and residual water flow, the associated reduction in green electricity production may amount to about 5% to 15% of hydropower generation and would thus exceed the effects of measures promoting green electricity under the Green Electricity Act from 2002.

**Figure 3** shows a scenario of the trend in electricity demand combined with electricity generating structures from 2002 to 2015.



#### Legend at the right side of the graphic:

- 2% demand increase per annum
- 7% subsidised "other" green electricity
- reduction through Water Framework Directive?

#### Legend below the graphic:

- |                      |   |
|----------------------|---|
| Hydropower           | Production decrease through Water Framework Directive |
| Supply to end user   | Fossil  |
| Consumption increase | Hydropower Water Framework Directive                  |
|                      | 7% other green electricity                            |

### Figure 3: Impact of increased consumption and the Water Framework Directive on the share of green electricity – Forecast up to 2015

It is evident that the implementation of the Water Framework Directive and the concomitant reduction in hydropower generation and the extent of the increase in demand for electricity may not be offset by the expansion of electricity generation from wind power, biomass and biogas ("other" green electricity). Accordingly, it will be considerable for electricity generation from renewable energy sources in Austria whether in the implementation of the Water Framework Directive the interests of electricity generation will be properly weighed against nature protection interests. In Austria, the decentralised water resources authorities established in each *Land* of the federation share considerable responsibility for a balanced implementation in which due account is taken of hydropower requirements.

Another important factor is the increase in the demand for electricity. According to all the forecasts made to date by economic research institutes, there will be a significant rise in the demand for electricity as the gross domestic product increases, even with the imposition of programmes to enhance efficiency. Increases in the demand for electricity are expected to occur in particular in households and in the services sector. As hydropower in Austria cannot, partly as a consequence of the requirements of EU Water Framework Directive, be expanded to remain commensurate with the expected increases in demand and as the usable potential of wind power and biomass for electricity generation are in fact quite limited, this may lead to a diminishing share of electricity

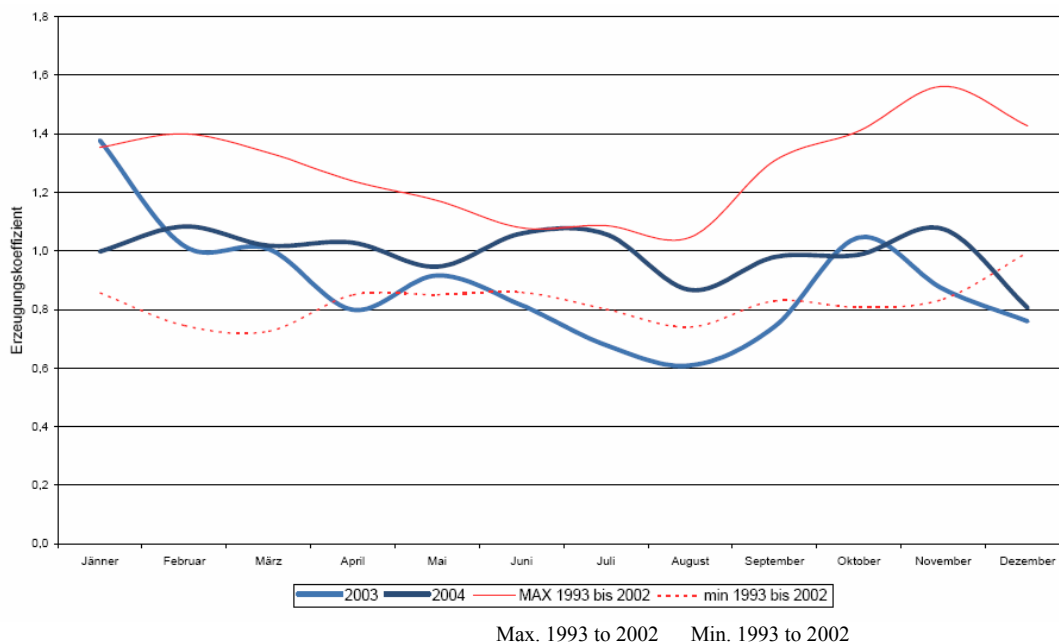
generation from renewable sources, even though Austria, compared with the EU average, is not only prominent with regard to its expanding share of green electricity generation but is also well above average in developing wind power and biomass.

### 3.2 Climatic conditions and availability of resources

The climatic conditions have a significant, direct impact on two technologies which in Austria make a substantial contribution to electricity production: hydroelectric power and wind power. There is also a direct impact with regard to photovoltaics; however, this resource is not discussed any further in the present report as it does not make a significant contribution to power supply in Austria.

#### 3.2.1 Hydroelectric power

Electricity generation from hydroelectric plants is strongly dependent on climatic conditions. Extreme events such as drought or floods lead to marked drops in hydroelectric power production. Figure 4 outlines the difference between the very dry year 2003 and the “standard” year 2004 on the basis of monthly production coefficients. In 2003 (after deduction of pumping electricity)<sup>2</sup> a total of 33.4 TWh were generated by hydroelectric power plants whereas in 2004 the total was 37.6 TWh, i.e. a difference of over 11%.

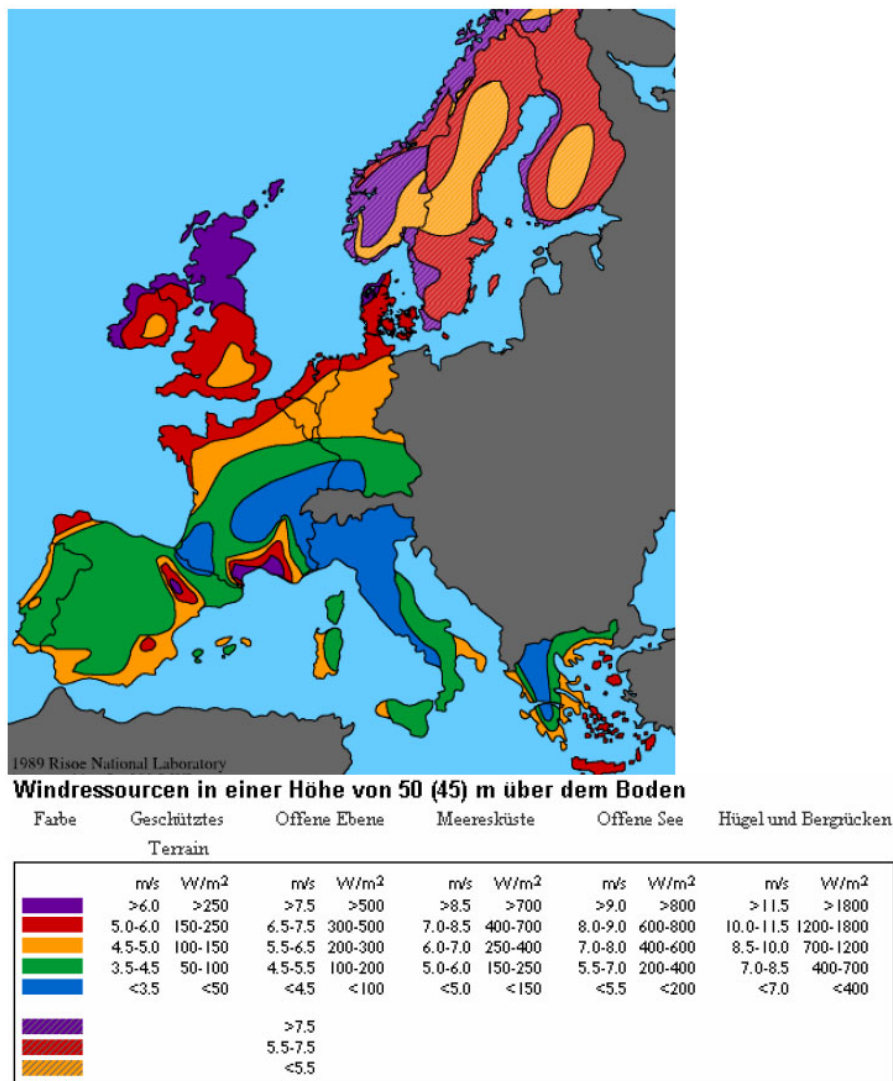


**Figure 4: Monthly production coefficient of run-of-river power plants in 2004**

#### 3.2.2 Wind power

Average wind speeds in Austria are lower than in coastal regions of other European countries where there is a lot of wind. Because of the resulting fewer full-load hours, there are higher costs per MWh of electric energy generated than in other countries. In spite of this, and bearing in mind that Austria is a landlocked country, there has been substantial wind power development in Austria.

<sup>2</sup> Estimated value: about 1 800 GWh.



Colour Sheltered terrain Open plain At a sea coast Open sea Hills and ridges

Wind resources at 50(45) m above ground level

[Source: Danish Wind Industry Association,  
<http://www.windpower.org/de/tour/wres/euomap.htm>, 25 May 2005]

**Figure 5: Wind resources in Europe, average wind speeds  
 at 50 (45) m above ground level**

In spite of the unfavourable wind conditions in a landlocked country such as Austria, electricity generation from wind power has increased sharply since the Green Electricity Act entered into force in 2003. At the end of September 2005, 680 MW wind power is operational and 936 MW has been authorised in Austria. Most of the authorised installations will enter into service in the middle of 2006. Consequently, it is expected that from 2007 about 2 TWh will be generated from wind power in Austria which is tantamount to about 3.5%-4% of electricity supply to end users from public grids in Austria. With these figures, Austria ranks fourth in terms of wind power development intensity per inhabitant. Among the 17 European countries with the highest wind power development intensity, no other country apart from Austria and Luxembourg lacks windy coastal regions.

Country	MW wind power at end 2004	Inhabitants	Inhabitants per MW wind power
Denmark	3 117	5 413 400	1 737
Spain	8 263	40 280 800	4 875
Germany	16 629	82 424 700	4 957
Austria	924	8 174 800	8 847
Ireland	339	3 969 600	11 710
Luxembourg	35	462 700	13 220
Netherlands	1 078	16 318 200	15 137
Portugal	522	10 524 200	20 161
Sweden	442	8 968 400	20 290
Greece	465	10 647 600	22 898
Norway	160	4 574 600	28 591
Italy	1 125	58 057 600	51 607
Finland	82	5 214 600	63 593
Great Britain	888	60 270 800	67 873
Latvia	26	2 306 400	88 708
Belgium	95	10 348 300	108 929
France	386	60 424 300	156 540

[Source: EWEA wind data, inhabitants data, [www.welt-in-zahlen.de](http://www.welt-in-zahlen.de)]

**Table 1: Number of inhabitants per MW wind power**

### 3.2.3 Biomass

In 2004 logging in Austria totalled 16.48 million cubic metres of timber harvested without bark.<sup>3</sup> In comparison to this, a significant proportion will be required for fuel supply to biomass electricity plants.

The requirement of plants authorised until the end of 2004 for generating electricity from solid biomass is about 3 million cubic metres a year, even if account is taken of the relatively high (for biomass) average net efficiency (25%) and it is assumed that at some green electricity plants there is a lower additional wood requirement for electricity production because of the simultaneous use of the heat generated.

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<sup>3</sup> OTS press release from the Federal Ministry of Agriculture, Forestry, the Environment and Water Management of 12 April 2005; indication of quantities without residues (also usable).

$$\frac{1\,680\,000\text{ MWh}_{\text{el}}}{2\text{ MWh}_{\text{th}}/\text{m}^3} \times \frac{1}{0.25(\eta)\text{MWh}_{\text{el}}/\text{MWh}_{\text{th}}} = 3.36\text{ million .m}^3$$

How these high quantities of biomass can be produced in Austria for the generation of electricity has not yet been fully clarified. It is likely that for additional plants generating electricity from biomass only very limited quantities of biomass raw materials can be obtained in this country, which means that in the future it will be necessary to import substantial quantities.

Even highly optimistic forecasts are based on the assumption that even with continued substantial support and major efforts to improve logistics in forestry in Austria, hardly more than 1 million cubic metres of biomass a year will be available in Austria for additional new power plants.

For comparison: about 1% of total electricity supply from public grids can be generated from 1 million cubic metres of biomass.

$$1\text{ million m}^3 * 2\text{ MWh}_{\text{th}}/\text{fm} * 0.25\text{ (efficiency)} = 500\text{ GWh}_{\text{el}}^4$$

Biomass quantities over and above this level may perhaps be projected as theoretical wood growth or as a technical potential, but this is hardly usable on economically viable conditions. The fuel costs of biomass power generating plants will in the future still considerably restrict the cost-reducing potential of these technologies on account of the relatively low electricity production efficiency.

### 3.3 Increase in demand for electricity

In parallel with the increase in the production of green electricity, there is an increase in electricity consumption. The following table shows the public and total electricity supply in Austria in the years from 2000 to 2004.<sup>5</sup>

Supply on the public electricity grid in Austria				Total supply in Austria <sup>1</sup>		
Calendar year	Consumption	Change		Supply incl. PSP, excl. physical exports	Change	
	in GWh	in GWh	in %	in GWh	in GWh	in %
2000	50 678.3	1 547.2	3.1	60 502		
2001	52 719.0	2 040.6	4.0	62 341	1 839.0	3.0
2001(a)	52 213.0	1 534.7	3.0	61 891	1 389.0	2.3
2002	52 860.9	647.9	1.2	63 370	1 479.0	2.4
2003	55 214.8	2 353.9	4.5	65 832	2 462.0	3.9
2004	56 655.0	1 440.2	2.6	67 819	1 987.0	3.0

(a) Transition to the 2002 Data Collection Guidelines (partly estimated)

\* Pumping storage power (about 1 800 – 2 000 GWh per year, estimated)

<sup>4</sup> Total supply quantity in 2004: 51 800 GWh.

<sup>5</sup> These quantities are distinct from the supplies to end users covered by support contributions as network losses and internal use by power stations are included.

1: These quantities are distinct from the supplies to end users covered by support contributions as internal use by power stations are not included.

[Source: Energie-Control GmbH]

**Table 2: Electricity supply on the public electricity grid including grid losses and including internal use by power stations, excluding Austrian Federal Railways (ÖBB) 16 2/3 Hz grid, and total electricity supply in Austria 2000-2004**

The increase factors in the table relate to spring. Overall the 2000-2004 increase in public and total production exceeded 11%.

According to the forecasts of the Austrian Institute of Economic Research (WIFO), there will, with a 2.2% GDP/y increase, be a rise in the demand for electricity of about 2.5-2.7% a year. In an efficiency scenario this increase could be reduced by about 1% a year to about 1.5-1.7% a year.

## **4 The support scheme for green electricity in Austria**

### **4.1 Overview**

Since 2003 the support scheme in Austria has been based on a grid feed-in tariff scheme that is the same throughout the country. The feed-in tariffs for green electricity plants, which were adopted in Austria in December 2002 after political negotiations between the Minister of Economic Affairs, the Minister of the Environment and representatives of the federal *Länder*, are extremely high compared with other countries, and a large number of plants have been set up as a result.

The feed-in tariffs apply for a 13-year period (15 years for new small-scale hydropower plants) from the date on which the green electricity plant is taken into service for all plants that have been authorised up to the end of 2004 and are taken into service until the middle of 2006 (wind energy, sewage gas, landfill gas, geothermal and photovoltaic) or to the end of 2007 (solid, liquid and gaseous biomass and small hydro).

In addition to involving substantial expenditure (about €210 million to €300 million a year), the establishment of numerous green electricity plants has also had saturation effects. Austria is therefore reviewing its support scheme for green electricity and striving for higher efficiency requirements and more stringent budget constraints.

The green electricity plants over 1 300 MW and small-scale hydro plants over 1 100 MW that have already been authorised are not covered by this review and will in any case retain their entitlement to financial support for the full period of 13 (15) years. Of the authorised 1 300 MW green electricity plants, about 500 MW have not yet been set up (situation mid 2005). It is expected that they will be completed by the end of 2007. Accordingly, the further development of green electricity plants in Austria is assured up to 2007.

In the evaluation report of the Amsterdam Forum, *The support schemes of renewable energy sources, Meeting document for the Amsterdam Forum on 13 October 2005*, it is stated on pages 11 and 18 that the support scheme for green electricity in Austria was terminated at the end of December 2004. This statement must be rectified as follows:

The Green Electricity Regulation laying down feed-in tariffs for electrical energy from green electricity plants (BGBl. II No 508/2002 as amended in BGBl. II No 254/2005)

applies to new plants which received all requisite authorisations by 31 December 2004 and which

- are taken into service by 30 June 2006 if they are operated on the basis of photovoltaics, wind power, geothermal power or sewage gas;
- are taken into service by 31 December 2007 if they are operated on the basis of fixed biomass and waste with a high biogenic fraction, liquid biomass or biogas.

For new or revitalised small-scale hydroelectric plants (with minimum output of up to and including 10 MW) the focus is not on the authorisation date. Such plants are entitled to the feed-in tariffs if they have been reestablished or revitalised by 31 December 2007. For existing small hydro plants, the feed-in tariffs apply until 31 December 2008.

Under Article 22(4) of the Green Electricity Act, moreover, the *Länder* receive support payments to promote new technologies for generating green electricity amounting to a total of €7 million a year.

#### **4.2 Description of the support scheme for green electricity in Austria**

Following a period of very limited development of green electricity on the basis of the earlier rules and regulations in force in the *Länder* (the share of wind power, biomass and biogas was about 0.8% in 2002), the support scheme was reformed at the beginning of 2003 through the federal Green Electricity Act.

- For the first time, the entire scheme for “other” green electricity, small-scale hydroelectric power plants and power-heat cogeneration was uniformly regulated at federal level.
- The small hydro certification scheme was replaced by a feed-in tariff model from 2003.
- The targets for “other” green electricity and small hydro plants relate to the federal territory in its entirety and are no longer linked to individual *Länder* (per grid operator or electricity trader).
- The 2008 target for small-scale hydroelectric power was raised from 8% to 9% and for “other” green electricity fixed at at least 4%.
- For the take-up of “other” green electricity and of electricity generated in small-scale hydro plants, three balancing groups were set up (green electricity balancing groups, each with a competent balancing group representative).
- Uniform feed-in tariffs and grants (support contributions) in Austria.

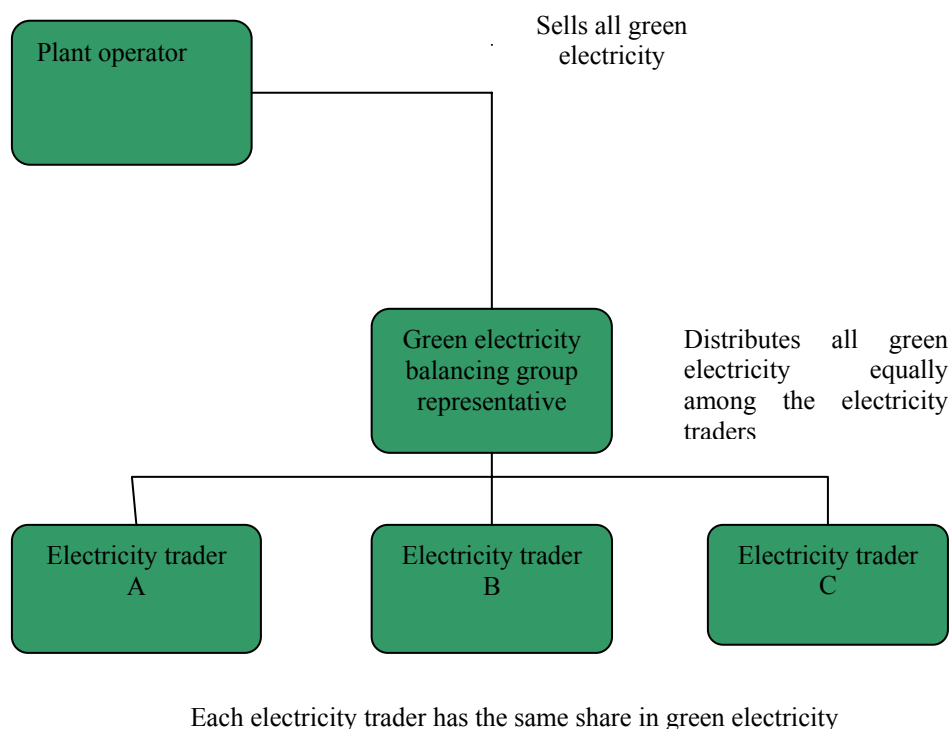
The green electricity support scheme in Austria (“other green electricity” and small hydro) is implemented through the three control area managers (Verbund-APG, VKW and TIRAG) in their capacity as balancing group representatives. They have to take up the energy offered to them at fixed “prices” (feed-in tariffs). For new plants these prices are laid down in the Green Electricity Regulation.

For “existing installations”, i.e. those authorised up to the end of 2002, the prices valid on the date of authorisation as laid down in the (old) feed-in tariff regulations of the *Länder* apply, for reasons of investment certainty, up to the end of the statutory support period. If the support period was not limited in these regulations, Article 30(4) of the



Green Electricity Act provides that this period ends 10 years after the date on which the installation was taken into service.

Every electricity trader in Austria who sells electric energy to end users resident in Austria is allocated green electricity by the balancing group representatives on the basis of the values of the preceding year. The green electricity should be bought from the balancing group representative at the price of 4.5 cents/kWh in accordance with Article 19 of the Green Electricity Act (settlement price). Accordingly, every end user obtaining power from the grid receives the same share of green electricity.

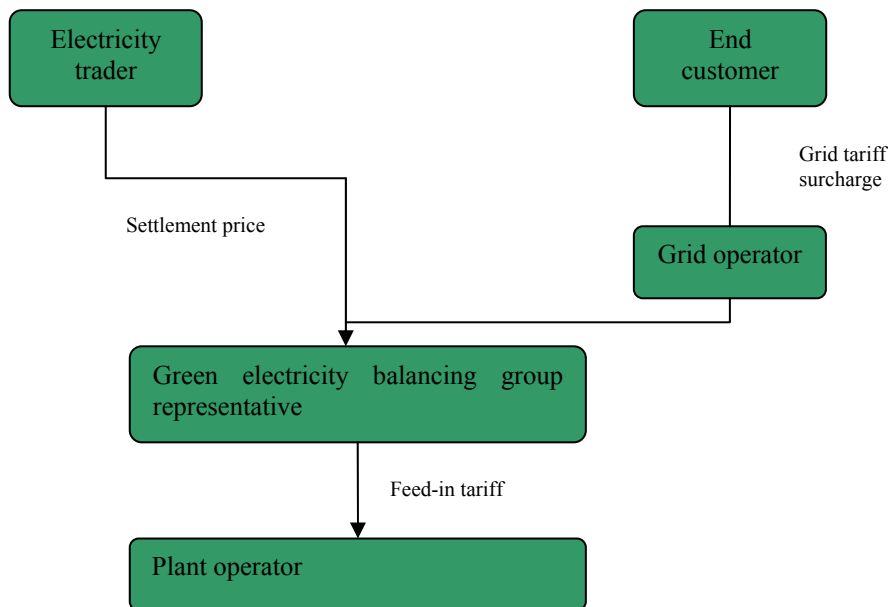


[Source: Energie-Control GmbH]

### Figure 6: Allocation of green electricity

The 4.5 cent/kWh statutory settlement price payable by electricity traders for the allocated green electricity (adaptable by regulation) finances only a part of the support for green electricity. Additional financing is provided through the scheme of support contributions, i.e. surcharges on the tariff charged for the use of the system.

Each year the support contributions are decided by the Federal Minister of Economic Affairs and Labour in consultation with the Federal Minister of Agriculture, Forestry, the Environment and Water Management, the Federal Minister of Justice, the Federal Minister of Social Affairs and Generations and a working party made up of the heads of the governments of the *Länder*.



[Source: Energie-Control GmbH]

**Figure 7: Financing of the green electricity system**

### 4.3 Legal bases

Directive 2001/77/EC was transposed into Austrian law by the Green Electricity Act (BGBl. I No 149/2002). This act lays down the main framework for the support scheme. This legal basis is supplemented by regulations which regulate specific aspects in detail, such as the exact level of feed-in tariffs. To date, the following regulations have been adopted pursuant to the Green Electricity Act:

- Regulation of the Federal Minister of Economic Affairs and Labour laying down the prices for the purchase of electric energy from green electricity installations, BGBl. II No 508/2002 as amended by BGBl. II No 254/2005
- Regulation of the Federal Minister of Economic Affairs and Labour laying down the support contributions to cover additional expenditure of the green electricity balancing group representatives for 2003, BGBl. II No 507/2002
- Regulation of the Federal Minister of Economic Affairs and Labour laying down support contributions to cover additional expenditure of the green electricity balancing group representative for 2004, BGBl. II No 642/2003 (valid from 1 January to 31 March 2004)
- Regulation of the Federal Minister of Economic Affairs and Labour laying down support contributions to cover additional expenditure of the green electricity balancing group representative for 2004, BGBl. II No 135/2004 (valid from 1 April to 31 December 2004)
- Regulation of the Federal Minister of Economic Affairs and Labour laying down support contributions to cover additional expenditure of the green electricity balancing group representative for 2005, BGBl. II No 533/2004

- Regulation of the Federal Minister of Economic Affairs and Labour laying down the new maximum limit of the average burden of total costs for funding green electricity from 1 January 2005, BGBl. II No 525/2004
- Regulation of the Federal Minister of Economic Affairs and Labour laying down an electricity-heat co-generation surcharge on all quantities of electricity supplied to end users (KWK Surcharge Regulation 2003), BGBl. II No 509/2002
- Regulation of the Federal Minister of Economic Affairs and Labour laying down an electricity-heat co-generation surcharge on all quantities of electricity supplied to end users (KWK Surcharge Regulation 2004), BGBl. II No 631/2003
- Regulation of the Federal Minister of Economic Affairs and Labour laying down an electricity-heat co-generation surcharge on all quantities of electricity supplied to end users (KWK Surcharge Regulation 2005), BGBl. II No 524/2004

## **5 Achievement of the national green electricity targets**

### **5.1 Basis**

Article 4 of the Green Electricity Act formulates the objectives of the Act as follows:

- Achievement of the 78.1% target in accordance with Directive 2001/77/EC, taking account of the 56.1 TWh base indicated in the Directive
- More efficient use of support resources while complying with the required upper cost limit of 0.22 cents/kWh in the “other” green electricity sector (may be increased by regulation from 2005 if necessary to attain the targets, in particular the 4% target for wind power and biomass) and 0.16 cents/kWh in the small hydro plants sector, in each case relating to the quantity of electricity kWh supplied to end users from public grids
- Technological prioritisation towards market readiness
- Security of investment for current and future plants
- At least 4% “other” green electricity in 2008<sup>6</sup>
- 9% small-scale hydroelectric power in 2008

Article 4(2) of the Green Electricity Act further stipulates that “from January 2004 about 2%, from 1 January 2006 about 3% and from 1 January 2008 at least 4% shall be attained”. The reference base for these figures is the total annual electricity supply from all Austrian grid operators to end users. This value is not identical with the 56.1 TWh base laid down as the reference base for the 78.1% target in accordance with Directive

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<sup>6</sup> N.B.: The Economic Committee of the National Council unanimously adopted the following recommendation in July 2002 in connection with the introduction of the Green Electricity Act: “Without prejudice to the 4% share to be attained for the production of electric energy from renewable energy sources, measured on the basis of the total annual quantity of electricity generated in 2008, the Federal Minister of Economic Affairs and Labour is called upon to examine whether it would be possible to raise the share of renewable energy sources in 2008 to 5%” (AB 1243 BlgNR, 21. GP). In actual fact, about 7.5% will be attained with the installations already authorised.

2001/77/EC. Consequently, the reference values indicated can be directly related to one another only to a limited extent.

## 5.2 Achievement of the national targets in 2004

In 2002, i.e. before the entry into force of the Green Electricity Act, about 8% of the electricity volume supplied from public grids in Austria was fed into the public grid from small-scale hydroelectric plants and about 0.8% from “other” green electricity plants (wind power, biomass, etc.) supported through feed-in tariffs.

In 2004 total annual electricity supply from all grid operators was 51 766 GWh (provisional figures). The quantities of green electricity fed into the public grid and supported from feed-in tariffs were as follows.

Green electricity – Quantities fed in and payments provided in Austria in 2004						
Energy source	Quantity fed in (in GWh)	Net payment in €	Quantity fed in (% share)	Payment (% share)	Green electricity share in % of total supply quantity <sup>2</sup>	Average payment in cents/kWh
<b>Small hydro plants</b>	<b>3 995</b>	<b>174 478 887</b>	<b>73.45</b>	<b>57.69</b>	<b>7.72</b>	<b>4.37</b>
<b>Other green electricity plants</b>	<b>1 444</b>	<b>127 978 512</b>	<b>26.55</b>	<b>42.31</b>	<b>2.79</b>	<b>8.86 (9.18)<sup>1</sup></b>
Wind power	924	71 422 865	16.98	23.61	1.78	7.73
Solid biomass incl. waste with high biogenic fraction	313	28 673 980	5.75	9.48	0.60	9.16 (11.16) <sup>1)</sup>
Gaseous biomass	102	12 802 452	1.87	4.23	0.20	12.58
Liquid biomass	18	2 302 265	0.33	0.76	0.03	12.93
Photovoltaic	12	7 542 623	0.21	2.43	0.02	65.16
Landfill and sewage gas	74	5 057 063	1.36	1.67	0.14	6.84
Geothermal	2	177 264	0.05	0.06	0.00	7.18
<b>Total small hydro and other green electricity plants</b>	<b>5 439</b>	<b>302 457 399</b>	<b>100.00</b>	<b>100.00</b>	<b>10.51</b>	<b>5.56 (5.59)<sup>1</sup></b>

<sup>1)</sup> If no account is taken of major waste treatment plants, the average payment would increase by the value indicated in brackets

<sup>2)</sup> Related to the total supply from public grids to end users of 51 766 GWh for 2004

[Source: Notified by the green electricity balancing group representatives, May 2005]

**Table 3: Quantity of green electricity fed into the grid and compensated in 2004**

On the basis of 1 444 GWh fed in from "other" green electricity, the proportion of supported “other” green electricity in 2004 was **2.8%** and supported small hydro power was **7.7%** (minimum output 10 MW). In the “other green electricity” sector, the “about 2% from 1 January 2004” target set in Article 4 of the Green Electricity Act has already been exceeded by about 0.8%.

In this calculation, no account has been taken of quantities of green electricity which are fed into the public grid but are not covered by the system of compensation payments. This situation may arise when a plant is taken out of the support scheme because higher

prices can be attained on the free market, as is the case for instance for a number of small-scale hydroelectric plants. Details are provided in the table included in the Annex.

### 5.2.1 Achievement of targets for small-scale hydroelectric plants

The target for small hydroelectric plants laid down in the Green Electricity Act for 2008 is 9%.

In March 2005, 946 MW existing small hydro plants (authorised before 2003) were recognised as green electricity plants (no revitalisation measures were notified for these plants). An additional 104 MW new small hydro plants are recognised. For 9 MW existing small hydro plants, revitalisations with over 50% electricity output increase have been notified. For 44 MW, revitalisation measures have been notified with at least 15% output increase<sup>7</sup>. Through these investment measures, an increase in output of about 570 GWh (520 GWh new plants and about 50 GWh through revitalisation measures) is achieved for the assumed 5 000 full load hours. This is tantamount to an approximately 1% increase in the proportion of electricity output from small hydro plants in relation to the supply forecast for 2008 from public grids (55 200 GWh) or approximately 4 600 GWh small hydro power output forecast for 2008.

The 9% target for 2008 (of 55 200 GWh) in accordance with the Green Electricity Act amounting to about 5 000 GWh will be attained if further electricity output increases of about 400 GWh are achieved through additional investment.

Additional support is required to attain the 9% small hydro power target in 2008.

### 5.2.2 Extent of achievement of “other” green electricity target

For the quantity of power from “other” electricity (wind power, biomass, biogas, etc) fed the public grid, the Green Electricity Act sets targets of “(...) about 2% from 1 January 2004, about 3% from 1 January 2006 and at least 4% from 1 January 2008” as the share in the quantities of “other” green electricity fed into the public grid in relation to the total supply from public grids to end users.

## 5.3 Prospects up to 2007

As a result of the rapid development in green electricity, the green electricity targets (at least 4% wind power, biomass, biogas) will be more than attained in 2008. On the basis of the existing operating licences, it may be assumed that a 7-7.5% share will be achieved already at the end of 2007. The further development of green electricity installations up to and including 2007 has been secured and has already been licensed. In 2006 and 2007, about 500 MW additional green electricity plants will enter into service, which will operate with the support of feed-in tariffs.

Development of bottleneck capacity (in MW) of green electricity plants under contract with balancing group representatives on the reference date indicated (provisional figures, situation in June 2005)			
Energy source	Contractual relationship with balancing group representatives on	Contractual relationship with balancing group representatives on 31 Dec. 2004	Authorised installations on 31 March 2005 <sup>(**)</sup>

<sup>7</sup> Incomplete data collection for revitalisation measures

	31 Dec. 2003		
<b>Biogas</b>	14.97	28.36	71.31
<b>Solid biomass</b>	41.07	87.54	378.84
<b>Liquid biomass</b>	1.97	6.84	18.79
<b>Landfill and sewage gas</b>	22.73	20.28	29.55
<b>Geothermal</b>	0.92	0.92	0.92
<b>Photovoltaic<sup>*)</sup></b>	14.18	15.07	27.74
<b>Wind power</b>	395.59	594.557 <sup>****)</sup>	935.8 (863.79) <sup>***)</sup>
<b>Small hydro up to 10 MW</b>	858.10	851.54	1 103.41

<sup>\*)</sup> Under Article 10(2) of the Green Electricity Act, green electricity balancing group representatives have to take up power from photovoltaic plants even if the 15 MW quota has already been attained

<sup>\*\*)</sup> In the case of wind power, situation in mid-August 2005 because an additional 60 MW were authorised in July 2005. For the other energy sources, the increases after the first quarter of 2005 until the middle of August 2005 remained under 3 MW and these have therefore not been updated

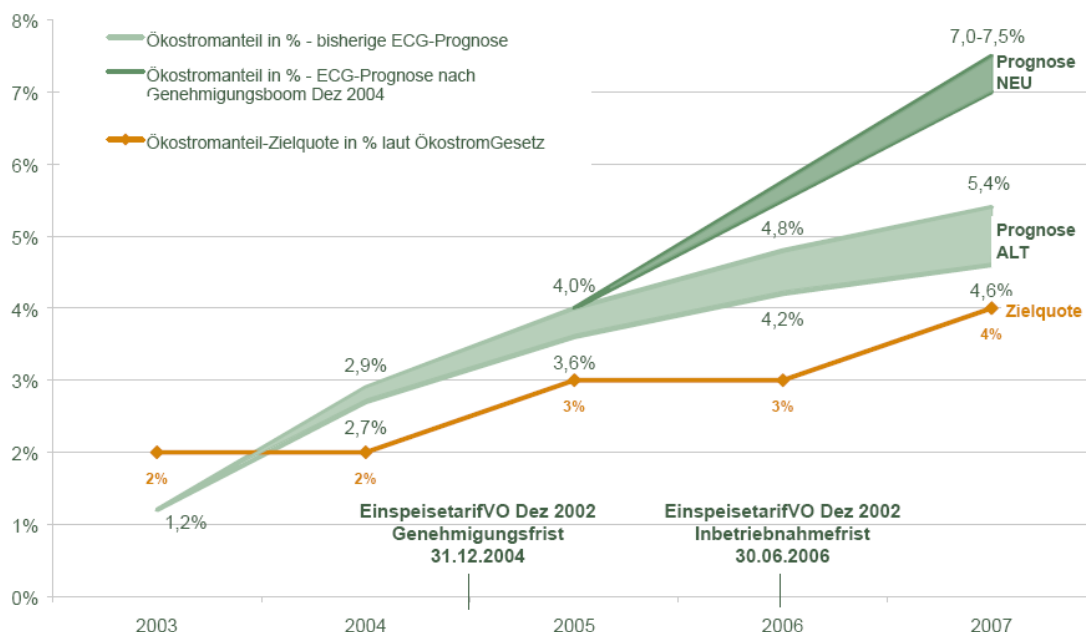
<sup>\*\*\*)</sup> Figure in brackets for 31 March 2005, figure preceding the brackets in September 2005

<sup>\*\*\*\*)</sup> In September 2005 a total of 680 MW wind power was in operation

[Source: Energie-Control GmbH, green electricity balancing group representative ]

**Table 4: Comparison of recognised green electricity plants and green electricity plants under contract with balancing group representatives<sup>8</sup>**

Because of the extension of the periods for taking biomass installations into service (and new or revitalised small hydro plants), the increase curve may be somewhat flattened. However, the figure indicated will be attained not later than at the end of 2008 when the installations can attain full output over the entire period.



<span style="color: green;">■</span> Green electricity share in % – earlier ECG forecast	5.4% forecast old
<span style="color: darkgreen;">■</span> Green electricity share in % – ECG forecast following the spate of authorisations in December 2004	7.0-7.5% forecast new
<span style="color: orange;">■</span> Green electricity share – target in % under the Green Electricity Act	4.6% target

<sup>8</sup> There may be deviations from other statistical analyses on account of partial start-up of operations and incomplete data (account has been taken only of contractual relationships with balancing group representatives on the relevant reference date).

Fed-in tariffs regulation December 2002  
 Authorisation period  
 31 Dec. 2004

Fed-in tariffs regulation December 2002  
 Authorisation period  
 30 June 2006

[Source: Energie-Control GmbH = ECG]

**Figure 8: Shares of “other” green electricity in comparison with the targets under the Green Electricity Act – Updated forecasts following the spate of authorisations at the end of 2004**

#### 5.4 Support payments and production costs per kWh

It is possible that the supported quantities of “other” green electricity will increase to 7.0%-7.5 % in 2007 if most of the green electricity plants already authorised are effectively set up. Some of the plants already authorised which qualify for the statutory feed-in tariffs will be taken into service only in 2006 and 2007 and will therefore not be fully operational until 2008.

**Table 5** shows the development of support payments for the small hydro and “other” green electricity sectors. The figures for 2006 for small hydro and “other” green electricity were calculated with two different market price variants, namely 3.497 cents/kWh (average value of the first two quarters of 2005, published in accordance with Article 20 of the Green Electricity Act) and 4.785 cents/kWh (figure for third quarter of 2005, also published in accordance with Article 20).<sup>9</sup>

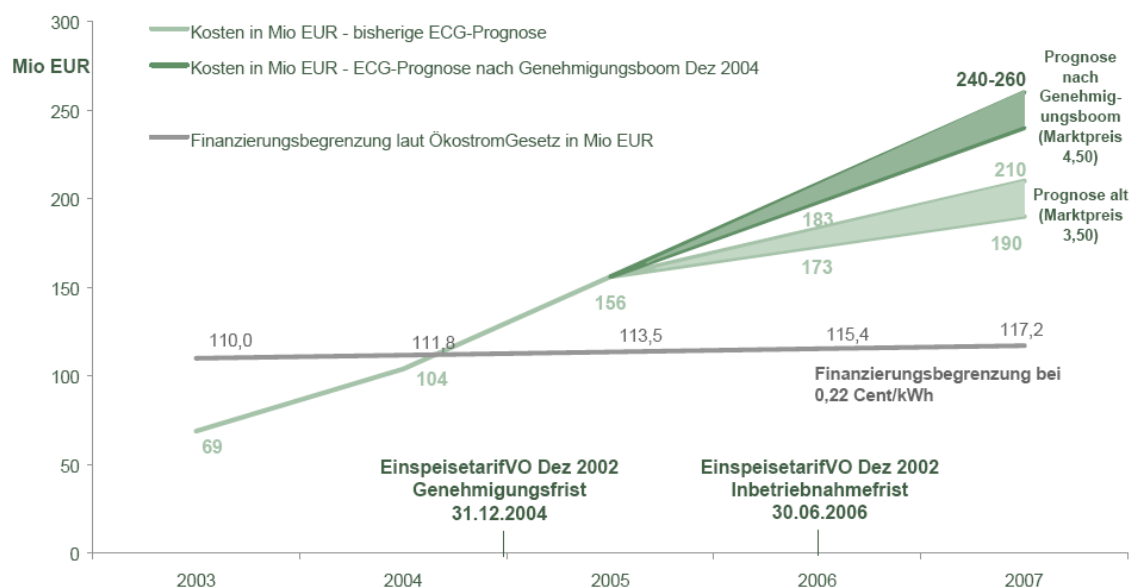
Support payments [in million euro]					
Sector	2003	2004	2005	2006 (market price variant 3.497 cents /kWh)	2006 (market price variant 4.785 cents /kWh)
Wind power	24	48	79	89	72
Solid biomass	16	25	43	113	94
Biogas	17	18	22	34	30
Liquid biomass	1	2	3	8	7
Photovoltaic	8	8	9	9	9
Other supported green electricity (excl. hydro power)	3	3	3	3	2
<b>Total</b>	<b>69</b>	<b>104</b>	<b>159</b>	<b>256</b>	<b>214</b>

[Source: Energie-Control GmbH, green electricity balancing group representative]

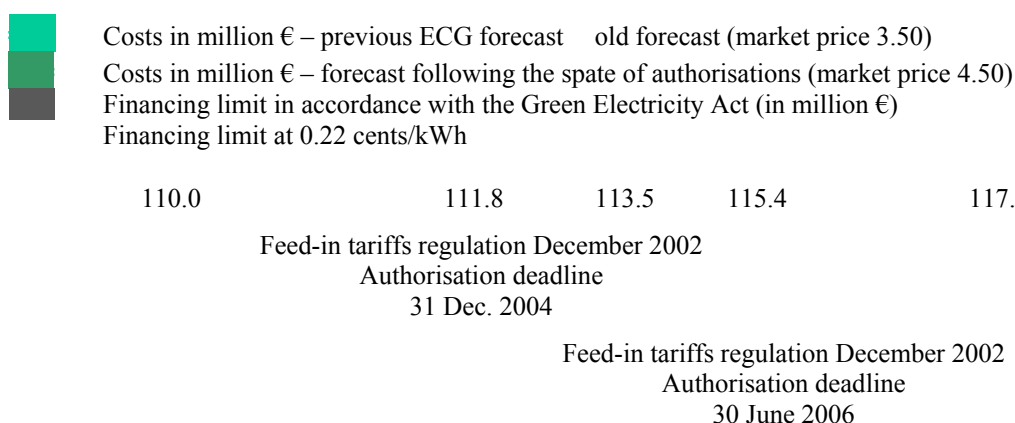
**Table 5: Development of support payments in 2003-2006 (2005 and 2006 figures are forecasts)**

**Figure 9** shows the development of support payments in a graph.

<sup>9</sup> In the mean time, the market price for the fourth quarter of 2005 (€45.11/MWh) has already been published in accordance with Article 20 of the Green Electricity Act.



million €



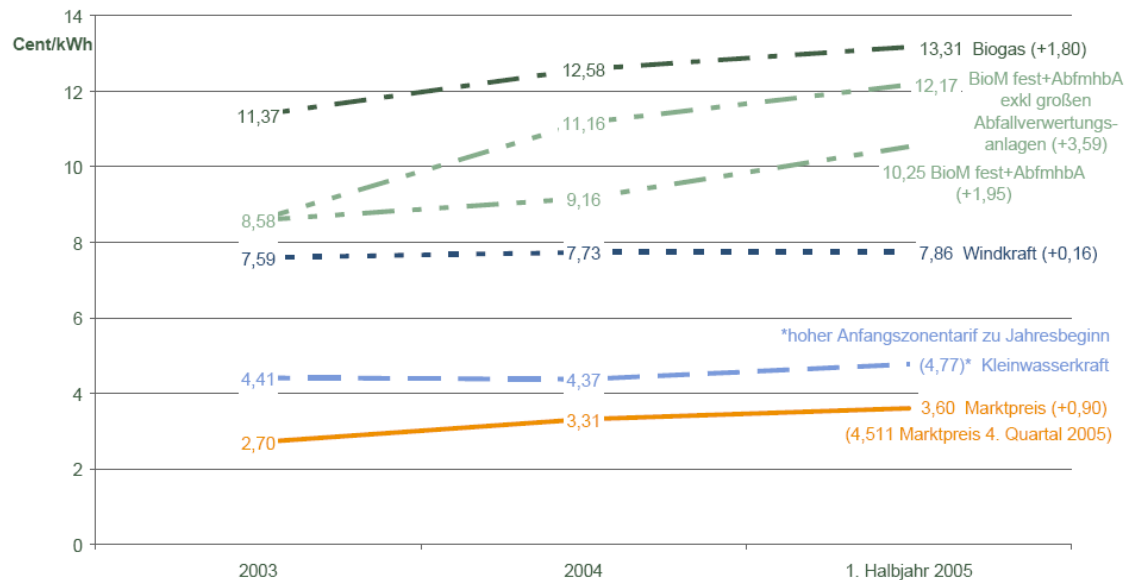
[Source: Energie-Control GmbH = ECG]

**Figure 9: Development of support payments for green electricity in 2003-2007 (excluding small hydro and fossil power-heat cogeneration)**

The following figure shows the development of average feed-in tariffs granted from 2003 up to the first quarter of 2005 in comparison with the development of market prices (published by Energie-Control GmbH in accordance with Article 20 of the Green Electricity Act).<sup>10</sup>

<sup>10</sup> N.B. The figure for small hydroelectric power for the first quarter of 2005 is not representative for the year as a whole as in accordance with the zone model the first quantities of electricity fed by a plant into the grid benefit from higher tariffs.





cents/kWh

first half-year 2005

- Biogas (+1.80)
- Solid biomass + waste with high biogenic fraction, excl. large waste treatment plants (+3.59)
- 10.25 Solid biomass + waste with high biogenic fraction (+1.95)
- 7.86 Wind power (+0.16)
- \* high initial zone tariff at beginning of year (4.77)\* small hydro
- 3.60 market price (+0.90)
- (4.511 market price fourth quarter 2005)

[Source: Energie-Control GmbH, green electricity balancing group representative]

**Figure 10: Development of average compensation payments for subsectors of “other” green electricity in comparison with the market price**

There have been significant increases in average feed-in tariffs in all sectors of supported “other” green electricity.

The average feed-in tariff for biogas plants rose from 11.37 cents/kWh in 2003 to 13.31 cents/kWh in the first quarter of 2005, for solid biomass plants and waste with high biogenic fraction (disregarding a number of large waste treatment plants) from 8.58 cents/kWh to 12.17 cents/kWh, and for wind power plants from 7.59 cents/kWh to 7.86 cents/kWh.

With this development, the technologies used and their cost structures – with the exception of hydro power – were further removed from market readiness than at the beginning of the implementation of the Green Electricity Act. Even at a market price level of 4 cents/kWh, the feed-in tariff for biogas indicated above during the first quarter of 2005 (13.31 cents/kWh) represents a subsidy level of 70%, for solid biomass (12.17 cents/kWh) 67% and for wind power (7.86 cents/kWh) – disregarding compensatory energy expenditure – 49%.

## 6 Achievement of targets under Directive 2001/77/EC

EU Directive 2001/77/EC seeks to promote an increase in the contribution of renewable energy sources to electricity production. Specifically, the Annex to the Directive Report on Directive 2001/77/EC

mentions as an indicative (i.e. non-obligatory) target increasing electricity production from renewable energy sources in EU-15 from 13.9% in 1997 to 22%.<sup>11</sup>

In the European Commission's evaluation report of May 2004,<sup>12</sup> it is forecast that EU-15 will not attain the 22% indicative target in 2010 on the basis of current developments, but only about 18% to 19%. This means that the increase from the 14% base value of 1997 will only be half as high as the indicative target set for EU-15.

The same Annex to the Directive contains targets – likewise indicative, i.e. non-obligatory – for each Member State. Among these, Austria occupies a special position since it is the only country which with a 70% base value in 1997 already generated during this reference year over 50% of its electricity consumption from renewable energy sources, mostly hydroelectric power.<sup>13</sup> Accordingly, a footnote was included in the Annex to the Directive concerning the 78.1% target for Austria according to which Austria declares that 78.1% would be a realistic figure given the assumption that in 2010 gross domestic electricity consumption will be 56.1 TWh.

The inclusion of this statement from Austria in the Annex to the Directive was a condition for Austria to agree to the 78.1% target.

In view of the steady rise in demand for electricity, failure to take account of an absolute reference value would have meant an extremely unequal treatment for Austria because of the country's far higher starting value in comparison with the other Member States of the EU. Austria would have had to develop electricity production far more substantially solely to retain the 70% share compared with the other Member States taken together in order to attain the indicative target (cf. Chapter 3).

In contrast with the sub-targets for small hydro power and “other” supported green electricity laid down in the Green Electricity Act, all electricity produced from renewable energy sources is taken into account to attain this target, including large-scale hydroelectric power plants, the plants' internal use of electricity and also renewable energy sources that are not supported under the provisions of the Green Electricity Act such as biomass for internal power supply plants in industry.

The dynamic effect of the high base value of 70% in combination with an increased demand for electricity (requiring high additional green electricity production just to retain the 70% base value in the face of increasing demand) means that in all forecast scenarios for a realistic increase in the demand for electricity, Austria cannot produce 78.1% from renewable energy sources in relation to gross domestic electricity consumption in 2010. This is true even if an energy efficiency programme is implemented in which, according to an analysis of the WIFO, it is likewise expected that there will be an annual increase in electricity demand of about 1.5–1.7%.

In an average year, about 37 TWh is generated from hydroelectric power in Austria. This is tantamount to an approximate share of 66.5% of consumption in 1997 at 56.1 TWh. If this hydro power production remains constant in absolute terms, its share in overall

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<sup>11</sup> Subsequently for EU-25 an increase from 13% to 21%.

<sup>12</sup> COM (2004) 366 final. Can be downloaded from the Energie-Control GmbH website.

<sup>13</sup> Sweden in second place with 49.1%, Portugal third with 38.5% and Spain fourth with 19.9 %.

consumption diminishes by about 1.2% per year because of the increase in demand for electricity. This means that just to compensate for the diminution of the share of hydro power an additional 1.2% would have to be produced from other renewable energy sources each year. Aggregated from the base year 1997 to the target year 2010, this would be about 15%. After 2010 electricity production from renewable energy sources is expected to be further complicated with the implementation of Water Framework Directive (cf. **Figure 3**).

The following table shows the development of electricity production from renewable energy sources from 1997 to 2004 together with the development of gross domestic electricity consumption. It also indicates a forecast up to 2010 which is influenced by the spate of authorisations at the end of 2004 and a further expansion from 2006 to 2010. This development in Austria is compared with the average development in the European Union.

Achievement of targets under Directive 2001/77/EC	1997**	2004 actual values	Authorised until 2004 (expansion to 2006/2007)	Scenario for further expansion 2006 to 2010	2010	Increase 1997 to 2010
	GWh	GWh	GWh	GWh	GWh	GWh
Gross domestic electricity consumption (incl. pumping electricity consumption) ****	56 083	67 819			74 596	18 513
Large-scale hydro (> 10 MW), excl. pumped power (about 1 800 GWh)***	31 400	33 465	33 465	300	33 765	2 365
Supported small hydro power (> 10 MW) incl. 5% internal use	4 152	4 197	4 750	100	4 850	698
“Other” supported green electricity (wind power, biomass, biogas, etc.), incl. 5% internal use	605	1 516	4 300	850	5 150	4 545
Other non-supported green electricity (waste liquor etc., statistically incompletely recorded)	845	1 450	1 500	100	1 600	755
Total of electricity production from renewables	37 002	40 628	44 015	1 350	45 365	8 363
Aliquot Austrian share in EU-15 target scenario (from 14% in 1997 to 22% in 2010)	7 852				16 411	8 559
Aliquot Austrian share in expected EU-15 development (from 14% in 1997 to 19% in 2010)	7 852				14 173	6 322
Share of renewable energy of 56 100 GWh***	66%	72%	78%	2%	81%	
Share of renewable energy in gross domestic electricity consumption	66%	60%			61%	

\* Assumptions for internal use of other green electricity plants and small hydro plants estimated

\*\* Data for small hydro and biomass taken over from 1998 operating statistics

Assumptions for internal use of other green electricity plants and small hydro plants estimated

\*\*\* The 70% base value for 1997 laid down in the EU Directive may have been calculated by inadvertently including Report on Directive 2001/77/EC

pumping electricity. The production coefficient of run-of-river power plants was 0.98 in 1997 and 0.99 in 2004. Production by storage power plants (after deduction of pumping electricity) may fluctuate from about 9.5 TWh/y to about 10.8 TWh/y. Most of the increase from 1997 to 2004 was accounted for by the power plants at Freudenu (960 GWh more) and Lambach (64 GWh more) and the extra generation from storage power plants (700 GWh more).  
 \*\*\*\* Assumed electricity demand increase from 2004 to 2010 by 1.6% a year  
 [Source: Energie-Control GmbH]

**Table 6: Extent of achievement of the indicative target of Directive 2001/77/EC**

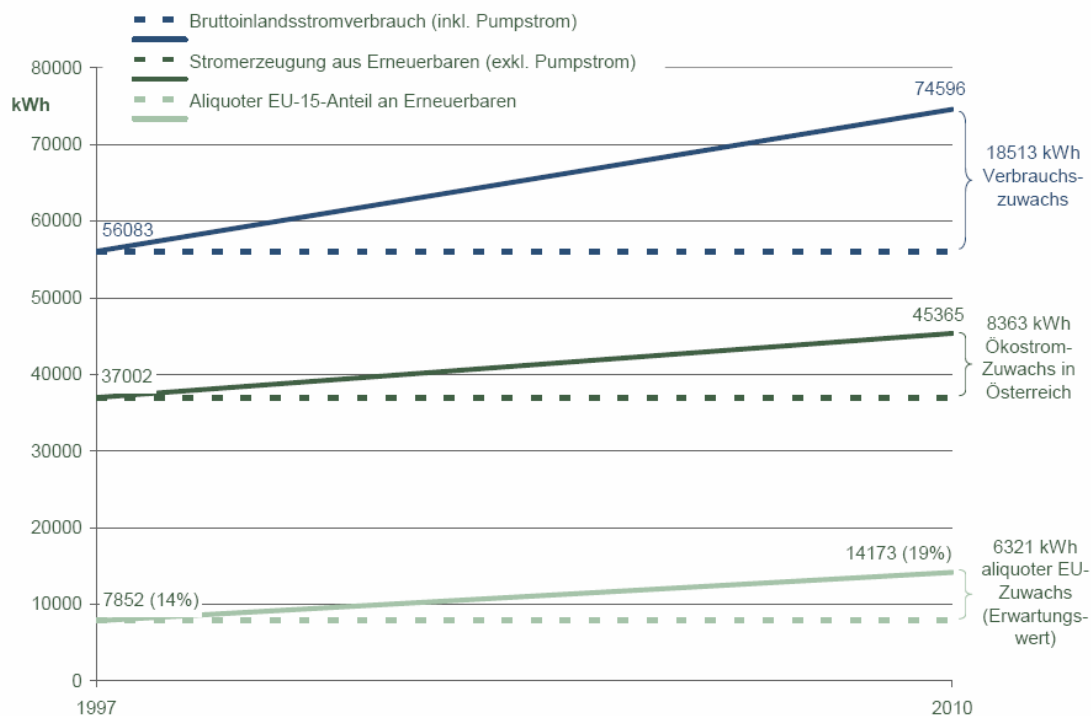
With this development, Austria will therefore in 2010 produce 8 360 GWh more electric energy from renewable energy sources than in 1997. This is a level of increase that is clearly above the EU average. According to DG TREN's evaluation report (of 24 May 2004, COM (2004) 366 final), the increase expected for EU-15 from 1997 to 2010 is from 14% to 19%; an aliquot conversion to Austria's shares would be tantamount to an approximately 6 300 GWh increase of electricity production from renewable sources, i.e. clearly less than the expected 8 360 GWh.

This above-average development in Austria seems all the more remarkable as Austria, as a landlocked country, has only significantly less favourable locations for wind energy generation with considerably higher support requirements and as the expansion of wind power has played a predominant role in expanding green electricity in recent years (cf. Chapter 3). In comparison with wind power, the potential for generating electricity from biomass and biogas are relatively small.

With an aliquot apportionment of the 22% target attainment up to 2010 to Austria, this would be the equivalent of an increase in green electricity from 1997 to 2010 of about 8 560 GWh, i.e. slightly more than the approximately 8 360 GWh expected increase.

This 200 GWh difference is certainly within the margin of statistical errors or forecast errors (annual increase in electricity demand, medium-scale hydro and large-scale hydro, etc.). Accordingly, current developments already show that Austria meets its aliquot share in the indicative 22% target up to 2010 while this target is not attained EU-wide and Austria, as a landlocked country, is at a geographic disadvantage in the context of the priority given to wind power generation. As a result of this development and the basic conditions described above, the level of subsidy to be charged to electricity consumers in support of electricity generation from renewable energy sources in Austria is likewise clearly above the European average. The following graph shows the development of the increase in demand for electricity, the increase of green electricity production in Austria and the aliquot EU green electricity shares.

- - Gross domestic electricity consumption (incl. pumped electricity)  
 18513 kWh consumption increase
- - Electricity production from renewables (excl. pumped electricity)  
 8363 kWh green electricity increase in Austria
- - Aliquot EU-15 share in renewables  
 6321 kWh aliquot EU increase (expected)



**Figure 11: Green electricity development in Austria in comparison with the increase in the demand for electricity and the development in EU-15**

## 7 Evaluation of development of green electricity from the angle of national climate protection

### 7.1 CO<sub>2</sub> reduction through increased use of green electricity

One of the objectives of providing support for generating electricity from renewable energy sources is to contribute to the reduction of CO<sub>2</sub> as part of the climate protection programme. Through the authorisation up to the end of 2004 of power plants generating electricity from renewable energy sources, the effect of the support provided under the Green Electricity Act will be that an additional 4.5 TWh electricity will be produced per year from renewable sources. The production of electric energy in new, modern gas/gas-and-vapour plants<sup>14</sup> causes about 0.34 tonnes CO<sub>2</sub> emission per MWh generated. On the other hand, the production of electric energy from renewable energy sources causes no CO<sub>2</sub> emission (hydroelectric power, wind power) or, if combined with sustainable forestry management, only to the extent that it can be extracted and bound from the atmosphere as the forest grows (biomass)<sup>15</sup>. Consequently, through the production of green electricity in accordance with the Green Electricity Act, Austria prevents the emission of 1.5 million tonnes of CO<sub>2</sub> causing green house gases in comparison with a modern gas/gas-and-vapour power station. For comparison: the total emission of greenhouse gases caused by humans in Austria in 2003 was about 91.6 million tonnes CO<sub>2</sub> equivalent.

<sup>14</sup> Reference scenario for the evaluation of new green electricity plants.

<sup>15</sup> CO<sub>2</sub>-neutral

If the production of 1 MWh of green electricity is promoted in new green electricity plants e.g. by granting €50/MWh as financial support, this means that in comparison with modern gas/gas-and-vapour plants with a 0.34 t CO<sub>2</sub> per MWh emission factor CO<sub>2</sub> costs of €150 are prevented.<sup>16</sup> The following table shows CO<sub>2</sub> reduction cost calculations per energy source on the basis of average feed-in tariffs granted in 2004 at an assumed market price of €45/MWh.<sup>17</sup>

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<sup>16</sup> €50/MWh divided by 0.34 t CO<sub>2</sub>/MWh.

<sup>17</sup> Note: For wind power, a market value reduction of €10 /MWh (1 cent/kWh) is applied as sales revenue would be reduced because of the non-influenceability of the production time variation curve and because compensatory energy expenditure would have to be taken into account.

CO <sub>2</sub> reduction costs			
Energy source	Average feed-in tariff 2004	Calculation (emission factor 0.34 t CO <sub>2</sub> /MWh)	CO <sub>2</sub> reduction costs
	€/MWh		€/t CO <sub>2</sub>
Existing small hydro	43.7	$(43.7 - \text{€}45/\text{MWh} / 0.34 \text{ t CO}_2/\text{MWh})$	0
New small hydro	48.0	$(48 - \text{€}45/\text{MWh} / 0.34 \text{ t CO}_2/\text{MWh})$	9
Wind power	77.3	$(77.3 - \text{€}35/\text{MWh} / 0.34 \text{ t CO}_2/\text{MWh})$	124
Biomass (excl. large waste treatment plants)	111.6	$(111.6 - \text{€}45/\text{MWh} / 0.34 \text{ t CO}_2/\text{MWh})$	196
Biogas	125.8	$(125.8 - \text{€}45/\text{MWh} / 0.34 \text{ t CO}_2/\text{MWh})$	238
Small biomass and agricultural biogas plants	150.0	$(150 - \text{€}45/\text{MWh} / 0.34 \text{ t CO}_2/\text{MWh})$	309
Photovoltaic	651.6	$(651.6 - \text{€}45/\text{MWh} / 0.34 \text{ t CO}_2/\text{MWh})$	1784

[Source: Energie-Control GmbH]

**Table 7: Calculation of CO<sub>2</sub> reduction costs**

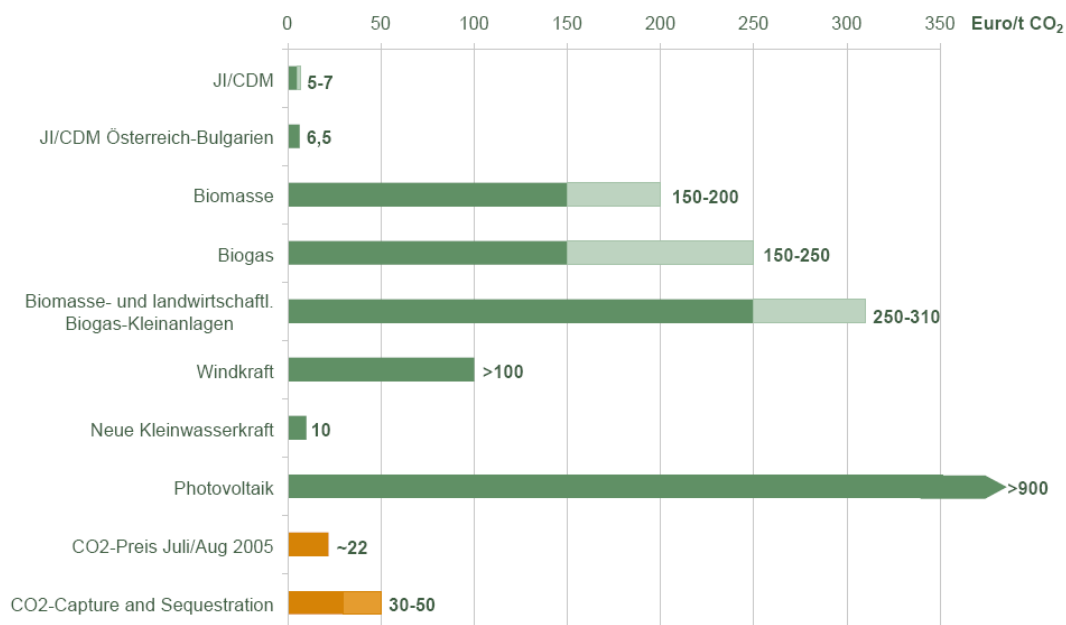
Accordingly, the CO<sub>2</sub> reduction costs for new small-scale hydroelectric power plants are therefore about €9/t CO<sub>2</sub>, for wind power €124/t CO<sub>2</sub>, biomass €196/t CO<sub>2</sub>, biogas €238/t CO<sub>2</sub>, small biomass and biogas plants €309/t CO<sub>2</sub> and photovoltaic power €1 784/t CO<sub>2</sub>. These figures should be viewed as average guide figures; in individual cases the actual figures may deviate substantially.

Comments on the above table:

- If instead of the 0.34 t CO<sub>2</sub>/MWh emission factor, applicable to modern gas/gas-and-vapour plants, a 0.5 t CO<sub>2</sub>/MWh emission factor were used as the average value for existing caloric power plants, the CO<sub>2</sub> reduction costs would be one third less, although this would mean comparing new green electricity plants with sub-optimal fossil-caloric plants.
- The spate of authorisations at the end of 2004, involving in particular costly small-scale biomass and biogas plants, will lead to increases in the average feed-in tariffs for biomass and biogas plants in the period from 2005 to 2007.

- Investment grants (e.g. provided in particular for small biomass and biogas plants usually as a supplement to the feed-in tariffs, are not included in the calculations.

The following figure provides an overview of the reduction costs of electricity generation from green electricity production supported through feed-in tariffs, and the reduction costs are compared with those of other climate protection programmes (JI/CDM) and with the current prices of CO<sub>2</sub> emission rights in the framework of the EU Emission Trading System (ETS) and of cost estimates for CO<sub>2</sub> capture and sequestration measures vis-à-vis fossil-fuelled power plants.



[Source: Energie-Control GmbH]

JI/CDM	5-7
JI/CDM Austria-Bulgaria	6.5
Biomass	150-200
Biogas	150-250
Small-scale biomass and agricultural biogas plants	250-310
Wind power	> 100
New small hydro plants	10
Photovoltaic	> 900
CO <sub>2</sub> price July/Aug. 2005	~ 22
CO <sub>2</sub> capture and sequestration	30-50

**Figure 12: CO<sub>2</sub> reduction costs (assumption for green electricity: average 2004 feed-in tariffs, market price 4.5 cents/kWh, emission factor fossil electricity generation 0.34 t CO<sub>2</sub>/MWh to 0.5 t CO<sub>2</sub>/MWh)**



## 7.2 Achievement of the national climate strategy targets

On 12 June 2002 the Austrian Federal Government adopted Austria's climate strategy to achieve the Kyoto target.<sup>18</sup> The following table shows the country's green electricity targets in comparison with the actual development of green electricity to date.

Measures in accordance with climate strategy 12 June 2002 <sup>1</sup>			Green Electricity Act – Current trends	
Sector	Total potential (million t CO <sub>2</sub> equivalent)	Derived from the following 2010 targets according to Kyoto options analysis <sup>2</sup>	Up to 2007 (based on authorised plants as at 31 March 2005)	Degree of achievement of target
<b>Hydro power capacity expansion</b>	0.2	<b>ca. 80 MW</b> (about 400 GWh)	<b>104 MW</b> only for small hydro plants supplementing large-scale hydro	attained
<b>Revitalisation of small hydro</b>	0.25	<b>ca. 80 MW</b> (about 400 GWh, 160 plants of 500 kW each)	<b>53 MW<sup>3</sup></b>	not yet attained
<b>Wind energy</b>	0.4	<b>ca. 300 MW</b> (in 2010 up 600 GWh/a)	<b>924 MW</b>	well over target
<b>Biogas cogeneration (agr. plants)</b>	0.04	<b>About 20 MW</b> (200 000 livestock units)	<b>71 MW</b> (about 100 additional plants, depending on size this corresponds to 100 – 250 GWh/a fed in)	well over target
<b>Biogas cogeneration (non-agr. plants, municipal and company plants)</b>	0.1			well over target
<b>Biomass (cogeneration)</b>	0.1	<b>About 50-70 MW</b> (200-250 GWh/a)	<b>378 MW</b>	well over target
<b>Photovoltaic</b>	no data		<b>15 MW</b>	negligible

1: Climate strategy 2008/2012, adopted by the Council of Ministers on 12 June 2002

2: See Kyoto options analysis of Kommunalkredit Austria AG

3: No comprehensive data available

[Source: Energie-Control GmbH]

### Figure 13: Green electricity shares in comparison with climate protection strategy targets

In all sectors, except for the revitalisation of small-scale hydroelectric plants, the targets set in the climate strategy are achieved or greatly exceeded. From the angle of the efficient use of resources, this development is questionable as the prevention cost in the green electricity sector are far above those of other measures (cf. **Figure 12**).

<sup>18</sup> The Austrian climate strategy is currently under review.

## **8 The guarantee of origin scheme in Austria**

### **8.1 Introduction**

In accordance with the provisions of Directive 2001/77/EC, the provisions on guarantee of origin had to be transposed into national legislation by the middle of 2004. The provisions have been fully transposed in Austria through the entry into force of the Green Electricity Act on 1 January 2003 and since there has been a fully functional guarantee of origin scheme, including an electronic guarantee of origin databank managed by Energie-Control GmbH in collaboration with the grid operators.

### **8.2 Legal basis**

The requirements for issuing guarantees of origin laid down in Article 5 of Directive 2001/77/EC are transposed into Article 8 of the Green Electricity Act. On the basis of these stipulations, each operator of a green electricity plant in Austria has the right to receive from the grid operator to whose grid the plant is linked a guarantee of origin concerning the energy fed into the grid.

Under Article 8 of the Green Electricity Act, a guarantee of origin should contain the following information:

- the quantity of energy generated,
- the type and minimum output of the plant,
- production period and place,
- energy resources used.

Under the provisions laid down, the grid operator is free to decide on the format (paper or electronic) and the period and unit to be used.

The head of the regional government is responsible for supervising the issuing of guarantees of origin.

### **8.3 Quality criteria for issuing guarantees of origin and transposition in Austria**

In connection with the guarantees of origin system, Article 5(5) of Directive 2001/77/EC provides that the Member States or the competent bodies should “(...) *outline in the report referred to in Article 3(3) the measures taken to ensure the reliability of the guarantee system.*”

The reliability of the guarantee of origin system basically depends on the accuracy of the information available. This accuracy may relate to several stages of the information transfer:

1. Issuing the guarantee of origin
  - a) guarantee of the energy produced
  - b) guarantee of the energy resources used
2. Transfer of the guarantee of origin

### 3. Use of the guarantee of origin

#### **8.3.1 Issuing the guarantee of origin**

##### **8.3.1.1 General quality criteria**

At the first level of information transfer, there are two phases in which erroneous information may occur. Erroneous information may concern the energy quantities produced or the primary energy resources used. An essential quality criterion for preventing wrong information in the sectors mentioned above is a confirmation of the relevant information by an independent third party (e.g. a regulator or certifying bodies). Apart from this requirement, it is also extremely important whether one or several agencies may issue the guarantee. Monopoly positions in issuing guarantees obviate potential errors that may occur in co-ordination of several issuing bodies.

##### **8.3.1.2 Implementation in Austria**

In 2004 Energie-Control GmbH made the guarantees of origin databank available for issuing guarantees of origin. For quantities of energy settled through the green electricity balancing group, guarantees of origin are for each month automatically generated in the databank and automatically transferred to the energy suppliers' accounts commensurate with their supply to end users. Each energy supplier thus receives the same share in renewable energy.<sup>19</sup>

In addition to settling these energy quantities, the databank may on a voluntary basis also be used by every grid operator or accreditation agency to issue guarantees of origin or guarantees in accordance with Article 45a(7) of the EIWOG [Electricity Management and Organisation Act]. Many grid operators have made use of this possibility and a large part of Austria's electricity production is settled through the guarantees of origin databank. This enhances reliability both with regard to guarantees of origin and to electricity disclosure as risks of fraud, e.g. the double issue of guarantees of origin, can be prevented within a databank.

In Austria two independent agencies are involved in ensuring the quality of information in issuing guarantees of origin. The use of (distinct) primary energy sources is certified by the head of the regional government. Energy quantities are certified through the grid operator, again an independent agency, which at the same has a regional monopoly. This means that for any plant in Austria there can in all cases be only one competent body for issuing guarantees of origin. In terms of information quality with regard to the issue of guarantees, Austria is therefore already at a very high level.

#### **8.3.2 Transfer of guarantees of origin**

##### **8.3.2.1 General quality criteria**

Within the EU, guarantees of origin are used for various purposes, which may be as follows:

- Use for the transfer of green electricity between Member States towards attaining the indicative targets of Directive 2001/77/EC

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<sup>19</sup> For more detailed information, see [www.herkunftsnachweis.at](http://www.herkunftsnachweis.at)

- Use as proof for electricity disclosure
- Use for obtaining State support (feed-in tariffs, quota models)
- Use as a quality label guarantee
- Use for marketing purposes

As guarantees of origin are already assigned a value on the market, it is essential to ensure that the same information cannot be multiply transferred (“traded”). To prevent such multiple trading, the technical format of the guarantee of origin system is of particular relevance. Duplication of information is virtually excluded within an electronic databank. If guarantees of origin are drawn up on other media (paper), there is a potential for multiple trading.

### **8.3.2.2 Implementation in Austria**

Article 8 of the Green Electricity Act does not specify which medium should be used by grid operators to issue guarantees of origin. They may use either the databank described above or paper forms. This possibility for grid operators to choose their medium entails that potential double transfers are prevented through legislation. There is therefore still room for improvement, and an electronic solution is recommended.

## **8.3.3 Use of guarantees of origin**

### **8.3.3.1 General quality criteria**

The risk of the double use of a guarantee of origin (e.g. for electricity disclosure and for a quality label independent from this) is closely linked with a (potentially) multiple transfer. In this connection, it should be borne in mind that various market participants may be involved in the use of guarantees of origin (e.g. plant operator requests feed-in tariff, electricity trader requests tax reduction). It is this fact that leads to potential interface problems and multiple use, which is why, also in this regard, the technical format of the guarantee of origin system is of essential significance. Within a databank, the guarantee of origin can be used for only one possible purpose and cannot be used for multiple purposes. A guarantee of origin can of course serve several systems at the same time (e.g. the receipt of financial support does not preclude its use for purposes of electricity disclosure), but within the databank, and in particular at the interfaces with other systems, there should be clear demarcations.

### **8.3.3.2 Implementation in Austria**

In Austria, the main purpose for which guarantees of origin are used is for electricity disclosure as Article 45a(7) of the EIWOG Act stipulates that guarantees of accredited bodies are not required if guarantees of origin are provided.