# Green Electricity Report Austria 2010

Report by Energie-Control GmbH pursuant to section 25(1)
*Ökostromgesetz* (Green Electricity Act)

## September 2010


Energie-Control GmbH
Rudolfsplatz 13a, 1010 Vienna
www.e-control.at

# Foreword

This report on renewable electricity, combined heat and power (CHP) and electricity demand trends in Austria was prepared pursuant to section 25(1) *Ökostromgesetz* (Green Electricity Act) as amended by BGBl (Federal Law Gazette [FLG]) I no 104/2009, which requires Energie-Control GmbH (E-Control) to report to the Minister of Economy, Family and Youth and the Advisory Council for Electricity on an annual basis.

Section 25(1) Green Electricity Act states:

"Energie-Control GmbH shall submit every year by the end of June to the Federal Minister of Economy, Family and Youth, as well as to the Advisory Council for Electricity, a report analysing to what extent the objectives of this Act have been attained and which changes have taken place as compared to the previous years. The report shall contain detailed analyses of the rate and causes of electricity consumption growth, as well as a discussion of policy options for reducing that growth. The report may include proposals for improving or adapting the support schemes and other regulations of this Act. Moreover, the report shall include the quantities of, as well as the expenses for, electricity from recognised plants using solar, geothermal, wind, wave and tidal energy, biomass, wastes containing a high percentage of biogenous materials, landfill gas, sewage treatment plant gas and biogases (eco-energy installations as well as hybrid and cofiring plants)."[1]

E-Control regularly posts renewable electricity data on its website (www.e-control.at). This information on market prices, renewable electricity output, support payments to generators, and balancing energy amounts and expenditure is updated on a quarterly basis.

Information on power labelling and guarantees of origin is contained in the annual power labelling report, downloadable from www.e-control.at (German only).

[1] legal text available in German only

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# 1 Executive summary

### Supported green power contributes 11.4% of public electricity supply

| | million kWh (= GWh) | % |
|---|---|---|
| Wind | 1,915 | 3.6% |
| Solid biomass | 1,958 | 3.7% |
| Biogas | 525 | 1.0% |
| Photovoltaics | 21 | 0.04% |
| Other supported green power (liquid biomass, landfill and sewage gas) | 85 | 0.16% |
| Small hydro capacity increase supported with feed-in tariffs | 800 | 1.5% |
| Expansion of hydropower up to 20 MW with approved investment grants | 500 | 0.9% |
| Additional black liquor fired capacity supported with (approved) investment grants | 300 | 0.6% |
| **Total green power supported under the Green Electricity Act** | **6,104** | **11.4%** |
| Compare: total hydropower generation including large hydro, excluding pumping | 37,310 | 69.8% |
| **Total supply from the public grid in 2009** | **53,439** | **100.0%** |

**Table 1: Supported green power (including approved investment grants) in the public grid in 2009**

From its entry into force until the end of 2009, the Austrian *Ökostromgesetz* (Green Electricity Act) supported an **increase in green electricity output by about 6,100 GWh each year**. This corresponds to **approximately 11.4%** of overall public electricity supply in Austria. Of these 6,100 GWh, 5,300 GWh were given feed-in tariffs (800 GWh relating to the construction of new and expansion of existing small hydropower generating stations and 4,500 GWh from "other" renewable generation) and an additional 500 GWh from small and medium-sized hydropower plants attracted investment grants. This was also the case for 300 GWh electricity produced from black liquor.

In the **first half of 2010**, supported green power bought by the green power settlement agent OeMAG accounted for 10.7% (2,957 GWh) of public electricity supply (27,534 GWh). This share was made up of 2.1% (580 GWh) hydropower from plants with up to 10 MW maximum capacity and under contract to OeMAG (this corresponds to about one-quarter of small hydropower generation, i.e. most operators opted out of the support scheme and sold their electricity on the free market), 3.9% (1,062 GWh) wind power, 3.6% (994 GWh) solid biomass and 1.0% (270 GWh) biogas. Photovoltaics (PV) contributed 0.04% (12 GWh).

In **the entire year 2009**, small hydro electricity purchased by OeMAG accounted for 1.2% of total public supply; this figure soared up to reach 2.1% in the first half of 2010. While of course new investments in generation capacity played a role in this, low market prices for electricity also made the feed-in tariffs paid by OeMAG a much more attractive option for operators than before.

For the other types of supported green electricity, there were no major changes in the first half of 2010 as compared to 2009 (public supply in 2009: 53,439 GWh; power bought by OeMAG in 2009: 644 GWh small hydro; 1,915 GWh wind; 1,958 GWh solid biomass; 525 GWh biogas; 21 GWh PV).

**Target of 15% supported green power in 2015 attainable**

We expect a significant increase in the amount of electricity generated in supported green power stations due to **new wind power plants**. As of mid-2010, projects for wind power plants with several hundred MW of capacity were awaiting approval by the relevant authorities. This includes about 500 MW wind power capacity to be approved and built over the next years in the Austrian province of Burgenland. Projecting wind power trends in Lower Austria is not as straightforward, as there is more local resistance to the construction of new wind parks. There are also plans for other federal provinces, but the wind conditions are less favourable there and projects are much smaller.

Since 2003 investment in small hydropower stations (rehabilitation of existing or construction of new plants) has been supported with increased feed-in tariffs. This has increased the output of small hydro by approximately 800 GWh.

Investments in medium-sized hydro (10 to 20 MW) after mid-2006 and small hydro (up to 10 MW) after 2007 are also eligible for investment grants. The Green Electricity Act provides for total spending of € 125 million (m) for this purpose up to 2014 (€ 75m overall or € 12.5m each year for small hydro and € 50m overall or € 7m each year for medium-sized hydro).

As of July 2010, the *Beirat für Investitionszuschüsse* (Advisory Council for Investment Aid) had approved investment grants for 28 new small hydropower plants with a cumulative capacity of 16.7 MW, and applications for 83 new facilities accounting for 45.5 MW were pending.

Regarding the rehabilitation of existing small hydropower plants, five applications (0.7 MW) had been approved and 33 (29.9 MW after the rehabilitation) were still awaiting a decision.

If all of these applications are accepted, investment grants will result in an additional 270 GWh electricity from small hydropower plants.[2]

The Advisory Council for Investment Aid had also approved investment grants for four new medium-sized hydropower plants with a cumulative capacity of 66.5 MW by July 2010. These plants will account for another 300 GWh electricity generated at medium-sized hydropower plants.[3]

**€ 340m in support for green electricity disbursed each year**

The financial support collected from electricity consumers under the Green Electricity Act amounts to **€ 340m each year**. Most of this money (€ 280m) is used to for feed-in tariffs, which are above the market price for electrical energy normally paid by consumers, or go into investment grants for hydropower plants (€ 20m each year, of which € 12.5m for small and € 7.5m for medium-sized plants). In addition, € 41.5m are invested in combined heat and power (CHP) each year; this sum is made up of € 28m for feed-in tariffs for modernised CHP plants[4] and € 13.5m for investment grants (€ 2.5m for black liquor and € 11m for other CHP).

[2] 62.1 MW * 4,000 full-load hours (new plants) and a 20% increase in output from existing, rehabilitated plants, resulting in 30.6 MW * 4,000 full-load hours
[3] 66.5 MW * 4,500 full-load hours
[4] These will end in 2010.

Electricity suppliers that are allocated supported green electricity on the basis of daily forecasts impose additional risk surcharges, which are often not itemised and not determined in a transparent way.[5]

The total amount of support under the Green Electricity Act of € 340m does not include additional support schemes for electricity generation from renewable sources, such as the Austrian Climate Change and Energy Fund (KLI.EN), which supports PV plants with capacities of up to 5 kW with € 35m in 2010, the provincial governments, which also support solar power plants, and the programme of the Ministry of Environment which provides funding for heat generated at biomass and biogas-fired CHP plants. Taking these resources into account, annual renewable electricity support payments **exceed € 375m**.

The **€ 340m in subsidies** that arise from the **Green Electricity Act** alone accounted for **8.8%** of the total cost of electricity supplied from the Austrian public grid (approx. € 3.85bn = 55 TWh * 7 cent/kWh) in 2009.

We can therefore safely say that green power support is a significant economic factor on the electricity market.

**Reimbursement of renewable electricity expenses**

E-Control received about 2,300 applications for the reimbursement of renewable electricity expenses incurred in 2008. Of these, 581 had been accepted by the end of August 2010 – resulting in reimbursements of € 19.4m – and 108 had been rejected. In twelve cases the de minimis rule (€ 500,000) applied.

[5] Report of the Austrian Federal Competition Authority of May 2010, available in German from the website of the Austrian Parliament at http://www.parlinkom.gv.at/PG/DE/XXIV/III/III_00127/fname_183698.pdf#search=%22%22

**Renewable generation approaching commercial viability**

The Green Electricity Act aims to promote particularly those renewable technologies that can actually become **competitive on the free market**. When analysing the effect of the green electricity support scheme between 2003 and the start of 2010, results are different for each renewable generating technology.

Between 2007 and mid-2010, the price of **baseload contracts** on the power exchange varied between 4.2 cent/kWh and 8.5 cent/kWh.

The **feed-in tariffs** paid out by OeMAG in the first half of 2010 ranged **from 5.5 cent/kWh to 56.1 cent/kWh**. On average, hydropower received 5.5 cent/kWh, wind 7.8 cent/kWh, solid biomass 13.6 cent/kWh, biogas 14.2 cent/kWh (2008 and 2009 saw a top-up payment for high fuel/feedstock costs of 3.9 cent/kWh and 3 cent/kWh, respectively) and photovoltaics 56.1 cent/kWh.

The trend in feed-in tariffs in 2010 was upwards for wind power (9.7 cent/kWh) and biogas (up to 22.5 cent/kWh including CHP and technology markups), but steeply downwards for photovoltaics (25–38 cent/kWh) and remained stable for solid biomass (up to 14.98 cent/kWh).

**Investment grants** for new hydropower stations with capacities of up to 20 MW and for CHP plants are limited to 10-30% of the original investment cost. This means that the supported share of the total cost is much smaller than for almost all feed-in tariffs for the other renewable generation technologies.

Generally, investment grants are the preferable support method as they are more effective in promoting a technology's readiness for the market than feed-in tariffs (which support operation). The latter have produced situations in some cases (e.g. biogas or biomass stations) where facilities would not be economically viable on their own and operation would be halted immediately if support ceased.

### *Only limited support needed for hydro and wind power*

Only very **limited financial support** is needed for investments in **hydro and wind power stations** to be economically viable. Feed-in tariffs for wind power rose quite sharply to reach 9.7 cent/kWh for new plants (a plus of 24% compared to the 7.8 cent/kWh tariff for facilities that were built between 2003 and 2006), but are still close to the electricity price at the exchange over the past years (4.2–8.5 cent/kWh).[6] Larger hydropower plants are often feasible without receiving any support; for medium-sized facilities (10–20 MW), investment grants between 10 and 20% are usually sufficient; 20–30% suffice for small plants.

### *Biomass and biogas not ready for the free market*

Generating electricity from solid biomass is relatively inefficient due to the low energy density of the raw material and the low temperature of the steam produced (small plants reach efficiencies of only 25–30%, or even less if own use is taken into account).

Though this drawback could be mitigated by using CHP technology, large biomass power stations are usually built at sites where there is no significant additional need for heat production.

The current legal situation is such that biomass stations are only granted feed-in tariffs that cover their costs if normal, non-supported electricity prices at least equal fuel costs; this does not allow for much additional investment into this technology, as fuel costs are often higher due to the low efficiency of biomass.

Generating electricity from biogas is the second-most expensive electricity generation technology (the most expensive is PV). The past few years have seen average feed-in tariffs of 17–18 cent/kWh (including raw material top-up payments of 3.9 cent/kWh in 2008 and 3 cent/kWh in 2009), but small power plants were much more heavily subsidised and often received investment grants in addition.

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[6] This also holds true when considering the necessary balancing energy costs incurred, which sank to 0.478 cent/kWh in 2009 (2008: 0.765 cent/kWh).

In spite of this, and the fact that raw material prices have been decreasing since they peaked in 2007–2008, operators of biogas plants claim that the feed-in tariffs do not permit viable operation of their facilities.

The legal situation is similar to biomass: new biogas stations are only granted feed-in tariffs that cover their costs if normal, non-supported electricity prices at least equal fuel costs; again, fuel costs are frequently higher due to the low efficiency of biogas and often, new plants are not eligible. In spite of this, there are a number of expansions of existing plants.

***Decentralised generation through PV***

Small photovoltaic power plants up to 5 kW are currently eligible for investment grants paid out by KLI.EN, financed from the state budget; larger facilities can opt for the feed-in tariff scheme set by the Green Electricity Act, which is financed by electricity consumers through their bills.

Photovoltaic electricity generation has the advantage that it takes place where the electricity is consumed, i.e. there is no need to use the public grid. Optimising supply structures would maximise this benefit by synchronising PV generation and local electricity consumption. Feed-in tariffs counteract these efforts as they incentivise injection of solar power into the public grid.

A comparison of the $CO_2$ reduction costs resulting from the feed-in tariffs for PV and those incurred by investment grants from KLI.EN reveals the much greater efficiency of the latter. KLI.EN provides grants of € 1,300 per kW of installed capacity. Assuming 1,000 full-load hours and an operational lifetime of 13 years (similar to the guaranteed term of feed-in tariffs), the resulting $CO_2$ reduction costs are € 230/t. This is less than half of the $CO_2$ reduction cost occasioned by feed-in tariffs.

Small-scale PV is a field where system operators are currently applying a wide variety of access conditions and charges, and network connection is far from standardised. A harmonised framework in this area would be desirable.

**Energy Strategy and Renewable Energy Action Plan**

The **Austrian Energy Strategy**, launched by the Federal Ministry of Economy, Family and Youth, in cooperation with the Federal Ministry of Agriculture, Forestry, Environment and Water Management in March 2010, contains a comprehensive range of targets relating to Austria's future energy supply. One major goal is to stop demand growth by 2020 and stabilise final energy consumption at today's 1,100 PJ.

The strategy provides for the use of renewables where the best cost-benefit ratio can be achieved. In electricity generation, this is taken to be the case in hydro and wind power. Agricultural energy crops are to be used primarily to produce biofuels for transport, and solid biomass, where it is available for energy uses, for heat generation. The use of PV will depend on how this technology's costs evolve.

Electricity generation from renewable energy sources is to be increased by 17 PJ (4.7 TWh) between 2008 and 2020; this corresponds to 1.5% of final energy consumption. The cumulative expansion of generation facilities envisaged for each individual renewable technology even exceeds this goal: hydropower is to deliver 13 PJ (3.5 TWh) – reduced by the effects of the Water Framework Directive – and new wind power up to 10 PJ (2.8 TWh) by 2020.

Considering the expansion and construction of hydropower facilities over the past years supported in accordance with the Green Electricity Act (feed-in tariffs and investment grants), small and medium-sized hydro should contribute about half of the overall hydropower goal. But plans for the expansion and construction of hydropower plants with capacities beyond 20 MW are not currently in line with the Energy Strategy: construction permits have only been granted to a limited extent so far.

The developments planned in the Austrian Energy Strategy to secure energy supply are reflected in the **National Renewable Energy Action Plan for 2010**, which was sent to the

European Commission at the end of July 2010, in line with Directive 2009/28/EC, and contains measures aimed at attaining the 34% renewables target.[7]

**Amendments to the Green Electricity Act**

Under the auspices of the Ministry of Economy, Family and Youth, a number of working groups have discussed proposed changes to the Green Electricity Act in separate workstreams. These relate to:

- How to raise the necessary financial means for green electricity support; and
- Specific provisions on individual green generation technologies.

***Raising the necessary financial means***

On 23 September 2009 the Austrian National Council passed a **motion for a resolution** requesting the Ministry of Economy, Family and Youth to present a proposal for amending the financing mechanism for the green electricity support scheme to the National Council by September 2010. The following conditions were set for the new mechanism:

- A fair and transparent distribution of costs that reflects consumption;
- A ceiling for green electricity costs paid by energy-intensive companies; and
- Itemisation of green electricity costs on bills.

The Ministry of Economy, Family and Youth established a working group to identify and assess possible approaches. The following financing mechanisms were discussed:

a) A markup on the total grid cost or individual parts of the system charges;
b) Allocation of supported green power with appropriate renveues; and
c) Drawing on the national budget and increasing the energy surcharge.

The current system is financed from markups on the system charges (by way of a flat renewables charge, which makes for about € 110m) and from the allocation of supported

[7] 28 PJ (7.8 TWh) additional electricity output from renewable sources in 2020 as compared to 2008, including PV and biogenous energy sources

green power through daily schedules at the ordered settlement prices for green electricity (which accounted for about € 514m in 2009; the forecast amount for 2010 is about € 657m). Suppliers charge final customers higher costs than that, arguing that they need a margin because of the uncertainty involved in forecasting of the amounts of supported green power.

The allocation of supported green power and the proceeds yielded will remain a central factor in the financing mechanism of the support scheme in the future. Selling supported electricity at market prices on the power exchange (i.e. ignoring the higher ordered renewable settlement prices) would have yielded proceeds of € 240m in 2009. This sum of course depends on electricity price trends, volume trends and the ideological value of supported green power. Forecasts are therefore subject to a degree of uncertainty.

### *Selective approach to technologies*

Since 2003, the green electricity support scheme under the Green Electricity Act has succeeded in increasing generation from renewable sources by 10% of total energy supply to consumers from the public grid. A cost-benefit analysis of this development reveals very different tendencies for the individual generation technologies:

- Relatively small incentives (by way of one-time investment grants) are sufficient for the construction, expansion and operation of **hydropower plants**.[8]
- For **wind power plants** to be built and operated, feed-in tariffs that are between 15 and 80% above the market price (depending on current market prices and feed-in tariffs) are needed.
- **PV power plants** could be constructed and operated even if support was cut further if they made use of their potential for decentralised generation at the consumption site (i.e. generating for own use).
- The average support payments needed for generation from **solid biomass** and **biogas** are much above the hydro and wind levels. The raw materials for these plants

[8] Hydropower plants up to 500 kW maximum capacity are also eligible for offtake obligations at multi-year average market price (annual proceeds would be approximately 500 kW * 4,000 full-load hours * 6 cent/kWh = € 120,000)

could normally be employed more efficiently for other energy uses (heat generation and production of transport biofuels) that involve much less financial support.

Conclusions on how to focus future strategies can build on this experience with the various technologies over several years.

**Target attainment**

The Green Electricity Act stipulates that the green power supported in line with the Act and injected into the public grid should reach **15%** of total supply to consumers in 2015. Consumption is projected to reach 56.6 TWh in that year, which means that the target for supported green electricity would be **8.5 TWh**.

In 2009 the green power settlement agent OeMAG purchased 4.5 TWh of green electricity (excluding small hydro). In addition, 2003 to mid-2010 saw the approval of new small hydropower plants with a total capacity of 180 MW and rehabilitation of stations with a total capacity of 90 MW. This would result in additional renewable electricity output of 0.8 TWh.[9]

Investment grant applications pending at OeMAG would cause an additional 0.2 TWh production from small hydro and 0.3 TWh production from medium-sized hydro if approved and implemented.

Investment grants for electricity generation from black liquor have been granted for plants amounting to a further 0.3 TWh.

Counting all approved and pending applications, the amount of additional green power enabled by the Green Electricity Act between 2003 and mid-2010 reaches 6.1 TWh.

The Green Electricity Act provides for wind power generation to increase by 1.5 TWh between 2010 and 2015 and biomass generation – assuming that sufficient raw materials are

[9] Annual values

available – by 0.6 TWh. If the relating additional capacity is built the amount of green power supported under the Green Electricity Act since 2003 rises from 6.1 to 8.2 TWh.

This would leave a shortfall of no more than 0.3 TWh to reach the overall target of 8.5 TWh, which could be met by further optimising existing hydropower stations and building new ones.[10]

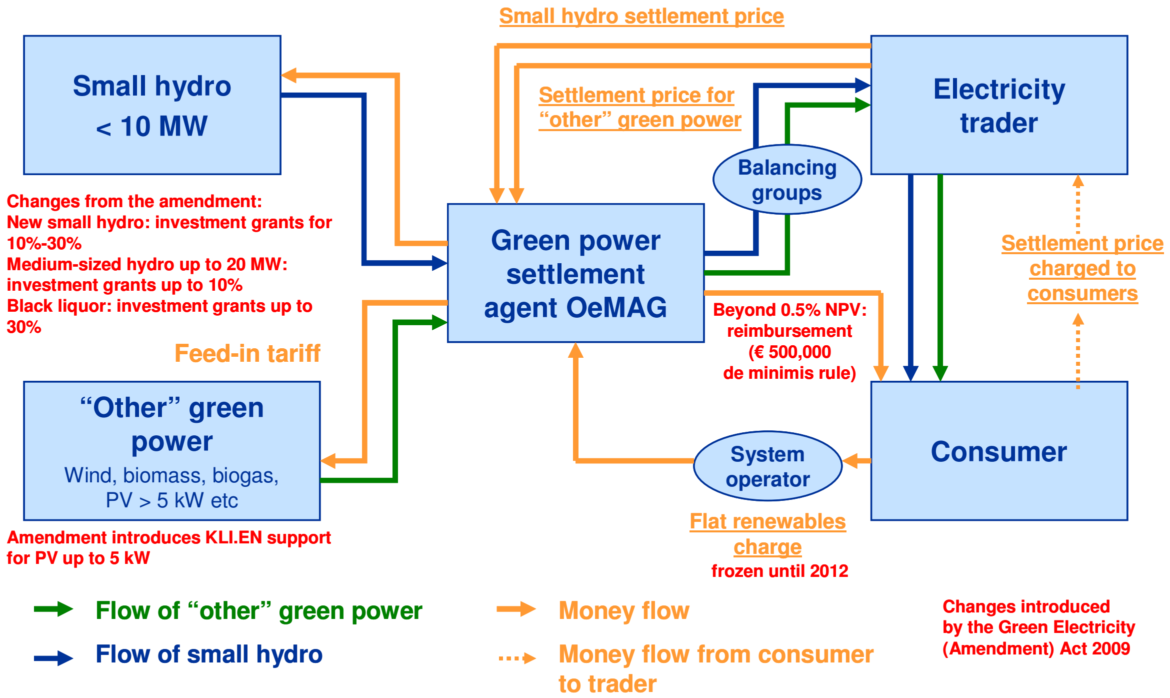
[10] The Green Electricity Act stipulates a goal of an additional 3.5 TWh from hydropower plants up to 20 MW; as of mid-2010, 1.3 TWh were already in operation or applications were pending.

# 2 Legal basis

## 2.1 Current legal framework (FLG I no 149/2002 as amended by FLG I no 104/2009)

The legislative framework for renewable electricity, and in particular the support scheme, is established by the Green Electricity Act (FLG I no 149/2002 as amended by I FLG no 104/2009).

The diagram below shows the workings of the current support scheme.




March 2009 | Source: E-Control

**Figure 1: Schematic diagram of the renewable electricity support scheme under the Green Electricity (Amendment) Act 2009**

Renewable electricity injected into the grid by supported generating stations attracts subsidies in the form of the feed-in tariffs paid by *Abwicklungsstelle für Ökostrom AG* (the green power settlement agent, OeMAG) at the rates in force when the contracts with it were concluded. This electricity is allocated to electricity retailers via the balancing groups in accordance with their shares of final consumption.

The *Ökostromverordnung 2010* (Green Electricity Order 2010, FLG II no 42/2010) was published on 2 February 2010. It determines the feed-in tariffs for new renewable generating stations where a first-time contract is made with the green power settlement agent between 20 October 2009 and the end of 2010 and it is possible to do so without exceeding the budget. The table below shows the feed-in tariffs for 2010.

| FEED-IN TARIFFS FOR GREEN POWER PLANTS 2010 *) | | | Tariffs in cent/kWh as set in FLG II no 42/2010 |
|---|---|---|---|
| **Generation independent of raw materials** | | | **13 years** |
| **Wind** | | | **9.70** |
| **Photovoltaics** | **building integrated** | up to 5 kWp | **investment subsidy by KLI.EN** |
| | | 5 kWp to 20 kWp | **38.00** |
| | | over 20 kWp | **33.00** |
| | **standalone devices** | up to 5 kWp | **investment subsidy by KLI.EN** |
| | | 5 kWp to 20 kWp | **35.00** |
| | | over 20 kWp | **25.00** |
| **Landfill and sewage gas** | | sewage gas | **6.00** |
| | | landfill gas | **5.00** |
| **Geothermal energy** | | | **7.50** |
| **Generation that relies on raw materials** | | | **15 years** |
| **Solid biomass (e.g. wood chips, straw)** | | up to 500 kW | **14.98** |
| | | 500 kW to 1 MW | **13.54** |
| | | 1 to 1.5 MW | **13.10** |
| | | 1.5 to 2 MW | **12.97** |
| | | 2 to 5 MW | **12.26** |
| | | 5 to 10 MW | **12.06** |
| | | over 10 MW | **10.00** |
| **Wastes containing high biogenic fractions** | | SN 17, tab 2, e.g. bark, sawdust | minus 25% |
| | | SN 17, tab 1, e.g. particle board waste | minus 40% |
| | | 5-digit SN in tab 1 and 2 Green Electricity Act | **5.00** |
| Cofiring | | | pro rata |
| **Cofiring in thermal power plants** | | solid biomass (e.g. wood chips, straw) | **6.12** |
| | | SN 17, tab 2, e.g. bark, sawdust | minus 20% |
| | | 5-digit SN in tab 1 and 2 Green Electricity Act | minus 30% |
| Cofiring | | | pro rata |
| **Liquid biomass** | | liquid biomass | **5.80** |
| | | markup for efficient CHP plants | **2.00** |
| **Biogas from agricultural products (e.g. maize, slurry)** | | up to 250 kW | **18.50** |
| | | 250 to 500 kW | **16.50** |
| | | over 1000 kW | **13.00** |
| | | biogas from cofermentation of wastes | minus 20% |
| | | markup for efficient CHP plants | **2.00** |
| | | markup for purification to natural gas quality | **2.00** |
| Cofiring | | | pro rata |
| **Feed-in tariffs for renewable generation that relies on raw materials after expiry of granted sales** | | | |
| **Solid biomass (e.g. wood chips, straw)** | | up to 2 MW | **8.50** |
| | | 2 to 10 MW | **7.50** |
| | | over 10 MW | **7.00** |
| **Biogas from agricultural products (e.g. maize, slurry)** | | up to 250 kW | **9.50** |
| | | over 250 kW | **8.00** |
| | | biogas from cofermentation of wastes | minus 20% |
| *) first conclusion of new contracts within the statutory budget ceiling | | | |

[Source: E-Control GmbH, February 2010]

**Table 2: Feed-in tariffs in 2010**

Green power is mostly financed by the settlement prices paid by electricity suppliers, which are determined annually by order (Table 3).

| **Settlement price** according to the Settlement Price Order **paid by suppliers** | **2007** | **2008** | **2009** | **2010** |
|---|---|---|---|---|
| | **in cent/kWh** | | | |
| Small hydro | 6.47 | 6.23 | 6.41 | 6.44 |
| "Other" green power | 10.33 | 11.00 | 10.51 | 12.42 |

[Source: E-Control GmbH]

**Table 3: The settlement prices established by the 2007 through 2010 orders**

Another source of finance is the flat-rate renewables charge payable per metering point collected by system operators from consumers pursuant to section 22a Green Electricity Act and passed on to OeMAG (Table 4).

| **Flat rate renewables charge paid by consumers** | **2007-2012 in €/year/MP** |
|---|---|
| Grid levels 1-4 | 15,000 |
| Grid level 5 | 3,300 |
| Grid level 6 | 300 |
| Grid level 7 | 15 |

[Source: section 22a(1) Green Electricity Act as amended by FLG I no 104/2009]

**Table 4: Flat renewables charges per calendar year for the 2007–2012 period under the Green Electricity (Amendment) Act 2009**

The Green Electricity (Amendment) Act 2006 requires the green power settlement agent to disclose on a daily basis the remaining budget during that year available for additional contracts to sell supported renewable electricity to it (Figure 2).

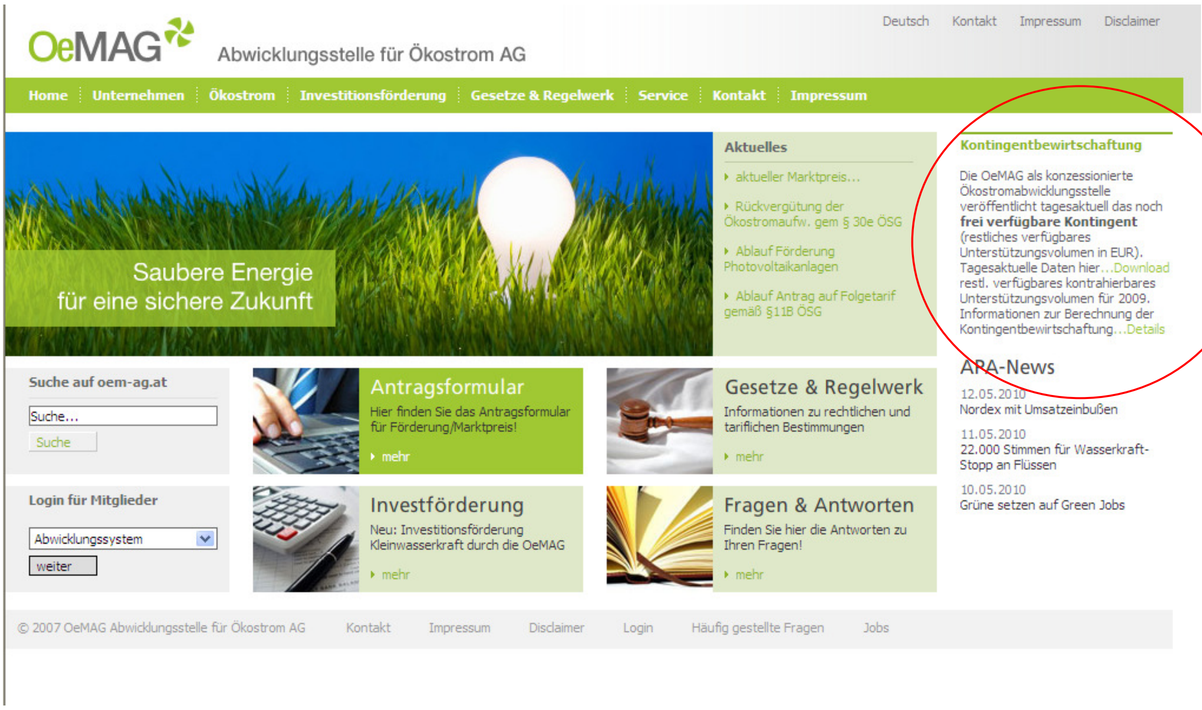



**Figure 2: Publication on www.oem-ag.at of the remaining contractible feed-in tariff budget, 12 May 2010**

| Support budget in €<br>remaining support budget available | | | | |
|---|---|---|---|---|
| As per | Solid biomass | Biogas | Wind | PV and others |
| 1/10/2006 (calculated) | 4,200,000 | 4,050,000 | 5,600,000 | 950,000 |
| 29.12.2006 | 632,369 | 155,980 | 217,676 | 172,711 |
| 4/2/2009 1) | 10,209,615 | 11,944,944 | 221,620,742 | 1,479,105 |
| Remaining support budget available | | | | |
| As per | Other technologies: *) | | | PV |
| 31.12.2009 | 19,443,813 | | | 0 |
| 1/1/2010 2) | 18,900,000 | | | 2,100,000 |
| 12.08.2010 | 13,308,654 | | | 0 |

1) Preliminary figures

2) Support budget at the start of 2010

The support budget at the start of 2010 as indicated in the table is a preliminary figure resulting from the additional support budget of € 21m pursuant to section 21a Green Electricity Act. Carry-overs from 2009 are considered to be reserved for covering the 2009 top-up payments to cover high fuel/feedstock costs and have thus not yet been included. What remains of the 2009 volumes after disbursing these top-up payments has been added to the 2010 support budget after the expiry of the three month application deadline.

*) Sections 21 and 21b Green Electricity Act as amended by FLG I no 114/2008 of 1 January 2009 abolish further breakdown of the budget by generating technologies.

[Sources: Publications by OeMAG; for budget as per 1 October 2006: E-Control GmbH caulcuations based on OeMAG data]

**Table 5: Evolution of the remaining contractible feed-in tariff budget available from OeMAG in 2009 and the first half of 2010**

As the table shows, € 19.44m in feed-in tariff payments were available for other renewable generating plants (all supported technologies other than photovoltaics [PV]) at year-end 2009. The budget for photovoltaics was exhausted on 16 December 2009. When the Green Electricity (Amendment) Act 2009 came into force this funding was topped up in accordance with the € 21m[11] additional annual budget for new capacity (plus the market value of the electricity, and less the pro rata balancing energy and administrative expenses), resulting in the available feed-in tariff payments shown in Table 5.

The movements in the budget in the course of 2009 should be viewed in the light of the fact that top-up payments to compensate operators of biogas and liquid biomass plants for high feedstock prices were capped at € 20m. If these funds are insufficient the top-up payments are reduced on a pro-rata basis. These feedstock compensation payments expired at the end of 2009.

[11] Under the Green Electricity Act as amended by FLG I no 104/2009

Among the other important changes brought about by the Green Electricity (Amendment) Act 2009 were:

1. A revised target for new and expanded renewable generating stations of 15% of the electricity supply from the public grid by 2015.
2. New injection tariffs based on the current average generating costs of the various technologies (exception: cap on biomass/biogas fuel/feedstock costs). When determining the prices, the fuel/feedstock costs may not exceed the market revenue (on the basis of the market price). Exception: solid biomass – the fuel costs will need to exceed revenue to achieve an increase of 100 MW in capacity.
3. Feed-in tariff guarantee periods of 15 years for new plants using renewable technologies dependent on raw materials as fuel/feedstock (biomass and biogas) and 13 years for all other renewable technologies.
4. Investment grants instead of feed-in tariffs for new and rehabilitated small hydropower stations.
5. Investment grants disbursed by the Climate Change and Energy Fund (KLI.EN) for photovoltaic systems up to 5 kWp.
6. Top-up payments for 2009 of up to 3 cent/kWh to cover higher fuel costs in existing biogas stations.
7. Priority for new hydropower plants, wind farms and biomass (provided that fuel is available). The expansion targets are: 700 MW of additional hydropower capacity (equally divided between small and medium-sized stations, which receive support in the form of investment grants, and large hydropower stations, which receive no funding); 700 MW of wind power capacity; and 100 MW of biomass capacity.
8. Additional annual support payments of € 21m from 2009 onwards. If this amount is insufficient to cover the anticipated applications, the Minister of Economy, Family and Youth may introduce a government bill to increase it.
9. Deletion of the provisions of the *Kraft-Wärme-Kopplungsgesetz* (Combined Heat and Power Act) from the Green Electricity Act and transfer to a separate CHP Act (FLG no 111/2008) applicable to new plants.
10. Simplification of the required form for economic efficiency calculations to determine the need for support for small hydropower plants. The construction and commissioning of such facilities must take place within two years of the approval of the investment grant by the settlement agent. The latter can extend the deadline by a further two years if there are reasons for doing so which are particularly worthy of consideration.
11. A technology markup of 2 cent/kWh$_{el}$ for the purification of biogas to natural gas quality, infeed into the gas grid and subsequent use for electricity generation.

12. Reimbursement of the renewable electricity expenses for the 2008–2010 period charged on by electricity suppliers to consumers if these exceed 0.5% of the latter's net revenue, up to a cumulative maximum of € 500,000, on application.
13. Exemption of recipients of equalisation supplements and social assistance from the flat-rate renewables charge (€ 15 per annum).

## 2.2 € 21m in additional support for the development of renewable generation capacity

An annual € 18.9m in additional support payments are available for wind power, biomass and biogas (€ 21m less € 2.1m for PV). The amount of the support payments is given by the difference between the feed-in tariff and the normal market price of electricity (plus the balancing energy costs). When the market price is low (e.g. an average of 4.8 cent/kWh in 2009) the amount of wind power that can be supported is lower than when the price rises (e.g. 5.2 cent/kWh on 1 July 2010 and up to 8.5 cent/kWh in 2008). If the market price returned to 2008 levels, the smaller difference from the supported wind power feed-in tariff would mean that the planned additional capacity could be financed from the budget provided for by the current legislation.

The next few years will show whether adjustments to the budget for support payments are required to meet the targets set by the Energy Strategy Austria and the National Renewable Energy Action Plan.

The following tables give an overview of the calculations for renewable electricity development on the basis of the existing budgets and market price assumptions.

| | % of € 21m | Available support volume m€/year | Average feed-in tariff cent/kWh | Balancing energy expenses cent/kWh | Market price 2009 cent/kWh | Statutory full-load hours h/year | Actual full-load hours h/year | Green power output enabled by support GWh | Capacity MW | Green power output % of 55 TWh |
|---|---|---|---|---|---|---|---|---|---|---|
| **Wind** | 50% | 10.5 | 9.7 | 0.478 | 4.71 | 2300 | 2200 | 192.0 | **83.5** | 0.35% |
| Biomass | 20% | 4.2 | 14.0 | 0.039 | 4.71 | 6000 | 7500 | 45.0 | 7.5 | 0.08% |
| Biogas | 20% | 4.2 | 16.0 | 0.039 | 4.71 | 6500 | 8000 | 37.1 | 5.7 | 0.07% |
| PV max | 10% | 2.1 | 36.0 | 0.039 | 4.71 | 1000 | 950 | 6.7 | 6.7 | 0.01% |
| **TOTAL** | 100% | **21** | | | | | | **280.8** | **103.4** | **0.51%** |

**Table 6: Additional renewable electricity generating capacity fundable with € 21m each year, assuming a market price of 7.28 cent/kWh (scenario 1, example of 2008)**

| | % of € 21m | Available support volume m€/year | Average feed-in tariff cent/kWh | Balancing energy expenses cent/kWh | Market price 2008 cent/kWh | Statutory full-load hours h/year | Actual full-load hours h/year | Green power output enabled by support GWh | Capacity MW | Green power generation % of 55 TWh |
|---|---|---|---|---|---|---|---|---|---|---|
| **Wind** | 50% | 10.5 | 9.7 | 0.478 | 7.28 | 2300 | 2200 | 362.3 | **157.5** | 0.66% |
| Biomass | 20% | 4.2 | 14.0 | 0.039 | 7.28 | 6000 | 7500 | 62.1 | 10.4 | 0.11% |
| Biogas | 20% | 4.2 | 16.0 | 0.039 | 7.28 | 6500 | 8000 | 48.0 | 7.4 | 0.09% |
| PV max | 10% | 2.1 | 36.0 | 0.039 | 7.28 | 1000 | 950 | 7.3 | 7.3 | 0.01% |
| **TOTAL** | 100% | **21** | | | | | | **479.7** | **182.6** | **0.87%** |

**Table 7: Additional renewable electricity generating capacity fundable with € 21m each year, assuming a market price of 4.7 cent/kWh (scenario 2, example of 2009)**

As the tables show, the annual additional amount of wind power capacity that would be fundable (at a constant feed-in tariff and unchanged balancing energy expenses) is between 83 MW and 158 MW depending on the market price (scenarios 1 and 2).

## 2.3 Renewable electricity refunds

The Green Electricity (Amendment) Act 2009 provides for the reimbursement to consumers of part of the renewable electricity expenses charged on to them under certain circumstances. A refund for the period from 1 January 2008 to 31 December 2010 can be applied for.
A refund will be made if the tax authority responsible approves an entitlement to reimbursement of the energy charge[12] and the renewable electricity expenses in the reference year exceed 0.5% of the applicant's net production value. Any other de minimis support payments approved for 2008 to 2010 must be deducted. The refunds are limited to € 500,000 per company for the 2008–2010 period (de minimis rule).

Applications must be submitted by the end of the following year. Applications for refunds for 2008 thus had to reach E-Control by the end of 2009. A total of 2,300 applications for the reimbursement of renewable electricity expenses had been received by then. Due to the large number of requests and the many incomplete submissions it has not yet been possible to process all of the applications. The figures shown below are therefore preliminary, and in particular the information on the amount of the refunds will change over the next few months as the number of processed applications increases.

Of the 2,300 applications for the reimbursement of expenses incurred in 2008, some 1,938 were made electronically and full documentation was attached to 958 of these (see Table 9). Essential information, such as evidence of the renewable electricity expenses and the energy charge

[12] This requires a favourable decision by the financing authority, issued by way of a notice.

compensation notice (which serves as evidence of the company's net production value), was missing from the other applications.

As of 31 August 2010 E-Control had issued 706 notices (581 of which were approvals and 125 rejections), resulting in the reimbursement of € 19.38m in evidenced renewable electricity expenses to the applicants via OeMAG. It is not yet possible to forecast the actual level of the refunds for 2008 because of the information missing from some of the applications.

| | | Notice | | | |
|---|---|---|---|---|---|
| | | Approval | Rejection | Total | Disbursement |
| 1st round | 16/4/2010 | 26 | 8 | 34 | 1,760,351.19 |
| 2nd round | 17/5/2010 | 57 | 7 | 64 | 3,863,777.66 |
| 3rd round | 31/5/2010 | 174 | 27 | 201 | 3,234,273.54 |
| 4th round | 25/6/2010 | 98 | 43 | 141 | 4,202,549.97 |
| 5th round | 22/7/2010 | 160 | 23 | 183 | 4,462,692.19 |
| 6th round | 31/8/2010 | 66 | 17 | 83 | 1,855,658.82 |
| | **TOTAL** | **581** | **125** | **706** | **19,379,303.37** |

**Table 8: Renewable electricity refunds: notices issued by E-Control and amounts disbursed**

The applications have been broken down by the sectors and subsectors concerned in accordance with the standardised ÖNACE classification. It was not possible to categorise 565 of the 1,938 online applications, and these are reported as "non-classifiable" in the analysis below.

Table 9 below shows an analysis of the electronic applications by sectors.

| NACE sector code | Description of the sector | Total number of electronic applications | Number of complete applications | Refunds for complete applications (unexamined) in € |
|---|---|---|---|---|
| --- | non-classifiable | 565 | 0 | - |
| A | Agriculture, forestry and fishing | 20 | 15 | 59,824.67 |
| B | Mining and quarrying | 34 | 32 | 1,402,249.76 |
| C | Manufacturing | 455 | 348 | 19,766,062.89 |
| D | Electricity, gas, steam and air conditioning supply | 30 | 19 | 328,353.74 |
| E | Water supply; sewerage; waste managment and remediation activities | 93 | 84 | 1,022,619.76 |
| F | Construction | 39 | 29 | 193,988.34 |
| G | Wholesale and retail trade; repair of motor vehicles and motorcycles | 104 | 76 | 918,777.22 |
| H | Transporting and storage | 91 | 59 | 2,827,374.05 |
| I | Accommodation and food service activities | 216 | 123 | 731,227.53 |
| J | Information and communication | 8 | 4 | 397,965.25 |
| K | Financial and insurance activities | 5 | 4 | 183,704.92 |
| L | Real estate activities | 15 | 10 | 220,681.42 |
| M | Professional, scientific and technical activities | 13 | 7 | 136,280.17 |
| N | Administrative and support service activities | 44 | 27 | 769,300.94 |
| O | Public administration and defence; compulsory social security | 94 | 41 | 413,871.50 |
| P | Education | 8 | 6 | 4,313.77 |
| Q | Human health and social work activities | 11 | 6 | 400,185.36 |
| R | Arts, entertainment and recreation | 58 | 44 | 140,528.55 |
| S | Other services activities | 35 | 24 | 124,026.75 |
| TOTAL | | 1938 | 958 | 30,041,336.59 |

**Table 9: Online applications for refunds of renewable electricity expenses incurred in 2008: preliminary analysis by sectors (incomplete data, status as of 12 August 2010)**

The 1,938 applications came from companies in 19 different sectors. The manufacturing sector accounted for the largest group of applications (455). This breaks down into a very wide range of subsectors (see Table 10). A total of 97 applications were attributed to the "Manufacture of food products" subsector.

| NACE sector subgroup code | Sector description subgroup | Total number of electronic applications | Number of complete applications | Refunds for complete applications (unexamined) |
|---|---|---|---|---|
| C16 | Manufacture of wood and of products of wood and cork, except furniture | 59 | 45 | 2,386,465.40 |
| C10 | Manufacture of food products | 97 | 77 | 1,516,772.82 |
| C11 | Manufacture of beverages | 8 | 3 | 83,709.79 |
| C13 | Manufacture of textiles | 20 | 17 | 811,407.57 |
| C17 | Manufacture of paper and paper products | 13 | 11 | 2,234,584.95 |
| C18 | Printing and reproduction of recorded media | 7 | 4 | - |
| C20 | Manufacture of chemicals and chemical products | 23 | 19 | 2,189,754.34 |
| C21 | Manufacture of basic pharmaceutical products and pharmaceutical preparations | 2 | 2 | 510,156.83 |
| C22 | Manufacture of rubber and plastic products | 42 | 35 | 909,810.06 |
| C23 | Manufacture of other non-metallic mineral products | 30 | 25 | 1,885,806.20 |
| C24 | Manufacture of basic metals | 25 | 20 | 1,902,501.36 |
| C25 | Manufacture of fabricated metal products, except machinery and equipment | 54 | 40 | 2,568,872.66 |
| C26 | Manufacture of computer, electronic and optical products | 8 | 6 | 591,272.81 |
| C27 | Manufacture of electrical equipment | 8 | 3 | 369,391.81 |
| C28 | Manufacture of machinery and equipment n.e.c. | 8 | 3 | 56,238.72 |
| C29 | Manufacture of motor vehicles, trailers and semi-trailers | 12 | 8 | 966,688.34 |
| C30 | Manufacture of other transport equipment | 2 | 0 | - |
| C31 | Manufacture of furniture | 3 | 2 | 8,108.44 |
| C32 | Other manufacturing | 34 | 28 | 774,520.79 |
| TOTAL C | | 455 | 348 | 19,766,062.89 |

**Table 10: Applications for refunds of renewable electricity expenses incurred in 2008: detailed analysis of applications from companies in the manufacturing sector (incomplete data, status as of 12 August 2010)**

In the case of **twelve applications** processed to date, the refunds were limited by the fact that they exceeded the **de minimis threshold** (status as of 12 August 2010). In the absence of the de minimis cap € 11.53m – almost twice the amount disbursed for these twelve applications – would have been paid (after deduction of € 5.90m in other de minimis support payments that had already been granted).

## 2.4 Renewable electricity support funding mechanism: motion for a resolution from the National Council

On 23 September 2009, the National Council passed a motion for a resolution requesting the Ministry of Economy to place a draft bill amending the legislation governing the mechanism for funding renewable electricity support payments before the National Council by September 2010. The motion called for this bill to have regard to the need for:

- Compliance with Community law;
- The funding mechanism to be consumption-based, and for the allocation of costs among electricity consumers to be fair and transparent;
- Arrangements to cap the costs borne by energy-intensive companies like those contained in section 22c Green Electricity (Amendment) Act 2008;

- Transparent consumer billing and mandatory disclosure of renewable electricity costs in invoices.

### 2.4.1 Working group on funding alternatives

During the first half of 2010 a number of working group meetings chaired by the Ministry of Economy considered alternative approaches to the financing of the renewable electricity support system. These were:

1. Contributions on the same lines as between 2003 and 2006;
2. Energy charge;
3. Taxes;
4. Component of the transmission system charges (not pursued further after 25 March 2010);
5. Consumption-based renewables charge with a stronger weighting for the capacity component.

An investigation into the components of the energy and system charges that could be used to finance renewable electricity yielded an additional approach:

6. Percentage surcharge on the system charges (similar to existing community levies).

The conclusions reached about these alternatives were as follows:

**Option 1: contributions on the same lines as between 2003 and 2006**

This approach does not cap the cost of the support payments for energy-intensives, but does meet the other requirements.

A problem that led to the changeover in 2006 is the insistence of the European Commission on the exemption of imported electricity from the contributions to the scheme.

**Option 2: energy charge**

The requirement for disclosure of the cost of contributions on bills is fulfillable, and all the other requirements are met. In E-Control's view the option of using an energy levy to raise the funds for the renewable electricity support scheme is the only one that meets all of the conditions set by the National Council.

For consumers and recipients of support payments it effectively makes no difference whether the scheme is funded by a charge or the existing contribution-based system.

In 2008, during the negotiations on the Green Electricity (Amendment) Act 2008, DG Competition suggested funding by means of an energy charge as a potential solution and this approach is certainly highly compliant with Community law.

An energy charge would be consumption-based, and would thus share the costs of the scheme in a fair and transparent manner.[13]

**Option 3: taxes**

This option is compliant with Community law. Mandatory disclosure of the cost of support payments on electricity bills would be possible, but the other requirements are not fulfilled.

This form of renewable electricity support funding is not consumption-based, and would thus be intransparent. It is also unclear whether, and in what form, cost capping would be possible.

**Option 4: component of the transmission system charges**

This option would comply with Community law, and disclosure of the costs occasioned by the scheme would be feasible. The requirement for consumption-related charging would partly be fulfilled, but those of a "fair and transparent" allocation of costs and of cost capping along the lines of section 22c Green Electricity (Amendment) Act 2008 would not.

The cost of building and operating transmission networks is currently met by a gross component (about 60% of overall expenses; contributions according to total supply in given areas/provinces) and a net component (about 40% of overall expenses; contributions according to the difference between total supply and total feed-in by electricity generating stations in given areas).

Funding the support scheme through the transmission system charges would mean that the provinces would make varying contributions to it due to their differing proportions of self-generated electricity. Moreover, the transmission network costs are passed on to the various grid levels according to a method ("cascading") that is at odds with the structure of the support scheme in place from 2003 to 2006. This would result in a very different burden-sharing structure to that previously negotiated. It is also unclear whether, and in what form, cost capping would be possible.

**Option 5: consumption-based renewables charge**

The condition of cost disclosure on electricity bills is fulfilled, and the same might apply to compliance with Community law under some circumstances. This type of mechanism would partly satisfy the requirement for consumption-related charging and that of a fair and transparent allocation of costs might also be considered to be partly fulfilled. It would not meet the cost-capping requirement.

In technical and administrative terms it does appear possible to graduate a renewables charge according to capacity (higher charges for higher capacities), and not only according to grid levels.

[13] The cap on costs would ease the burden on the overall electricity bill, different shares of which are paid by consumers at different grid levels since the system charges are graduated.

Since the capacity component would reflect peak rather than average load, this kind of mechanism would only be partly consumption-based. Consumers and industrial sectors with short periods of peak demand would pay a higher share of renewable electricity funding than at present, or than they would under a consumption-based system such as an energy charge or a support contribution.
It is unclear whether, and in what form, cost capping would be possible.

**Option 6: percentage surcharge on the system charges**
This option would result in transparent disclosure of the cost of the renewable electricity support scheme on the bills for system charges. The extent to which renewable funding costs would be graduated by grid levels (if the same percentage surcharge was chosen for all grid levels) would mirror the system charges at the various grid levels. The scheme would implicitly be consumption-based to the same degree as the system charges.

A funding mechanism like this could comply with EU state aids law because, unlike the contributions scheme in place from 2003 to 2006, it would not involve collection of a surcharge on kWh of energy supplied but of one on network infrastructure costs.

### 2.4.2 The basic arithmetic of alternative renewable electricity funding mechanisms

The motion for a resolution passed by the National Council requires the formulation of proposals for a new renewable electricity support payment funding system. This section brings together basic numbers and figures related to the various funding alternatives.

Electricity consumers contribute **€ 340m per year** to fund the support payments made under the Green Electricity Act. Most of this money (€ 280m) goes to the payment of fixed feed-in tariffs which are higher than the price that consumers would otherwise pay for electricity (the market price). A smaller proportion of the total (€ 20m per year, made up of € 12.5m for small and € 7.5m for medium-sized hydropower stations) consists of funding for hydropower investment grants. An annual € 41.5m is used to support combined heat and power (CHP) plants. Of this, € 28m pays for feed-in tariffs for modernised CHP plants[14] and € 13.5m for investment grants (€ 2.5m for black liquor fired capacity and € 13.5m for other CHP facilities).

Electricity suppliers to whom subsidised renewable electricity is allocated on the basis of daily forecasts also charge risk markups, the amount of which is not precisely calculable or transparent.

[14] Ends in 2010

The above € 340m does not include other support programmes for renewable electricity generation such as the KLI.EN programme, which has a budget of € 35m for 2010 to support photovoltaic systems with capacities of up to 5 kW.

At **€ 340m**, in 2009 the **total support payments** for programmes under the Green Electricity Act represented **8.8%** of the total energy cost paid for electricity supplied from the Austrian public grid, which were about € 3.85 billion (bn) (55 TWh x 7 cent/kWh).

The overall volume of green power subsidies thus has a significant influence on the environment in which the electricity supply industry operates.

The current funding system consists of a combination of surcharges levied on the system charges (flat renewables charge payable per metering point with total receipts of about € 110m) and the allocation of supported renewable electricity priced at settlement rates fixed by order, by means of daily schedules (total receipts in 2009 approx. € 514m; forecast receipts in 2010 approx. € 657m). Consumers are being charged higher contributions to renewable funding than the suppliers' additional expenses due to green power. The argument used by electricity suppliers to justify this is forecasting uncertainties regarding future quantities of supported renewable electricity.

In future the nature and extent of the sale or allocation of supported renewable electricity, and the related income, will continue to be crucial to the financing of the support scheme. In 2009 the sale of supported renewable electricity at power exchange prices (instead of the higher settlement prices set by order) would have resulted in receipts of about € 240m. Of course, the amount of revenue generated by the sale of green power depends on electricity price trends and the quantity of and value attributed to the power supplied. Due to these factors it is not possible to make accurate estimates of the revenue that could be derived from selling supported renewable electricity.

The tables below show the number of metering points and the flat renewables charges for each grid level in 2008 and 2009. The funds generated by these charges are available to finance support payments under the Green Electricity Act and the Combined Heat and Power Act.

| | Renewables charge in €/MP | Number of registered metering points | Renewables charge in €/grid level |
|---|---|---|---|
| Grid levels 1-3 | 15000 | 94 | 1,415,000 |
| Grid level 4 | 15000 | 163 | 2,447,500 |
| Grid level 5 | 3300 | 4,843 | 15,981,900 |
| Grid level 6 | 300 | 26,794 | 8,038,050 |
| Grid level 7 | 15 | 5,661,863 | 84,927,942 |
| **Total** | | 5,693,757 | **112,810,392** |

Source: OeMAG

**Table 11: Revenue from flat rate renewables charges in 2008**

| | Renewables charge in €/MP | Number of registered metering points | Renewables charge in €/grid level |
|---|---|---|---|
| Grid levels 1-3 | 15000 | 98 | 1,470,000 |
| Grid level 4 | 15000 | 164 | 2,460,000 |
| Grid level 5 | 3300 | 4,877 | 16,094,100 |
| Grid level 6 | 300 | 26,745 | 8,023,500 |
| Grid level 7 | 15 | 5,723,470 | 85,852,050 |
| **Total** | | 5,755,354 | **113,899,650** |

Source: OeMAG

**Table 12: Revenue from flat rate renewables charges in 2009**

Alternative financing mechanisms could be based on the system charges or their components (the capacity charge, unit rate, charge for grid losses and metering charge) paid by consumers. Consumers pay a total of about € 2bn in system charges each year, € 1.3bn of which are accounted for by the unit rate, € 0.3bn by the capacity charge, € 0.2bn by the charge for grid losses and € 0.14bn by the metering charge. Raising the € 340m in **funding for renewable electricity support payments** (and CHP support) solely via the **grid utilisation charge** would imply a **markup of about 17%** on the latter.

A funding mechanism based on a **surcharge on the overall system charges** would be a **simple and transparent system**.

A 17% surcharge would mean that an average household with a consumption of 3,500 kWh and system charges payments of some € 180 would contribute € 31 to the financing of green power subsidies. This roughly corresponds to the current payments for the flat renewables charge (€ 15) and renewable electricity settlement prices (0.4–0.6 cent/kWh).[15] Consumers with a lower consumption would contribute less than before as a result of the absence of the flat-rate renewables charge.

[15] All amounts ex VAT

The effects of other funding approaches could be significantly influenced by the following parameters.

The € 0.3bn in capacity charges are billed on the basis of a total connection capacity of about 30,000 MW. Of this capacity about 77.5% is at grid level 7 (including standard load profiles of 4 kW per metering point), 6% is at grid level 6, 10% is at grid level 5, 2.5% is at grid level 4 and some 4% at grid level 3.

The unit rates are collected on a total supply of about 55 TWh. Grid level 7 accounts for about 46% of total supply, grid level 6 for 11%, grid level 5 for 23.5%, grid level 4 for 8% and grid level 3 for 11.5%.

Total unit rate and capacity charges of € 1.6bn break down into 67.6% at grid level 7, 9.8% at grid level 6, 13.7% at grid level 5, 4.2% at grid level 4 and 4.6% at grid level 3.

### 2.4.3 Basic arithmetic of energy charge revenue

Austrian energy consumers pay energy charges of 1.5 cent/kWh for electricity, 6.6 cent/m³ for natural gas and 5 cent/kg for coal. The following table shows the evolution of energy levy receipts and refunds by tax offices:

| Year | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 (preliminary values) |
|---|---|---|---|---|---|---|
| | **Charges in m€** | | | | | |
| Electricity charge | 874.35 | 888.73 | 892.09 | 927.88 | 922.7 | 881 |
| Natural gas charge | 313.53 | 348.42 | 333.01 | 317.18 | 345.26 | 332 |
| Coal charge | 25.61 | 34.66 | 35.41 | 20.44 | 26.74 | 35 |
| **Total** | **1,213.49** | **1,271.81** | **1,260.51** | **1,265.50** | **1,294.70** | **1,248** |
| | **Energy charge refunds in m€** | | | | | |
| **Total** | **478.19** | **484.11** | **591.65** | **502.81** | **580.53** | **593** |
| | **Number of refunds** | | | | | |
| Total | 4,574 | 6,650 | 10,306 | 11,708 | 12,411 | |

Sources: Ministry of Finance, bookings by tax offices to energy charge accounts in the years shown

**Table 13: Evolution of energy charge receipts and refunds by tax offices**

According to these figures the tax offices have recently been collecting somewhat less than € 1.3bn per year in energy charges and returning almost € 600m to some 12,000 applicants. The electricity charge made up about 70% of the total revenue.

The € 340m in funding for renewable electricity support payments would correspond to an earmarked electricity charge of 0.55–0.58 cent/kWh if no refunds were given. If the same percentage of this dedicated electricity charge were reimbursed as the proportion of the existing energy charges repaid in recent years (45–48%), raising € 340m would require a rate of 1.0-1.1 cent/kWh.

### 2.4.4 Renewable electricity allocation and sale

Whichever of the above options is chosen, the manner in which the subsidised renewable electricity is used will need to be clarified. It should be transparent and economically optimal.

The following alternatives are conceivable, among others:

1. Sale of supported renewable electricity on the Graz power exchange spot market;
2. Tendering or auctioning of all or part of the supported electricity;
3. Allocation to given market participants at a fixed, market-based price;
4. Allocation to all electricity suppliers at a settlement price set by order (status quo).

Options 1 and 2 would enable the subsidised green power to be sold at market prices, and the revenue generated in this way would be transparent.

Previous experience suggests that the disadvantage of option 4 is the lack of transparency regarding the passing on of renewable electricity expenses by electricity suppliers to consumers.

Under option 3 the electricity would be allocated to the same retailers as before, in proportion to the quantity of power they supply to consumers, but at a set "normal" market price rather than a settlement price determined by order.

## 2.5 Green Electricity Act working group

On 26 May 2010 the Ministry of Economy, Family and Youth invited organisations concerned with all the renewable generating technologies to take part in an exchange of views. The following wishes were expressed with regard to the various technologies:

- Wind power: extension of the current 9.7 cent/kWh feed-in tariff to new capacity installed in coming years.
- Photovoltaics: raising or abolition of the support budget cap and short-term adjustment of the amount of support to the cost structures.

- Small hydropower: a choice between investment grants or feed-in tariffs for mini hydropower plants (up to 500 kW).
- Biomass/biogas: a further increase in the feed-in tariffs (to an average of approx. 14 cent/kWh for existing plants plus top-up payments to cover high feedstock prices where applicable; and to 13-18.5 cent/kWh for new biogas plants using agricultural input materials plus markups for CHP and biogas processing).

The ministry also held out the possibility of further discussions in working groups involving organisations representing the various technologies.

## Comments on renewable electricity subsidisation and sale in Germany

The German renewable electricity support system was changed at the start of 2010. Since then the transmission system operators have sold green power on the power exchange instead of allocating it to electricity suppliers. The details of the system are as follows.

Generators whose electricity is paid for in accordance with the *Erneuerbare-Energien-Gesetz* (Renewable Energy Act, EEG) receive the applicable feed-in tariffs from the system operators concerned.

The system operators pass the electricity on to the transmission system operators, and the same feed-in tariffs (less system charges) are repaid to them in return.

The supported renewable electricity is then redistributed among the four transmission system operators so that each has the same share of it on its network.

Since the entry into effect of the *Ausgleichsmechanismus-Ausführungsverordnung* (Equalisation Mechanism Execution Order) the green electricity has no longer been sold directly to the electricity suppliers. Instead, it is offered on the day-ahead or intraday spot market of a power exchange.

The proceeds do not cover the entire cost of the support payments. The shortfall is made up by “EEG contributions”, paid by electricity retailers to transmission system operators per kWh of electricity delivered to them and set for the coming year each October. The electricity suppliers are entitled to pass EEG contributions on to consumers.

Feed-in payments of € 12.7bn are forecast for 2010. The electricity sold by the transmission system operators on the power exchange is expected to fetch € 4.5bn. The difference of € 8.2bn will have to be met by the EEG contributions.[16] According to the transmission system operators, electricity

[16] Multiplying the 2010 contribution of 2.047 cent/kWh by final consumption in 2009 of 477,000 GWh less 70,000 GWh used by consumers given special treatment yields total EEG contributions of € 8.3bn (preliminary figures).

consumers will be called on to pay 2.047 cent/kWh in 2010.[17] Deviations from the forecasts are rolled over into the determination of the EEG contributions for the following year.

### Limit on negative exchange prices

Due to the volatility of electricity supply, in particular of wind power (due to its dependence on weather conditions), and the inflexibility of demand, prices on the exchange may be negative.

Because of this a temporary exemption enables the transmission system operators to set price limits if there is a danger of extremely negative prices, so as to keep the EEG contributions within bounds.

A number of requirements must be met for setting such price limits, they may only be established for limited periods and must be changed at irregular intervals to prevent the market from taking its cue from them.

[17] See Energiespektrum, 9 November 2009, *EEG-Umlage für 2010* (EEG contributions for 2010); Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, *Einfluss der Förderung erneuerbarer Energien auf den Haushaltsstrompreis im Jahr 2009 mit Ausblick auf das Jahr 2010* (Influence of renewable energy support funding on household electricity prices in 2009 and outlook for 2010).

# 3 Supported renewable electricity: output, costs and subsidies

This chapter provides current and historical data on the quantities of renewable energy bought by the green power balancing groups and – since 2006 – OeMAG. The historical data is not classified by balancing groups. However these numbers can be found in previous E-Control green electricity reports.

## 3.1 Green power plants under contract to OeMAG/green power balancing group representatives

At year end 2003–2009 the green power balancing group representatives (GPBGRs) and subsequently OeMAG supplied details of the number of subsidised renewable generating stations under contract and their capacities.

The tables below illustrate the development of maximum capacity in MW and of the numbers of generating stations under contract to OeMAG (or green power balancing group representatives) on the respective cut-off dates. As of 31 December 2009, 4,786 “other” green power plants with a total capacity of 1,433 MW had a contractual relationship with OeMAG, and there were 11,412 accredited generating stations with a combined capacity of 1,694.5 MW. OeMAG also had contracts with 1,488 small hydropower plants with a total capacity of 200.9 MW, and there were 2,654 accredited small hydropower plants with a combined capacity of 1,210.8 MW.

| Primary energy source | Under contract to GPBGRs at year-end 2003 | Under contract to GPBGRs at year-end 2004 | Under contract to GPBGRs at year-end 2005 | Under contract to OeMAG at year end 2006 | Under contract to OeMAG at year end 2007 | Under contract to OeMAG at year end 2008 | Under contract to OeMAG at year-end 2009 2) | Accredited plants at year-end 2009 3) |
|---|---|---|---|---|---|---|---|---|
| Biogas | 15.0 | 28.4 | 50.7 | 62.5 | 74.9 | 76.2 | 77.0 | 94.5 |
| Solid biomass | 41.1 | 87.5 | 125.9 | 257.9 | 309.1 | 311.7 | 313.4 | 413.9 |
| Liquid biomass | 2.0 | 6.8 | 12.4 | 14.7 | 16.5 | 14.5 | 9.6 | 25.3 |
| Landfill and sewage gas | 22.7 | 20.3 | 21.2 | 13.7 | 21.4 | 21.2 | 21.1 | 29.1 |
| Geothermal energy | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| Photovoltaics | 14.2 | 15.1 | 15.4 | 15.3 | 18.8 | 21.7 | 26.8 | 71.3 |
| Wind | 395.6 | 594.6 | 816.9 | 953.5 | 972.0 | 960.9 | 984.1 | 1,059.6 |
| Total “other” green power | 491.4 | 753.6 | 1,043.4 | 1,318.5 | 1,413.6 | 1,407.1 | 1,433.0 | 1,694.5 |
| Small hydro capacities up to 10 MW (supported) 1) | 858.1 | 851.5 | 709.7 | 320.9 | 380.2 | 124.7 | 200.9 | 1,210.8 |
| **Total “other” green power and small hyrdo** | **1,349.5** | **1,605.1** | **1,753.1** | **1,639.3** | **1,793.8** | **1,531.8** | **1,433,169.7** | **2,905.3** |

1) Many small hydropower plant operators leave the support scheme and sell at market prices instead.
2) Entitled to granted sales and feed-in tariffs, almost all in operation
3) Accredited plants, not all of which have been built
[Sources: E-Control GmbH, green power balancing group representatives, OeMAG - preliminary values as of July 2010]

**Table 14: Capacity of accredited (approved) green power plants and generating plants under contract to OeMAG/GPBGRs (mostly operational) in MW, 2003–2009**

| Primary energy source | Under contract to GPBGRs at year-end 2003 | Under contract to GPBGRs at year-end 2004 | Under contract to GPBGRs at year-end 2005 | Under contract to OeMAG at year end 2006 | Under contract to OeMAG at year end 2007 | Under contract to OeMAG at year end 2008 | Under contract to OeMAG at year-end 2009 2) | Accredited plants at year-end 2009 3) |
|---|---|---|---|---|---|---|---|---|
| Biogas | 119 | 159 | 231 | 253 | 294 | 293 | 291 | 341 |
| Solid biomass | 27 | 39 | 68 | 93 | 115 | 113 | 118 | 186 |
| Liquid biomass | 21 | 34 | 49 | 45 | 51 | 47 | 46 | 92 |
| Landfill and sewage gas | 43 | 42 | 46 | 38 | 45 | 45 | 43 | 65 |
| Geothermal energy | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Photovoltaics | 1,793 | 1,852 | 1,975 | 2,065 | 2,515 | 3,112 | 4,150 | 10,525 |
| Wind | 97 | 116 | 133* | 127 | 139 | 134 | 136 | 201 |
| Total “other” green power | 2,102 | 2,244 | 2,371 | 2,623 | 3,161 | 3,746 | 4,786 | 11,412 |
| Small hydro capacities up to 10 MW (supported) 1) | 2,044 | 2,063 | 2,195 | 1,900 | 2,023 | 1,305 | 1,488 | 2,654 |
| **Total “other” green power and small hyrdo** | **4,146** | **4,307** | **4,566** | **4,523** | **5,184** | **5,051** | **6,274** | **14,066** |

*) Figure from the guarantees of origin database; injecting plants in GPBGRs in December 2005
1) Many small hydropower plant operators leave the support scheme and sell at market prices instead.
2) Entitled to granted sales and feed-in tariffs, almost all in operation
3) Accredited plants, not all of which have been built
[Sources: E-Control GmbH, database of guarantees of origin, green power balancing group representatives, OeMAG - preliminary values as of July 2010]

**Table 15: Number of accredited (approved) green power plants and renewable generating plants under contract to OeMAG/GPBGRs (mostly operational), 2003–2009**

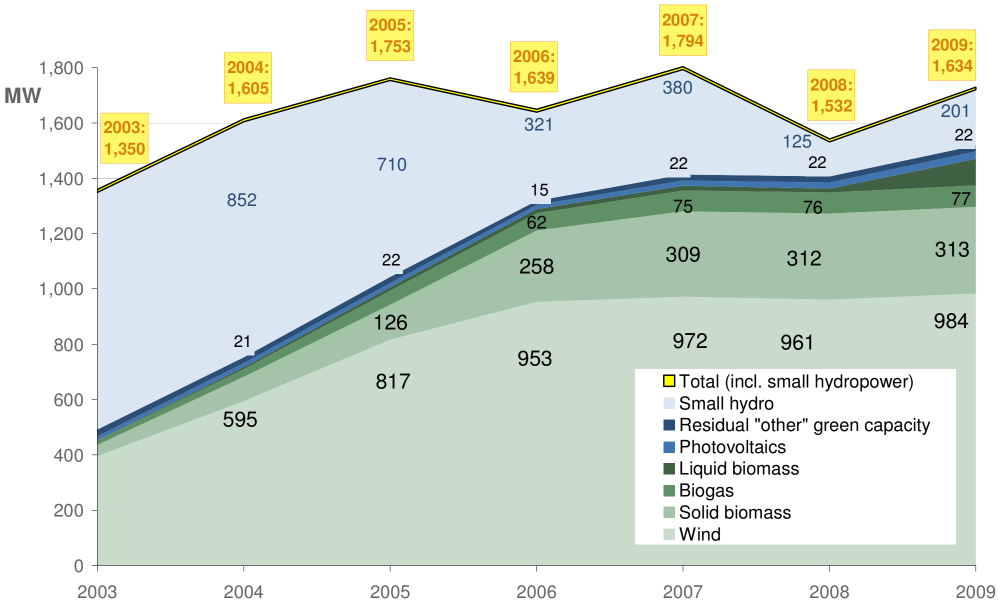
As Table 16 shows, in the first six months of 2010 generating plants with a total capacity of 1,751 MW (“other” renewable electricity: 1,433 MW; small hydro: 318 MW) were under contract to OeMAG, and stations with 2,975 MW of capacity were accredited (“other” renewable electricity: 1,733 MW; small hydro: 1,242 MW).

| Capacity in MW and number of green power plants under contract to OeMAG vs. accredited generating stations H1 2010 *) | | | | |
|---|---|---|---|---|
| Primary energy source | Contract with OeMAG 1) | | Accredited plants 2) | |
| | Number | MW | Number | MW |
| Biogas | 289 | 77.7 | 344 | 95.4 |
| Solid biomass | 121 | 319.6 | 188 | 415.5 |
| Liquid biomass | 46 | 9.4 | 93 | 25.3 |
| Landfill and sewage gas | 44 | 21.1 | 68 | 29.8 |
| Geothermal energy | 2 | 0.9 | 2 | 0.9 |
| Photovoltaics | 4,555 | 30.6 | 12,184 | 88.4 |
| Wind | 132 | 973.5 | 205 | 1,077.6 |
| Total "other" green power | 5,189 | 1,432.9 | 13,084 | 1,732.9 |
| Small hydro capacities up to 10 MW (supported) | 1,707 | 318.3 | 2,698 | 1,242.3 |
| *) As of 30 June 2010; accredited photovoltaic plants as of 31 March 2010 | | | | |
| 1) Entitled to granted sales and feed-in tariffs, almost all in operation | | | | |
| 2) Accredited plants, not all of which have been built | | | | |

[August 2010 | Sources: E-Control GmbH, OeMAG]

**Table 16: Capacity and number of renewable generating plants under contract to OeMAG vs. accredited generating stations, H1 2010**

The evolution of maximum capacity in MW between 2003 and the end of 2009 is also depicted by the chart below.




[Sources: E-Control GmbH, OeMAG]

**Figure 3: Evolution of capacity under contract to OeMAG/GPBGRs, 2003–2009**

In accordance with section 7(3) Green Electricity Act, the provincial governors provide E-Control with copies of the accreditation notices for green power plants, and these give an insight into overall trends in Austria. The table below compares the number of plant approvals forwarded to E-Control (accreditation notices) and the number of operational renewable generating stations included in the green power settlement agent's support scheme.

| Capacity at year-end, in MW<br>Renewable generation plants under contract to OeMAG (or GPBGRs) and accredited generating stations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Primary energy source | Cut-off date | 31.12.2003 | 31.12.2004 | 31.12.2005 | 31.12.2006 | 31.12.2007 | 31.12.2008 | 31.12.2009 |
| Small hydro | under contract | 858.1 | 851.5 | 709.7 | 320.9 | 380.2 | 124.7 | 200.9 |
| | accredited | 968.3 | 1,077.4 | 1,139.8 | 1,151.9 | 1,167.6 | 1,179.3 | 1,210.8 |
| "Other" green power | under contract | 491.4 | 753.6 | 1,043.4 | 1,318.5 | 1,413.6 | 1,407.1 | 1,433.0 |
| | accredited | 632.9 | 1,171.3 | 1,525.7 | 1,626.5 | 1,621.1 | 1,652.6 | 1,694.5 |
| Extract from the database of accreditation notices - as of April 2010<br>[Sources: E-Control GmbH, green power balancing group representatives, OeMAG - preliminary values as of July 2010] | | | | | | | | |

**Table 17: Renewable generation plants under contract to OeMAG and approved generating stations (accreditation notices) in MW, 2003–2009**

The number of contracted small hydropower plants varies as a result of fluctuations in the market price of electricity, which in some cases exceeds feed-in tariff levels.

## 3.2 Investment grants

The Green Electricity (Amendment) Act, FLG no 104/2009, states that support payments to green power plants are to take the form of feed-in tariffs and investment grants. Small and medium-sized hydropower plants and photovoltaic arrays up to 5 kWp qualify for investment grants, while all other technologies receive feed-in tariffs.[18] In addition to the support provided for by the Green Electricity Act, operators of renewable generating plants can also apply for funding from provincial government schemes and other domestic environmental programmes.

OeMAG is the settlement agent for the payment of feed-in tariffs and of investment grants for small and medium-sized hydropower plants. Since 2009 the Climate Change and Energy Fund (KLI.EN) has disbursed investment grants for small photovoltaic systems with capacities of up to 5 kWp. In 2009 KLI.EN paid out € 19m in investment grants for such systems.

[18] Provided that the plant fulfils all of the requirements and sufficient funding is available.

As of 31 July 2010, grants amounting to € 16.7m had been extended to 28 new small hydropower plants, and a further € 0.6m to five rehabilitated stations. An additional 83 funding applications for new generation plants and 33 applications for rehabilitated stations are currently under consideration.

| Funding applications small hydropower plants | | | | |
|---|---|---|---|---|
| | Number | Total capacity in kW | Total support in € | Total projected cost in € |
| New plants | 113 | 73,670 | 16,732,454 | 263,885,303 |
| rejected | 2 | 3,815 | 0 | 7,706,000 |
| approved | 28 | 24,466 | 16,732,454 | 83,017,841 |
| under consideration | 83 | 45,389 | 0 | 173,161,461 |
| Rehabilitated plants | 40 | 30,742 | 647,220 | 67,883,958 |
| rejected | 2 | 156 | 0 | 586,796 |
| approved | 5 | 687 | 647,220 | 2,824,955 |
| under consideration | 33 | 29,899 | 0 | 64,472,207 |
| **Total** | **153** | **104,412** | **17,379,674** | **331,769,260** |

[Source: OeMAG, as per 31/7/2010]

**Table 18: Investment grants for small hydropower plants**

Investment grants of € 23.5m had been approved for four medium-sized hydropower stations as of 31 July 2010.

| Funding applications for new medium-sized hydropower plants | | | | |
|---|---|---|---|---|
| | Total approved applications | Planned maximum capacity in kW | Approved maximum support in € | Projected cost in € |
| Medium-sized hydropower | 4 | 66,460 | 23,480,000 | 316,700,000 |

[Source: OeMAG, as per 31/7/2010]

**Table 19: Investment grants for medium-sized hydropower plants**

Seven CHP stations had had applications for funding amounting to € 44.8m approved as of 31 July 2010. In 2009, € 28m was earmarked for support payments to modernised CHP plants.

| Funding applications for new CHP plants | | | | |
|---|---|---|---|---|
| | Total approved applications | Planned maximum capacity in kW | Approved maximum support in € | Projected cost in € |
| CHP | 7 | 1,480,160 | 44,799,200 | 1,131,246,750 |

[Source: OeMAG, as per 31/7/2010]

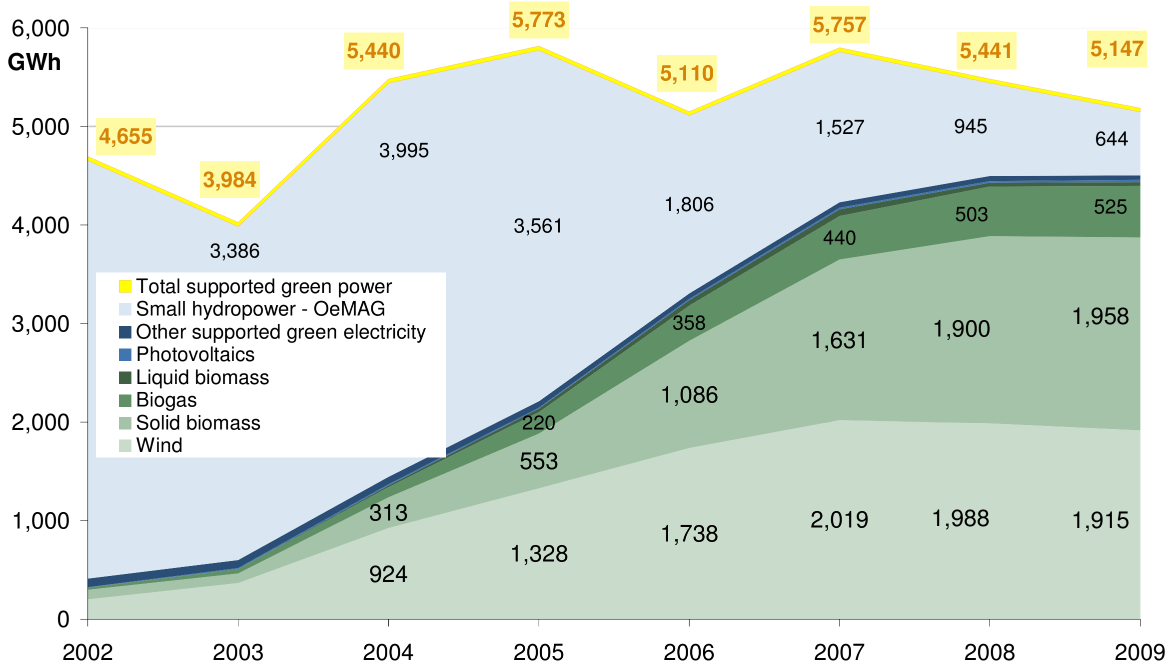
**Table 20: Investment grants for CHP plants**

## 3.3 Quantity of supported renewable electricity

The amount of “other” renewable electricity (i.e. excluding small hydropower) purchased by OeMAG (previously the green power balancing group representatives) increased from 412 GWh to 4,503 GWh between 2002 and 2009 (see Figure 4 and Table 21).

Including small hydropower, OeMAG bought a total of 5,147 GWh of supported renewable energy in 2009.

The quantity of small hydropower bought by the green power settlement agent was highly volatile. Volumes declined from 2004 to 2009 due to the fact that rising market prices prompted many small hydropower plant operators to leave the support system and sell their power on the open market, and that the possibility for existing small hydropower plants to apply for feed-in tariffs expired at the end of 2008. Small hydropower offtake rebounded sharply in the first half of 2010.




[Sources: E-Control GmbH, OeMAG]

**Figure 4: Renewable electricity purchased by OeMAG/GPBGRs in GWh, 2002–2009**

Table 21 gives a breakdown of the absolute and percentage contributions of the various technologies to power infeed, compensation levels, and average compensation payments in 2008 and 2009.

Power purchased by OeMAG as a proportion of total supply via the public grid fell from 9.8% in 2008 to 9.6% the following year. This was due to a decline in share of small hydropower from 1.7% to 1.2% (see above).

In contrast, the share of “other” renewables rose from 8.1% in 2008 to 8.4% in 2009.

| Renewable electricity infeed and compensation in Austria, 2008-2009 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Primary energy source | Infeed in GWh 2009 | Net compen-sation in m€ 2009 | Supported green power infeed as % of total supply 2009[1)] | Average compen-sation in cent/kWh 2009 | Infeed in GWh 2008 | Net compen-sation in m€ 2008 | Supported green power infeed as % of total supply 2008[2)] | Average compen-sation in cent/kWh 2008 |
| **Supported small hydropower** | **644** | **33.3** | **1.2%** | **5.17** | **945** | **53.1** | **1.7%** | **5.62** |
| **Other technologies** | **4,503** | **514.2** | **8.4%** | **11.42** | **4,496** | **523.1** | **8.1%** | **11.64** |
| Wind | 1,915 | 148.8 | 3.6% | 7.77 | 1,988 | 154.8 | 3.6% | 7.79 |
| Solid biomass incl. HBF waste fired | 1,958 | 270.9 | 3.7% | 13.84 | 1,900 | 258.5 | 3.4% | 13.61 |
| Gaseous biomass *) | 525 | 73.7 | 1.0% | 14.05 | 503 | 89.0 | 0.9% | 17.71 |
| Liquid biomass *) | 39 | 5.4 | 0.1% | 13.85 | 36 | 6.3 | 0.1% | 17.71 |
| Photovoltaics | 21 | 12.1 | 0.04% | 57.02 | 17 | 10.4 | 0.03% | 60.05 |
| Landfill and sewage gas | 44 | 3.1 | 0.1% | 7.00 | 50 | 3.8 | 0.1% | 7.61 |
| Geothermal energy | 1.5 | 0.19 | 0.003% | 12.71 | 1.6 | 0.18 | 0.003% | 11.15 |
| **Total small hydro and other green power plants** | **5,147** | **547.5** | **9.6%** | **10.64** | **5,440** | **576.2** | **9.8%** | **10.59** |

*) Incl. the 4 cent/kWh top-up payments for high fuel/feedstock cost disbursed in 2008

1) Total supply to consumers via the public grid was 53,439 GWh in 2009 (preliminary value).

2) Total supply to consumers via the public grid was 55,438 GWh in 2008.

[16/2/2010 | Source: OeMAG, February 2010 - preliminary values]

**Table 21: Renewable electricity infeed and compensation, 2008 vs 2009**

In the first half of 2010 OeMAG purchases accounted for 10.7% of total supply via the public grid. The rise is largely explained by a sharp year-on-year increase in the small hydro contribution from 1.0% to 2.1%, as shown in Table 22.

| Green power infeed and compensation (incl. market value) in Austria, H1 2009 and H1 2010 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Primary energy source | Infeed in GWh H1 2010 | Net compen-sation in m€ H1 2010 | Supported green power infeed as % of total supply H1 2010[1)] | Average compen-sation in cent/kWh H1 2010 | Infeed in GWh H1 2009 | Net compen-sation in m€ H1 2009 | Supported green power infeed as % of total supply H1 2009[2)] | Average compen-sation in cent/kWh H1 2009 |
| **Supported small hydro** | **580** | **31.6** | **2.1%** | **5.45** | **267** | **14.5** | **1.0%** | **5.42** |
| **Other technologies** | **2,377** | **266.7** | **8.6%** | **11.22** | **2,351** | **263.8** | **8.8%** | **11.22** |
| Wind | 1,062 | 83.1 | 3.9% | 7.83 | 1,084 | 84.3 | 4.0% | 7.77 |
| Solid biomass incl. HBF waste fired | 994 | 134.6 | 3.6% | 13.55 | 954 | 132.8 | 3.6% | 13.93 |
| Gaseous biomass *) | 270 | 38.2 | 1.0% | 14.15 | 261 | 36.7 | 1.0% | 14,06 + 3,00 |
| Liquid biomass | 16 | 2.2 | 0.1% | 13.84 | 20 | 2.8 | 0.1% | 13.82 |
| Photovoltaics | 12 | 6.8 | 0.04% | 56.09 | 10 | 5.6 | 0.04% | 58.53 |
| Landfill and sewage gas | 22 | 1.6 | 0.1% | 7.21 | 22 | 1.6 | 0.1% | 7.10 |
| Geothermal energy | 0.7 | 0.08 | 0.003% | 10.43 | 0.7 | 0.09 | 0.002% | 13.49 |
| **Total small hydro and other green power plants** | **2,957** | **298.3** | **10.7%** | **10.09** | **2,618** | **278.3** | **9.8%** | **10.63** |

1) Total supply to consumers via the public grid was 27,534 GWh in H1 2010 (preliminary value).

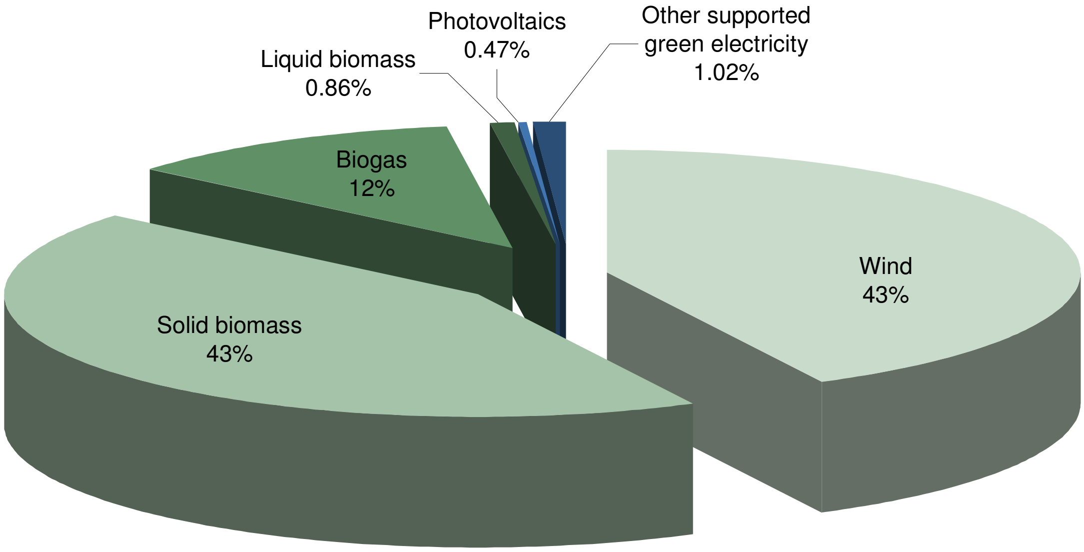
2) Total supply to consumers via the public grid was 26,807 GWh in H1 2009 (preliminary value).

*) Average compensation in 2009 was 14,06 cent/kWh plus a 3 cent/kWh top-up payment for high fuel/feedstock cost.

[10/8/2010 | Source: OeMAG, August 2010 - preliminary values]

**Table 22: Renewable electricity infeed and compensation, H1 2009 vs H1 2010**

Wind and solid biomass make up the highest proportions of supported renewable electricity. Biogas produces a significantly lower volume of green power, while other technologies such as PV account for less than 1% of supported renewable electricity purchased by the green power settlement agent (Figure 5).



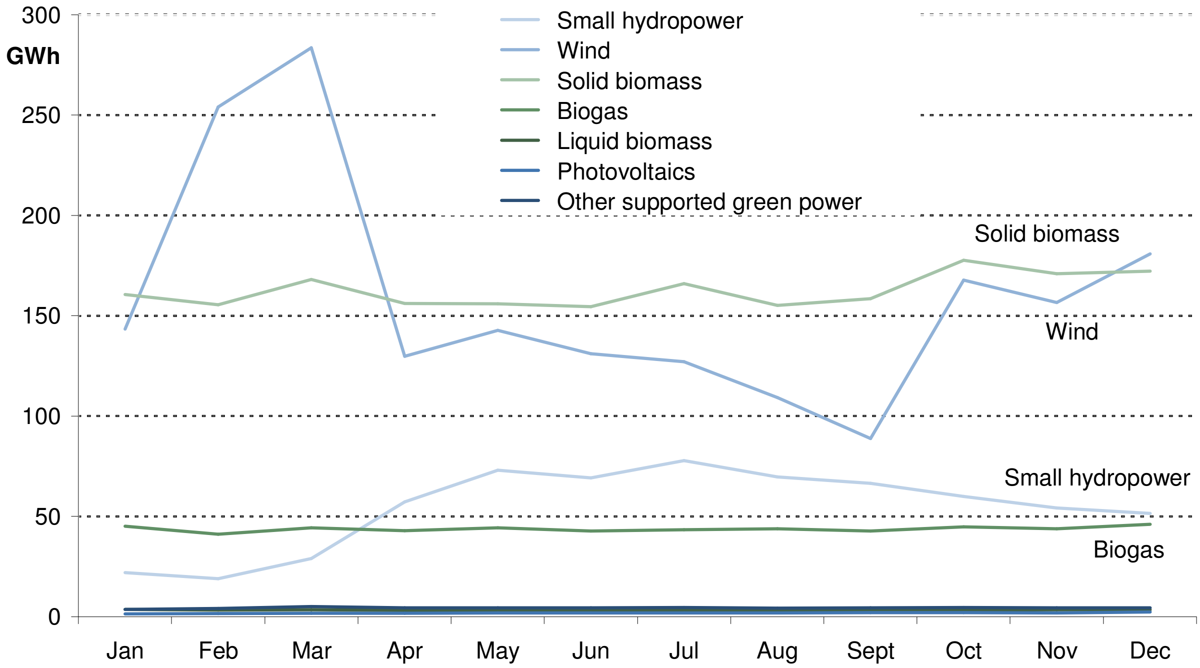

[Sources: E-Control GmbH, OeMAG]

**Figure 5: "Other" green electricity purchased by OeMAG by technologies, 2009 (% of total OeMAG purchases, excluding hydropower)**

Figure 6 below shows monthly infeed broken down by technologies in GWh in 2009, based on figures from OeMAG. It is noticeable that generation tends to be far higher in winter than during the summer months.

However, generation from biomass and biogas stations remains fairly constant throughout the year. This indicates that biomass and biogas plants are mostly used for electricity as opposed to heat generation, chiefly as a result of the high revenue derived from renewable power.[19]

[19] Where biomass or biogas plants are used primarily for electricity generation, their overall efficiency decreases because the efficiency of electricity generation in such plants is relatively low.




[Source: GO database]

**Figure 6: Monthly infeed by technologies, 2009**

The renewable settlement prices for 2010, which were set in September 2009, assume a small increase in small hydropower production in 2010 to 656 GWh. However, since small hydro generation was 580 GWh in the first half of 2010 alone, it is likely that full-year volume will be significantly higher and may be as much as 1,200 GWh.[20]

In addition, OeMAG's purchases of "other" renewable electricity are projected to slightly increase year on year, to around 4,775 GWh in 2010 (Table 23).

[20] Increased recourse to the guaranteed feed-in tariff due to relatively low market prices, as well as the effects of rehabilitations and new plant construction

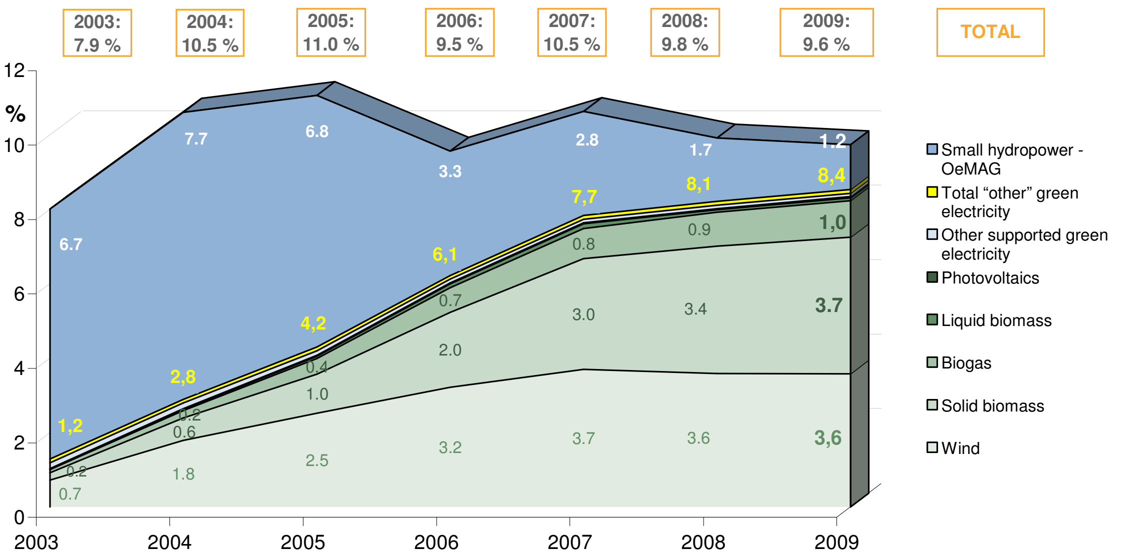
| Supported renewable electricity output, in GWh | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Primary energy source | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010 forecast* |
| Wind | 366 | 924 | 1,328 | 1,738 | 2,019 | 1,988 | 1,915 | 2,150 |
| Solid biomass | 99 | 313 | 553 | 1,086 | 1,631 | 1,900 | 1,958 | 1,980 |
| Biogas | 42 | 102 | 220 | 358 | 440 | 503 | 525 | 530 |
| Liquid biomass | 2 | 18 | 33 | 54 | 71 | 36 | 39 | 40 |
| Photovoltaics | 11 | 12 | 13 | 13 | 15 | 17 | 21 | 23 |
| Other supported green power | 78 | 76 | 65 | 55 | 54 | 52 | 46 | 52 |
| **Total "other" green power** | **598** | **1,445** | **2,212** | **3,304** | **4,230** | **4,496** | **4,503** | **4,775** |
| | | | | | | | | |
| Small hydro (OeMAG)[1] | 3,386 | 3,995 | 3,561 | 1,806 | 1,527 | 945 | 644 | **656 / 1,200** |
| **Total supported green power** | **3,984** | **5,440** | **5,773** | **5,110** | **5,757** | **5,440** | **5,147** | **5,431/ 5,975** |

[1]Many operators of small hydropower (and landfill and sewage gas fired) plants have left the support scheme and sell at (higher) market prices instead.
[Sources: OeMAG/GPBGRs, E-Control GmbH]

**Table 23: Renewable electricity purchased by OeMAG, 2003–2009 and forecast for 2010**

The chart below shows infeed of supported renewable electricity as a percentage of total supply. Infeed of green electricity peaked at 11% of total supply in 2005. The largest contribution to supported renewable electricity infeed has come from small hydro.

Electricity from renewable energy sources accounted for 9.6% of overall electricity supply in 2009, with biomass and wind both making significant contributions.




[Sources: E-Control GmbH, OeMAG]

**Figure 7: Renewable electricity supported by feed-in tariffs as a percentage of total supply, 2003–2009**

The above chart does not include supported renewable energy sources eligible for the investment grants under the Green Electricity Act (i.e. medium-sized hydro and black liquor CHP plants since 2006, and small hydro since 2007).

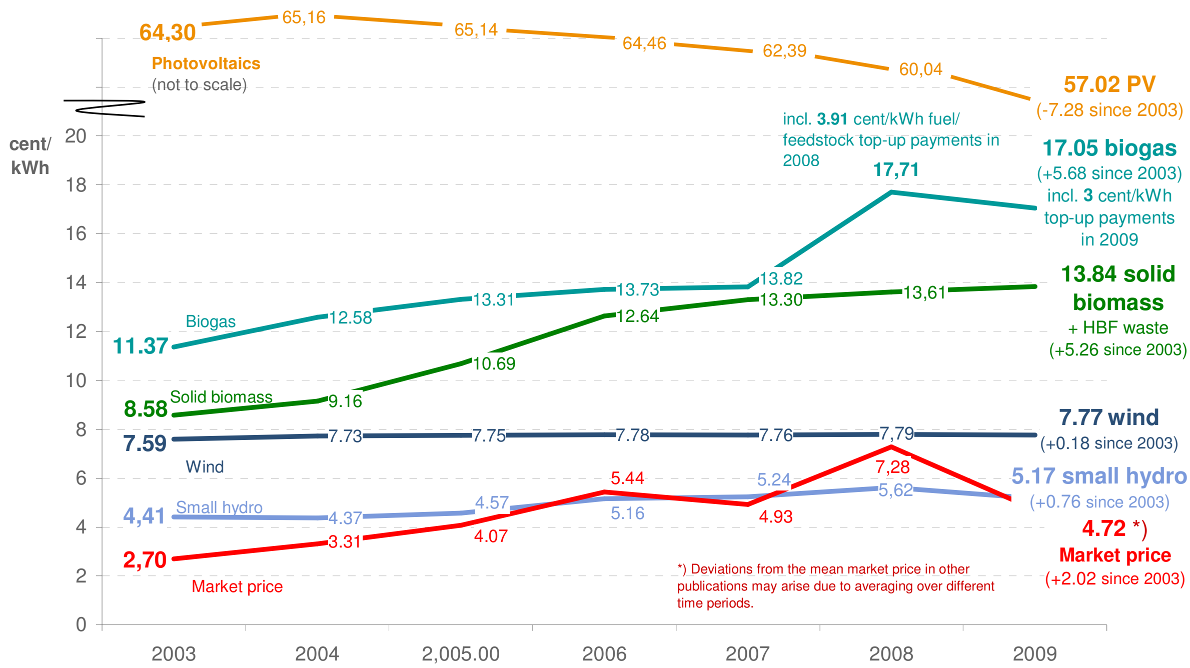
## 3.4 Average feed-in tariffs

The feed-in tariffs for renewable electricity generating plants rose steadily from 2003 to 2008, before falling slightly for most technologies in 2009 (see Figure 8).

The rise in feed-in tariffs for small hydro was mainly a consequence of larger plants that receive lower tariffs leaving the support scheme whereas the generating stations that tend to be paid higher tariffs remained in it.

The reduction in feedstock top-up payments from 4 cent/kWh in 2008 to 3 cent/kWh the following year led to a drop in feed-in tariffs for biogas and liquid biomass plants.

Market prices peaked in 2008 before falling sharply in 2009 to an annual average of 4.72 cent/kWh.




[12/7/2010 | Sources: E-Control GmbH, green power balancing group representatives, OeMAG]

**Figure 8: Average feed-in tariffs (average annual compensation paid by the green power settlement agent), 2003–2009**

An overview of the feed-in tariffs for 2009 can be found in the description of the green power support scheme in Chapter 2.

## 3.5 Total compensation payments including the market value of electricity

After rising steadily for several years, total compensation payments (the quantity of renewable electricity multiplied by the feed-in tariffs) fell year on year in 2009, to stand at € 548m, of which € 515m was accounted for by "other" renewable electricity (Figure 9).

This decline was due to a drop in supported small hydropower and the fact that the figures exclude the top-up payments for feedstock in 2009[21]

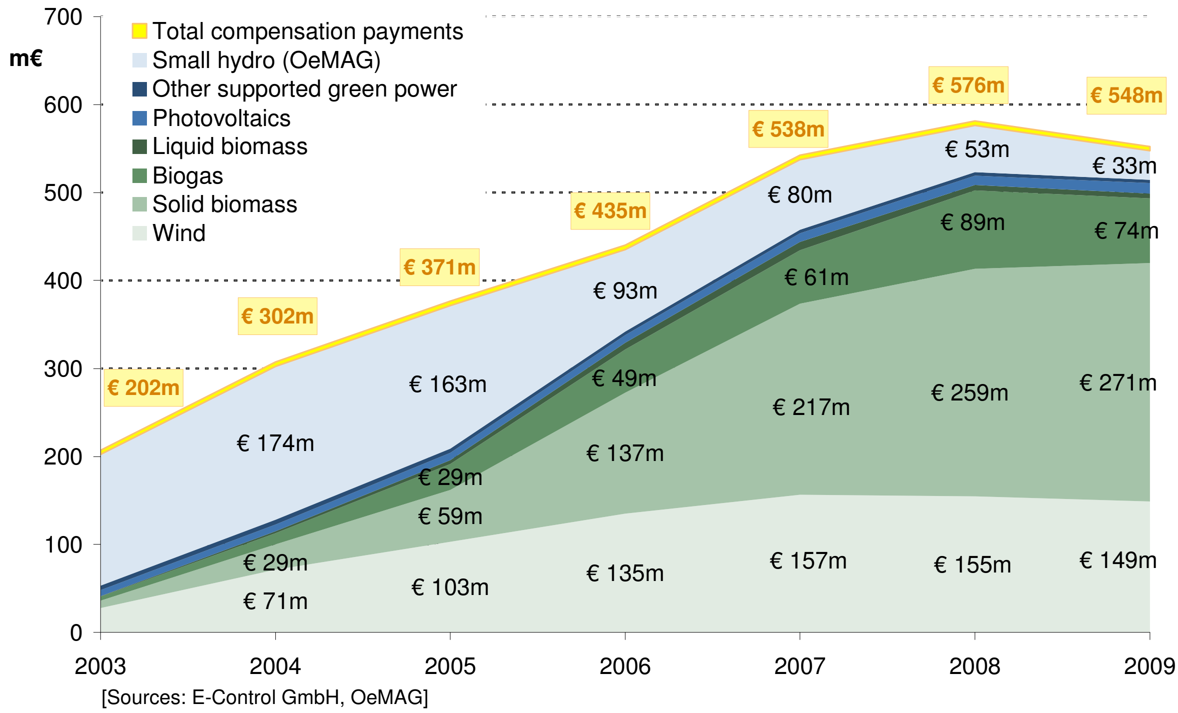
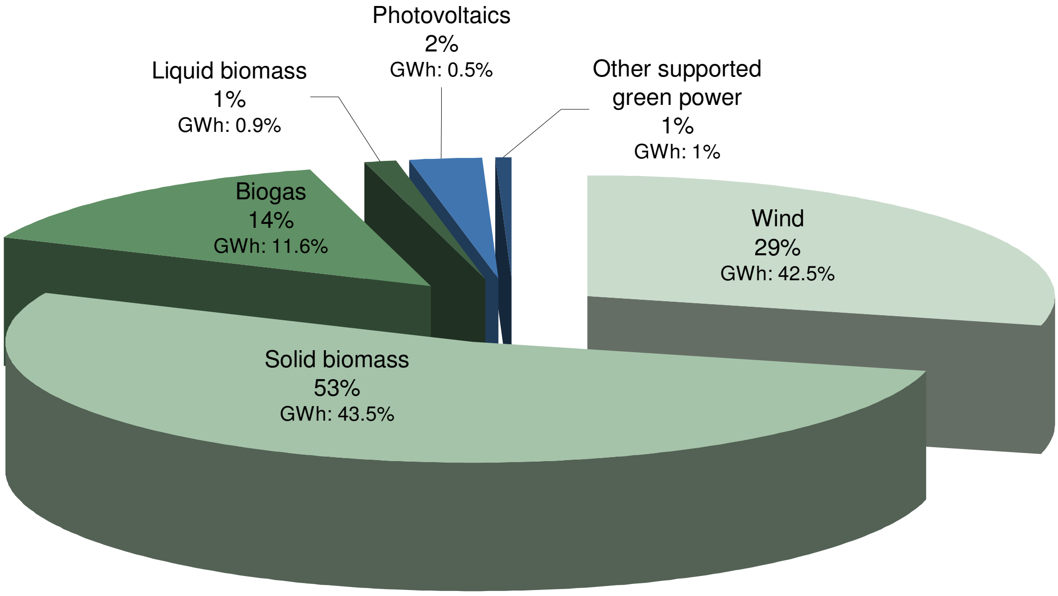



**Figure 9: Total compensation payments (including the market value of electricity) in m€, 2003-2009**

[21] On 2 February 2010 the *Rohstoffzuschlagsverordnung* (Raw Material Mark-Up Order) for biogas plants for 2009 established a 3 cent/kWh mark-up, resulting in additional compensation payments of about € 15m.

Figure 10 shows the breakdown of compensation payments for “other” green electricity in 2009. In some cases the feed-in tariffs for the various technologies differ greatly, and as a result the compensation payments are often at variance with the contribution of a given technology to overall electricity supply. These are also illustrated by the chart below.




[Sources: E-Control GmbH, OeMAG]

**Figure 10: Compensation (including the market value of electricity) for “other” green electricity, by technologies (shares in the total compensation paid by OeMAG in 2009)**

## 3.6 Market price trends

Section 20 Green Electricity Act obliges E-Control to determine the average market price of baseload power on a quarterly basis, and to publish this information in an appropriate manner.

Since the first quarter of 2004 E-Control’s market price calculations have been based on the prices of quarterly baseload futures on the EEX exchange (Phelix index), as opposed to the Platts German Forward Baseload Assessment used in 2002 and 2003.

The chart below shows the movements in market prices, stated in €/MWh, from the first quarter of 2003 through to the third quarter of 2010, which E-Control has posted on its website (www.e-control.at).[22]


**Figure 11: Market electricity price trend in accordance with section 20 Green Electricity Act, in €/MWh[23]**

From its initial level of 2.45 cent/kWh in the first quarter of 2003, the market price rose steadily to reach 5.82 cent/kWh in the third quarter of 2006. After slipping to 4.39 cent/kWh in mid-2007, the price rebounded to an all-time high of 8.5 cent/kWh in the third quarter of 2008. This was followed by a sharp decline to 4.33 cent/kWh in the second quarter of 2009. After a brief recovery in the following quarter, the prices decreased once more, bottoming out at 4.17 cent/kWh in the second quarter of 2010. They then advanced to 5.2 cent/kWh in the third quarter of this year.

[22] € 10/MWh is equivalent to 1 cent/kWh.
[23] € 10/MWh is equivalent to 1 cent/kWh.

## 3.7 Support requirements (after deduction of market value)

Support requirements for green electricity are calculated by subtracting the market value of the electricity from the total amount paid in compensation and adding balancing power, administrative and finance costs, and expenses for technology promotion funds.

The market value of supported renewable electricity is the average of the quarterly baseload futures included in the market prices published by E-Control pursuant to section 20 Green Electricity Act for a given year.[24]

Balancing energy expenses are apportioned according to OeMAG's costs for wind power and other technologies. In 2009 wind accounted for the lion's share of balancing energy expenses, at around 88%.

Administrative expenses and finance costs (2009: € 2.9m) and provincial government technology promotion funds (2009: € 7m) were allocated to the various technologies on a pro rata basis in accordance with the corresponding *Aliquotierungsverordnung* (Prorating Order).

In 2009 support requirements for "other" renewable energy amounted to € 284m, and those for all supported renewable electricity, including small hydro, to € 280m.

As market electricity prices in 2009 and 2010 were well below 2008 levels (and supported green electricity volumes rose slightly), support requirements have surged compared with 2008, and are expected to increase significantly to € 353m in 2010.

Support requirements for small hydropower were negative by € 4m in 2009, as market prices were higher than the feed-in tariffs for most of the year.

The changes in support requirements since 2003, including the forecast level for 2010 and the corresponding market prices, are shown in the table below.

[24] E.g. the baseload futures price for the first quarter of 2009 is included in the calculation of intra-year market prices at 1 April 2008, 1 July 2008, 1 October 2008 and 1 January 2009, published in accordance with section 20 Green Electricity Act. These four values are applied to the calculation of the market value of renewable electricity for the first quarter of 2009. A similar method is used to calculate quarterly values for the remainder of 2009, resulting in the full-year value for 2009.

| Support requirements, in m€ | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Primary energy source | *2003* market price *2.574* cent/kWh | *2004* market price *3.063* cent/kWh | *2005* market price *3.787* cent/kWh | *2006* market price *5.208* cent/kWh | *2007* market price *5.108* cent/kWh | *2008* market price *6.425* cent/kWh | *2009* market price *5.909* cent/kWh | *2010 forecast* market price *4.493* cent/kWh |
| Wind | 24 | 50 | 75 | 71 | 74 | 42 | 49 | 86 |
| Solid biomass | 16 | 26 | 43 | 87 | 156 | 142 | 160 | 192 |
| Biogas | 17 | 18 | 25 | 32 | 51 | 61 | 60 | 52 |
| Liquid biomass | 1 | 2 | 3 | 5 | 10 | 4 | 3 | 4 |
| Photovoltaics | 8 | 8 | 8 | 8 | 8 | 9 | 11 | 11 |
| Other supported green power (excluding hydro) | 3 | 3 | 2 | 1 | 3 | 1 | 1 | 2 |
| **Total "other" green power** | **70** | **108** | **155** | **205** | **303** | **259** | **284** | **347** |
| | | | | | | | | |
| Supported small hydro | 69 | 77 | 67 | -7 | 12 | -7 | -4 | 5 |
| **Total supported green power** | **139** | **184** | **223** | **198** | **315** | **252** | **280** | **353** |

[Sources: OeMAG/GPBGRs, E-Control GmbH]

**Table 24: Support requirements, 2003–2009 and 2010 (preliminary values)**

If market prices were to reach 5 or 6 cent/kWh, support requirements for 2010 would drop to € 326m or € 273m, respectively. These scenarios are presented in detail in the following table:

| Market prices and support requirements 2010, in m€ | | | |
|---|---|---|---|
| Primary energy source | *Market price 4.493 cent/kWh* | *Market price 5.000 cent/kWh* | *Market price 6.000 cent/kWh* |
| Wind | 86 | 75 | 54 |
| Solid biomass | 192 | 182 | 162 |
| Biogas | 52 | 49 | 44 |
| Liquid biomass | 4 | 4 | 3 |
| Photovoltaics | 11 | 11 | 11 |
| Other supported green power (without hydropower) | 2 | 2 | 1 |
| **Total "other" green power** | **347** | **323** | **275** |
| | | | |
| Supported small hydro | 5 | 3 | -2 |
| **Total supported green power** | **353** | **326** | **273** |

[Source: E-Control GmbH]

**Table 25: Support requirements for 2010, as determined by market prices**

## 3.8 Cost burden arising from renewables charges and settlement prices for household consumers

In 2009 renewable energy support payments placed an additional cost burden of € 27–30 on the average household.

**Calculation method**

The renewable electricity bought by OeMAG at feed-in tariff rates and allocated to electricity suppliers is financed by two price components, flat-rate renewables charges and settlement prices (see Chapter 2).

The renewables charges are collected directly from consumers, whereas the settlement prices are initially paid by electricity suppliers, and the difference from the market value of the remaining electricity can be charged on to consumers.

A weighted settlement price, which is higher than the market price, is determined on the basis of the quantities of small hydropower and "other" renewable electricity for which compensation is paid. The weighted settlement price in 2009 was 10.00 cent/kWh.[25]

The observations and calculations discussed below refer to household consumers, since business and industrial consumers usually make individual contracts.

The calculations below are based on three different models. In model 1, the market value is determined using the mean of the quarterly futures for the year in question. Model 2 uses the daily EEX quarterly baseload futures in years -1 and -2 as the basis for calculating the market values.[26] Model 3 derives the market values from the daily EEX baseload year futures in years -1 and -2. The market value generated by the respective model is then weighted according to information from suppliers on the differences between allocated and peak load electricity. Deviations from all-baseload pricing are limited to 4% (weighting factor for 2007: 0.9599; 2008: 1.0048; 2009: 0.9790).[27] The results of the three models are expressed as price ranges.

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[25] The weighted settlement price is calculated as follows: 4,503 GWh of "other" renewable electricity multiplied by the settlement price for "other" renewable energy of 10.51 cent/kWh, plus 644 GWh of electricity from small hydropower multiplied by the settlement price of 6.41 cent/kWh for small hydropower, divided by total power infeed of 5,147 GWh.

[26] This means that the quarterly prices in 2007 and 2008 are applied to 2009, and an unweighted average is computed.

[27] The weighting factor of 0.9994 for 2010 is not included in these calculations.

The suppliers' costs are calculated by comparing the additional expenses actually incurred due to payment of the renewable electricity settlement price determined by order with the (weighted) market value of the allocated renewable electricity. These costs may be passed on to consumers.[28]

The following table shows the average additional cost of the total electricity supply (i.e. allocated supported renewable electricity plus "normally" procured electricity) for the 2007–2009 period in cent/kWh, calculated using the models described above.

| Additional expenses for retailers attributable to settlement prices | 2007 | | 2008 | | 2009 | |
|---|---|---|---|---|---|---|
| | in cent/kWh | | | | | |
| | min | max | min | max | min | max |
| Reference procurement cost** | 4.08 | 4.98 | 5.14 | 6.46 | 5.36 | 6.57 |
| Settlement price for "other" renewable electricity | 10.33 | | 11.00 | | 10.51 | |
| Settlement price for small hydropower | 6.47 | | 6.23 | | 6.41 | |
| Additional expenses for **"other" renewable electricity** (scaled to total electricity volume)* | 0.41 | 0.48 | 0.37 | 0.48 | 0.33 | 0.43 |
| Additional expenses for **small hydropower** (scaled to total electricity volume)* | 0.04 | 0.07 | 0.00 | 0.02 | 0.00 | 0.01 |
| **Total additional expenses for all renewable electricity according to E-Control calculations*** | **0.45** | **0.55** | **0.37** | **0.50** | **0.33** | **0.44** |

*) 2007: 4,230 GWh "other" renewable electricity; 1,527 GWh supported small hydropower; 54,688 GWh supply to consumers
2008: 4,496 GWh "other" renewable electricity; 945 GWh supported small hydropower; 55,359 GWh supply to consumers
2009: 4,503 GWh "other" renewable electricity; 644 GWh supported small hydropower; 53,439 GWh supply to consumers (preliminary value)

**Reference procurement cost: 3 options: option 1: weighted market price of individual quarters; option 2: quarterly baseload futures in years -1 and -2; option 3: baseload year futures in years -1 and -2
[Source: E-Control GmbH]

**Table 26: Additional expenses attributable to settlement prices, based on the three calculation models**

The suppliers' average additional expenses for green power, allocated to their total supply and compared with market prices, ranged between 0.37 cent/kWh (minimum in 2008) and 0.55 cent/kWh (maximum in 2007). These fluctuations reflect the development of the quantity of renewable electricity as compared to total supply, variations in settlement prices from year to year, and the market electricity price trends.

In the 2007–2009 period electricity suppliers[29] passed on average additional expenses of between 0.51 cent/kWh (2009) and 0.60 cent/kWh (2007). The maximum expense charged was between 0.60 cent/kWh and 0.66 cent/kWh.

[28] The Act does not regulate the manner in which the renewable electricity expenses are to be charged on to consumers in detail.

| **Additional expenses passed on by the largest electricity suppliers** (nine provincial incumbents and others) | **2007** | **2008** | **2009** |
|---|---|---|---|
| | **in cent/kWh** | | |
| Mean | 0.60 | 0.53 | 0.51 |
| Minimum | 0.57 | 0.48 | 0.37 |
| Maximum | 0.66 | 0.60 | 0.60 |
| **Reference value: additional expenses according to E-Control calculation model*** | 0.45-0.55 | 0.37-0.50 | 0.33-0.44 |

*Reference procurement cost: 3 options: option 1: weighted market price of individual quarters; option 2: quarterly baseload futures in years -1 and -2; option 3: baseload year futures in years -1 and -2

[Sources: Information on bills and websites of the suppliers, calculations by E-Control GmbH]

**Table 27: Additional expenses arising from settlement prices actually passed on to consumers by 19 suppliers compared to the additional expenses calculated**

Investigations by the Federal Competition Authority and E-Control have revealed that the additional expenses for renewable electricity charged on to consumers are higher than the difference between the renewable energy settlement prices payable by the suppliers and the "normal" cost of procuring electricity. However, since the suppliers do not disclose their procurement costs, it is impossible to determine the precise extent of the overcharging.

In October 2009 the Federal Competition Authority was requested to initiate an investigation into the suspicion voiced in E-Control's Green Electricity Report 2009 that suppliers were overcharging consumers for their renewable electricity expenses. The Authority's report, published in May 2010, reaches the following conclusions (excerpts):
"It seems likely that in the past, energy utilities have indicated amounts as additional expenses arising from renewable electricity that were higher than the actual costs arising from the allocation of such electricity. However, the Federal Competition Authority was unable to determine conclusively the precise extent of the surcharge that was not covered by the utilities' costs. … The current system of renewable electricity support is largely to blame for this problem. At the time at which they set their prices for consumers the utilities are unaware of a number of key factors that influence the cost of renewable electricity. Consequently the companies are forced to rely on forecasts. There is little possibility of issuing catch-up payment demands to consumers in the meaning of the *Konsumentenschutzgesetz* (Consumer Protection Act) (i.e. in particular household consumers) who have been undercharged for the utility's renewable electricity expenses. As a result, in order to ensure that their costs are fully covered, suppliers tend to take a conservative approach in their calculations.

[29] Information taken from bills issued by the nine provincial energy utilities and ten other large suppliers

… In order to make the actual cost of renewable electricity support more transparent, consideration should be given to reform of the current support system…"[30]

Due to the intra-year adjustments made by numerous suppliers, the analyses of the amounts charged on to consumers by electricity suppliers in 2010 that are currently available are incomplete. The volatility of electricity prices in the 2008 and 2009 procurement periods also hinders the calculation of renewable electricity expenses.

Table 28 provides a detailed overview of the additional expenses incurred by the largest electricity suppliers.

| Electricity suppliers | 2007 | 2008 | 2009 |
|---|---|---|---|
| | Additional renewable electricity expenses in cent/kWh | | |
| **Bewag** | **0.66** | n.a. | 0.53 |
| Energie AG | 0.58 | 0.48 | 0.48 |
| Energie Graz | 0.58 | n.a. | 0.55 |
| Energie Klagenfurt *) | 0.58 | n.a. | n.a. |
| **Energie Ried** | 0.60 | **0.60** | **0.60** |
| **EVN** | **0.66** | 0.53 | 0.53 |
| IKB | 0.58 | 0.48 | 0.39 |
| Kelag *) | 0.59 | n.a. | n.a. |
| Linz AG | 0.58 | 0.48 | 0.48 |
| MyElectric | 0.59 | n.a. | 0.53 |
| Salzburg AG | 0.62 | 0.52 | 0.52 |
| Stadtwerke Hartberg | 0.57 | 0.57 | 0.57 |
| Steweag-Steg | 0.59 | 0.56 | 0.56 |
| **Switch** | **0.66** | 0.53 | 0.53 |
| Tiwag | 0.58 | n.a. | 0.37 |
| Unsere Wasserkraft | 0.60 | 0.55 | 0.55 |
| Verbund *) | 0.60 | n.a. | n.a. |
| VKW**) | 0.59 | n.a. | 0.42 |
| **Wien Energie** | **0.66** | 0.53 | 0.53 |
| **Reference value: additional expenses according to E-Control calculations*** ** | **0.45-0.55** | **0.37-0.50** | **0.33-0.44** |

*) In 2008 and 2009, the cost of renewable electricity was not itemised but included in the energy price.
**) VKW has announced that the renewable electricity expenses will be raised on 1 July 2010. The table lists expenses before the raise.

***Reference procurement cost: 3 options: option 1: weighted market price of individual quarters; option 2: quarterly baseload futures in years -1 and -2; option 3: baseload year futures in years -1 and -2
[Sources: Information on bills and websites of the suppliers]

**Table 28: Detailed comparison of additional renewable electricity expenses actually charged to consumers by 19 suppliers and additional expenses calculated[31]**

[30] Federal Competition Authority, *Prüfbericht über die Praxis der Ausweisung von Ökostromaufschlägen durch Energieversorgungsunternehmen* (Audit report on the disclosure of surcharges for renewable electricity by energy utilities) (German only).

Examples of the total cost burden due to suppliers' additional expenses and the flat renewables charges for three typical consumers (household, business and industrial) are shown in the table below.

| Annual cost burden for three typical consumers (in €) | 2007 | | 2008 | | 2009 | |
|---|---|---|---|---|---|---|
| | in cent/kWh | | | | | |
| | min | max | min | max | min | max |
| Total for household at GL 7 consuming 3,500 kWh | 31 | 34 | 28 | 33 | 27 | 30 |
| Total for business at GL 6 consuming 100,000 kWh* | 746 | 851 | 665 | 804 | 630 | 737 |
| Total for industrial consumer at GL 3 consuming 150 GWh* | 683,255 | 840,751 | 562,782 | 771,653 | 509,904 | 670,055 |

*) For companies subject to the net production value cap pursuant to section 30e Green Electricity Act as amended by FLG I no 104/2009, smaller amounts may result for 2008 and 2009.
Reference procurement cost: 3 options: option 1: weighted market price of individual quarters; option 2: quarterly baseload futures in years -1 and -2; option 3: baseload year futures in years -1 and -2
[Source: E-Control GmbH]

**Table 29: Annual cost burden for three typical consumers (attributable to expenses in excess of the weighted market price of electricity and to flat renewables charges)**

The average annual cost burden arising from expenses actually passed on and renewables charges for a household consumer with an annual consumption of 3,500 kWh was between € 33 (2009) and € 36 (2007); the highest cost burden was € 38 per year (2007).

| Actual annual cost burden charged on to households consuming 3,500 kWh | 2007 | 2008 | 2009 |
|---|---|---|---|
| | in € | | |
| Mean | 36 | 34 | 33 |
| Minimum | 35 | 32 | 28 |
| Maximum | 38 | 36 | 36 |
| **Reference value: cost burden according to E-Control caluclations*** | 31-34 | 28-33 | 27-30 |

*Reference procurement cost: 3 options: option 1: weighted market price of individual quarters; option 2: quarterly baseload futures in years -1 and -2; option 3: baseload year futures in years -1 and -2

[Sources: Information on bills and websites of the suppliers, calculations by E-Control GmbH]

**Table 30: Actual annual cost burden (charged-on settlement prices and flat renewables charges) for the household customers of 19 electricity suppliers compared to the cost burden calculated**

[31] In isolated cases suppliers may have made intra-year adjustments to the renewable electricity expenses passed on to their customers; these are not all taken into consideration in this table.

# 4 Cost of balancing energy for supported green electricity

The renewable electricity to be taken by OeMAG is allocated to electricity retailers in advance, by way of schedules. Particularly where wind power is concerned, these forecasts may diverge from the actual quantities of renewable electricity supplied. OeMAG uses the balancing market to balance out these deviations.

The retailers pay the settlement price determined by order (in 2009, 6.41 cent/kWh for small hydropower and 10.51 cent/kWh for “other” renewable electricity) for the electricity allocated to them in advance according to the schedules. The differences between actual feed-in and the schedules are charged at a weighted settlement price of 10.00 cent/kWh, calculated as follows: 4,503 GWh of “other” renewable electricity x 10.51 cent/kWh plus 644 GWh of small hydropower x 6.41 cent/kWh, divided by the total feed-in quantity of 5,147 GWh.

An annual final settlement and adjustments for the effects on the settlement prices only take place if an overall tolerance threshold of 2% (or rather, separate limits for small hydro and “other” renewable electricity) is transgressed. In 2009 the deviation of infeed from the scheduled allocations was 1.11%, so no final settlement of accounts was required. The tolerance threshold was also undershot from 2003 to 2008. In the event of a final settlement the balancing energy expenses would be identical to the direct expenses, whereas in its absence they correspond to the effective balancing energy expenses (see Table 32).

| **Austria *)** | Q1 | Q2 | Q3 | Q4 | **2009** |
|---|---|---|---|---|---|
| Allocation (forecast) in MWh | 1,411,115 | 1,251,213 | 1,183,145 | 1,357,366 | 5,202,839 |
| Actual infeed in MWh | 1,389,996 | 1,226,864 | 1,176,443 | 1,352,375 | 5,145,678 |
| Balancing energy in MWh | -21,119 | -24,349 | -6,702 | -4,991 | -57,161 |
| **Deviation **)** | **1.52%** | **1.98%** | **0.57%** | **0.37%** | **1.11%** |

+ ... forecast > actual infeed
- ... forecast < actual infeed
*) The values for Austria as a whole are calculated from the weighted values of the control areas
**) Balancing energy deviation in % of infeed
[Sources: OeMAG 17/6/2010 | E-Control GmbH]

**Table 31: Deviations of actual infeed from schedules in 2009**

The table below shows the quantities of balancing energy used by the three balancing groups in 2009, and the expenses arising from them. Renewable electricity take-off of 5,147 GWh was accompanied by 381 GWh of balancing energy take-off and 327 GWh of balancing energy supplies – a total of 708 GWh. Effective balancing energy expenses were € 10.84m. Almost all of the balancing energy, namely 676 GWh at a cost of € 10.7m, arose in the APG balancing group, which includes virtually all of the wind power capacity.

In Austria as a whole an average of 0.21 cent per kWh of renewable electricity was paid for balancing energy.

| Balancing energy volumes and expenses by balancing groups, 2009 | | | | | |
|---|---|---|---|---|---|
| | | APG | TIWAG | VKW | Austria total |
| Green power purchased by OeMAG | GWh | 4,715.15 | 350.72 | 81.58 | 5,147.45 |
| | m€ | 498.22 | 34.39 | 14.93 | 547.53 |
| Positive balancing energy caused | GWh | 365.25 | 13.3 | 2.74 | 381.29 |
| | m€ | 21.76 | 0.81 | 0.17 | 22.73 |
| | Additional settlement price revenues (m€) | -36.51 | -1.33 | -0.27 | -38.12 |
| | De facto expenses for balancing energy (m€) | -14.76 | -0.52 | -0.11 | -15.39 |
| Negative balancing energy caused | GWh | -310.71 | -13.92 | -2.77 | -327.4 |
| | m€ | -5.61 | -0.80 | -0.10 | -6.51 |
| | Settlement price revenue shortfall (m€) | 31.06 | 1.39 | 0.28 | 32.73 |
| | De facto expenses for balancing energy (m€) | 25.45 | 0.59 | 0.18 | 26.22 |
| **Total de facto balancing energy (GWh)[1)]** | | 675.96 | 27.22 | 5.5 | 708.68 |
| **Total de facto expenses for balancing energy (m€)** | | **10.70** | **0.07** | **0.07** | **10.84** |
| Balancing energy expenses per kWh of green power (cent/kWh) | | 0.23 | 0.02 | 0.09 | 0.21 |
| 1) Also where there are negative positions, the amounts are added here to yield total deviation. | | | | | |

[16/2/2010 | Sources: OeMAG, February 2010 - preliminary values]

**Table 32: Balancing energy volumes and expenses by balancing groups in 2009**

The table below sets out the balancing energy data as at 30 June 2010.

| Balancing energy volumes and expenses by balancing groups, H1 2010 | | | | | |
|---|---|---|---|---|---|
| | | APG | TIWAG | VKW | Austria total |
| Green power purchased by OeMAG | GWh | 2,689.28 | 224.11 | 43.52 | 2,956.91 |
| | m€ | 269.61 | 21.22 | 7.48 | 298.31 |
| Positive balancing energy caused | GWh | 148.46 | 5.93 | 1.73 | 156.13 |
| | m€ | 8.87 | 0.32 | 0.10 | 9.30 |
| | Additional settlement price revenues (m€) | -16.70 | -0.67 | -0.19 | -17.56 |
| | De facto expenses for balancing energy (m€) | -7.83 | -0.34 | -0.09 | -8.26 |
| Negative balancing energy caused | GWh | -164.62 | -5.45 | -1.72 | -171.8 |
| | m€ | -4.15 | -0.28 | -0.03 | -4.46 |
| | Settlement price revenue shortfall (m€) | 18.51 | 0.61 | 0.19 | 19.32 |
| | De facto expenses for balancing energy (m€) | 14.37 | 0.34 | 0.16 | 14.86 |
| **Total de facto balancing energy (GWh)[1)]** | | 313.09 | 11.39 | 3.45 | 327.93 |
| **Total de facto expenses for balancing energy (m€)** | | **6.54** | **-0.01** | **0.07** | **6.60** |
| Balancing energy expenses per kWh of green power (cent/kWh) | | 0.24 | 0.00 | 0.16 | 0.22 |
| 1) Also where there are negative positions, the amounts are added here to yield total deviation. | | | | | |

[10/8/2010 | Sources: OeMAG, August 2010 - preliminary values]

**Table 33: Balancing energy volumes and expenses by balancing groups, H1 2010**

Table 34 shows the evolution of balancing energy expenses over time. The expenses fell sharply in 2009, to roughly the same level as in 2004.

| Balancing energy volumes and expenses, 2003-2009 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
| Green power purchases | GWh | 3,982.30 | 5,439.50 | 5,773.25 | 5,109.63 | 5,756.75 | 5,440.43 | 5,147.45 |
| | m€ | 202.19 | 302.46 | 371.49 | 435.19 | 537.52 | 576.19 | 547.53 |
| Positive balancing energy by GPBGRs/OeMAG | GWh | 256.43 | 316.52 | 375.07 | 448.41 | 468.18 | 417.03 | 381.29 |
| | m€ | 12.27 | 13.07 | 28.94 | 36.25 | 30.99 | 35.48 | 22.73 |
| | Additional settlement price revenues (m€) | -11.54 | -14.24 | -16.88 | -20.18 | -43.59 | -42.42 | -38.12 |
| | De facto expenses for balancing energy (m€) | 0.73 | -1.18 | 12.06 | 16.07 | -12.59 | -6.93 | -15.39 |
| Negative balancing energy by GPBGRs/OeMAG | GWh | -233.86 | -296.69 | -353.10 | -424.90 | -397.03 | -350.68 | -327.4 |
| | m€ | -2.58 | -1.76 | -5.83 | -9.16 | -7.26 | -10.08 | -6.51 |
| | Settlement price revenue shortfall (m€) | 10.52 | 13.35 | 15.89 | 19.12 | 36.96 | 35.67 | 32.73 |
| | De facto expenses for balancing energy (m€) | 7.94 | 11.59 | 10.06 | 9.96 | 29.71 | 25.59 | 26.22 |
| **Total de facto balancing energy (GWh)[1]** | | 490.29 | 613.21 | 728.17 | 873.31 | 865.21 | 767.71 | 708.68 |
| **Total de facto expenses for balancing energy (m€)** | | **8.67** | **10.42** | **22.11** | **26.03** | **17.11** | **18.65** | **10.84** |
| Balancing energy expenses per kWh of green power (cent/kWh) | | 0.22 | 0.19 | 0.38 | 0.51 | 0.30 | 0.34 | 0.21 |

1) Also where there are negative positions, the amounts are added to yield total deviation.

[March 2010 | Sources: GPBGRs/OeMAG]

**Table 34: Balancing energy volumes and expenses, 2003–2009**

In preparation for the enactment of the Prorating Order 2010, which establishes the assumptions for the calculation of the 2010 quotas on the basis of actual expenses in 2009, prorated balancing energy expenses of 0.478 cent/kWh for wind farms and 0.039 cent/kWh for other renewable generating capacity were determined.

The table and charts below, comparing the renewable electricity for which OeMAG (and before, the green power balancing group representatives) paid compensation with wind power injection to the grid, the total quantity of balancing energy, and effective balancing energy expenses, reveal a link between wind power generation and balancing energy volumes and costs over the 2003–2006 period. The more wind power there was, the higher the quantity of balancing energy and the effective balancing energy expenses in a given year.

Further refinements in wind power forecasting after 2007 led to reductions in balancing energy needs and effective balancing energy expenses.

| Comparison of effective balancing energy expenses with wind power and total green power in m€ | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** |
| **Green power purchases (incl. small hydro) in GWh** | 3,982 | 5,439 | 5,773 | 5,110 | 5,757 | 5,440 | 5,147 |
| **Wind power infeed in GWh** | 366 | 924 | 1,328 | 1,738 | 2,019 | 1,988 | 1,915 |
| **Total balancing energy in GWh** | 490 | 613 | 728 | 873 | 865 | 768 | 709 |
| **Total effective balancing energy cost in m€** | 8.67 | 10.42 | 22.11 | 26.03 | 17.11 | 18.65 | 10.84 |

[July 2010 | Sources: GPBGRs/OeMAG]

**Table 35: Comparison of effective balancing energy expenses with wind power infeed and total renewable electricity infeed, 2003–2009**

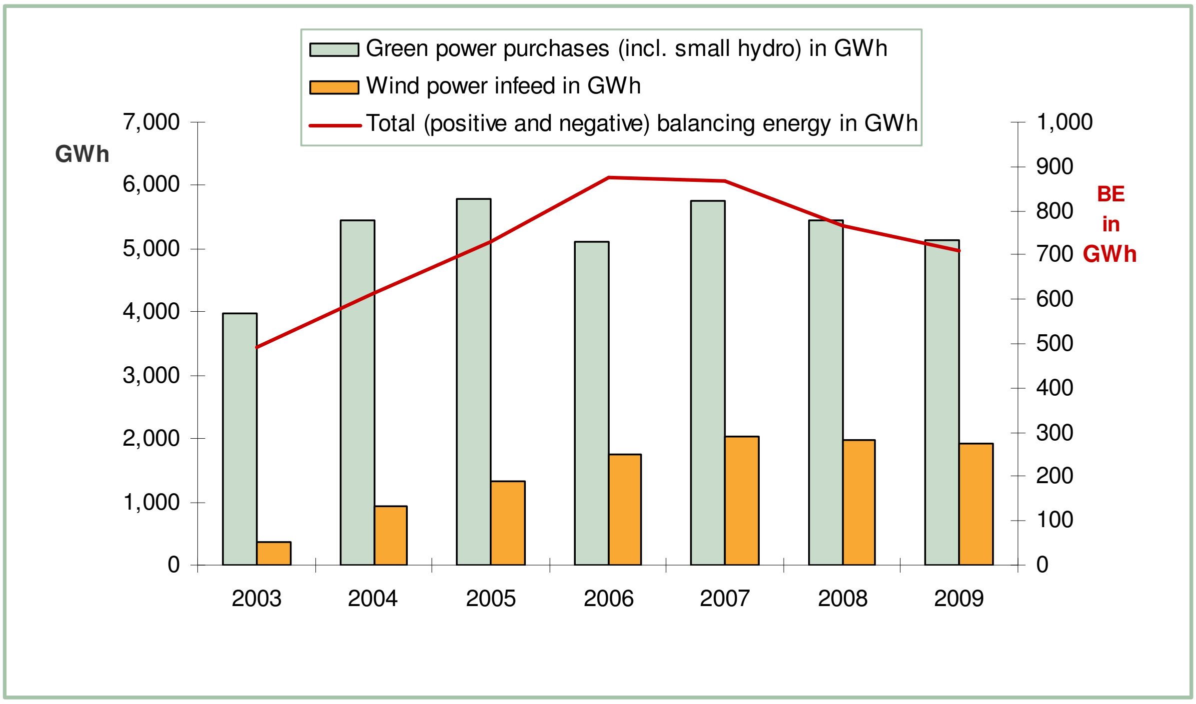



**Figure 12: Quantity of balancing energy over time, in GWh**

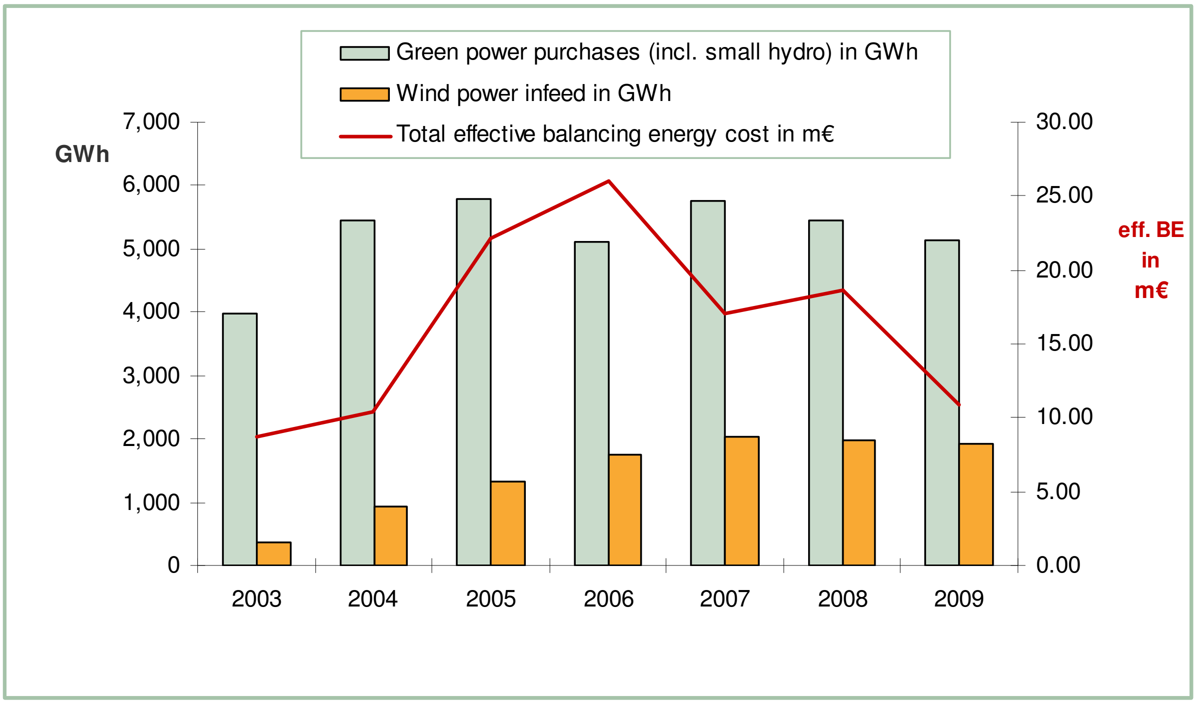



**Figure 13: Evolution of effective balancing energy expenses in €m**

# 5 Target attainment

## 5.1 Targets established by European Union directives

EU directives establish targets for increases in the share of renewable energy sources in energy supply and electricity generation; these are generally expressed as percentages. Since overall energy demand is rising, this approach puts countries like Austria, which has high baseline levels of renewable generation, at a disadvantage.

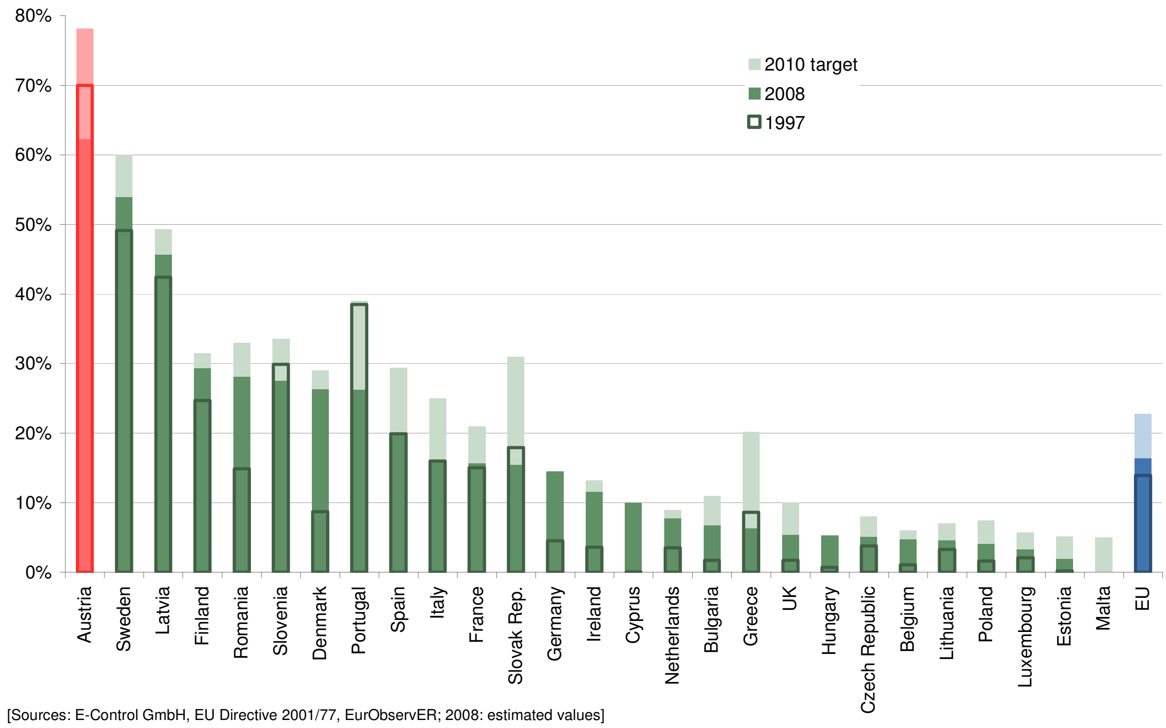
Two directives that set target shares for renewable energy are currently in force:

- Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources of 27 September 2001
- Directive 2009/28/EC on the promotion of the use of energy from renewable sources of 23 April 2009

### 5.1.1 Directive 2001/77/EC

Directive 2001/77/EC, published in September 2001, will be replaced by Directive 2009/28/EC. Directive 2001/77/EC sets Austria an indicative (i.e. non-binding) target of a 78% contribution of electricity produced from renewable energy sources to gross electricity consumption by 2010. A footnote to the Directive remarks that Austria states that 78.1% would be a realistic figure, assuming gross national electricity consumption of 56,1 TWh in 2010. This 78% target was taken as the goal of the Green Electricity Act. The Directive counts all electricity derived from renewable energy sources, including large hydropower, own use and renewable electricity that does not attract support under the Green Electricity Act, e.g. from biomass-fired autogeneration stations.

The graphic below depicts the renewable contribution to electricity supply in EU member states in 1997 and 2008, as well as the targets set by Directive 2001/77/EC.




[Sources: E-Control GmbH, EU Directive 2001/77, EurObservER; 2008: estimated values]

**Figure 14: Renewable electricity contributions in 1997 and 2008, and the EU targets under Directive 2001/77/EC, EU-27**

Austria is in an unusual position as it already had a renewable electricity contribution of over 50% in the reference year. Renewables – mostly hydropower – provided about 70% of electricity consumption in 1997.[32]

The table below sets out domestic electricity consumption and supply from the public grid in Austria from 1997 to 2009 (2009: preliminary or estimated figures) and forecasts for the 2010–2015 period. Also shown are renewable electricity output in Austria, its contribution to consumption in the years concerned, and renewable generation as a percentage of the reference value of 56.1 TWh specified in Directive 2001/77/EC.

These statistics indicate that some 65% of domestic electricity demand was met by renewable energy sources in 2009, representing 81% of the reference level. The development targets set by the Green Electricity (Amendment) Act 2008 would, considering that the MEDA[33] model projects further consumption growth, raise the renewable contribution to electricity consumption to 68% by 2015.

[32] Followed by Sweden (49.1%), Portugal (38.5%) and Spain (19.9%).

[33] MEDA is an empirical demand model developed by E-Control (see 2008 E-Control electricity monitoring report) which can be applied to gross domestic electricity consumption forecasting. Computation of the annual growth rates yields average growth of 1.58% until 2015.

| Renewable contribution to total electricity consumption | 1997* | 2009 preliminary values | 2010 forecast | Development 2010-2015 | 2015 forecast |
|---|---|---|---|---|---|
| | GWh | GWh | GWh | GWh | GWh |
| **Domestic electricity consumption** (incl. own use and pumped storage) | 56,083 | 69,754 | 70,654 | 6,871 | 76,625 |
| **Public grid - supply to consumers** incl. annual 1% increases from 2010 | 42,391 | 53,302 | 53,835 | 3,279 | 56,581 |
| Large hydro (> 10 MW) excl. pumping** | 31,400 | 33,936*** | 33,936 | 1,750 | 35,686 |
| Small hydro (<10 MW) | 4,152 | 5,097**** | 5,197 | 700 | 5,797 |
| Medium-sized hydro (10-20 MW, eligible for investment grants pursuant to the Green Electricity [Amendment] Act) | | | 107 | 750 | 750 |
| "Other" supported green power (wind, biomass, biogas, etc.) | 605 | 4,503 | 4,800 | 1,827 | 6,330 |
| 5% own use in green power plants supported with feed-in tariffs | | 225 | 240 | 91 | 317 |
| Other non-supported green power (black liquor, etc, data incomplete) | 845 | 1,704 | 1,733 | 200 | 1,904 |
| **Total electricity generation from renewable energy sources** | 37,002 | 45,465 | 46,013 | 5,318 | 50,784 |
| Renewable contribution to 56,100 GWh** | 66% | 81% | 82% | | 91% |
| Renewable contribution to domestic consumption | 66% | 65% | 65% | | 66% |

* Data for small hydropower and biomass are taken from the 1998 operational statistics

** The reference value of 70% in 1997 in the EU Directive might have resulted from accidentally including electricity for pumping; generation from pumped storage plants (net of own use for pumping) can vary between 9.5 and 10.8 TWh per year; an efficiency level of 70% is assumed for the calculation of electricity for pumping.

*** Actual output; differences to previous publications may occur.

**** Some 3,866 GWh thereof are registered in the guarantees of origin database (as of March 2010); 644 GWh were supported with feed-in tariffs in 2009.

[Source: E-Control GmbH]

**Table 36: Percentage attainment of the indicative target set by Directive 2001/77/EC and forecast up to 2015**

The Green Electricity (Amendment) Act 2009 introduced a new target for 2015, in addition to that established by Directive 2001/77/EC. Sufficient new and expanded capacity is to be put in place by then with the aim of ensuring that 15% of all supplies to consumers from the public grid come from facilities under contract to OeMAG or eligible for investment grants.

Section 5.3 discusses this 15% target in detail.

### 5.1.2 Directive 2009/28/EC

Directive 2009/28/EC of 23 April 2009, which was announced as part of the 2009 energy and climate package, provides for an increase of the EU-wide renewable share to 20% by 2020, and a share of 10% in the transport sector. In contrast to Directive 2001/77/EC, which is replaced by the new legislation, these targets relate to overall energy supply and not only to electricity supply. They are connected with the goal of a 20% increase in energy efficiency by 2020 as set out in the European Parliament resolution entitled "Action Plan for Energy Efficiency: Realising the Potential".[34]

The Directive also regulates and revises the requirements for the guarantees of origin evidencing power suppliers' energy mix for their customers' information.

Directive 2009/28/EC must be transposed into Austrian national law by 5 December 2010.

#### 5.1.2.1 Goal of 34% renewable share by 2020

In order to hit the European Union's overall targets, member states are required to draw up national action plans. These must contain sectoral targets and pay close attention to biomass – especially new biomass resources. In addition, the effects of energy efficiency and saving measures on national gross energy consumption must be estimated.

The annex to the Directive lays down binding national targets, which are set out in the table below. As can be seen from the table, starting out from a share of 23.3% in 2005 Austria must reach a renewable contribution of 34% by 2020. In the version finally adopted, the Directive defines the method for calculating the renewable share in greater detail and introduces slight changes as compared to the original formulation. According to updated calculations by Statistics Austria the reference value for Austria in 2005 is 25.8%.

[34] European Parliament resolution of 31 January 2008 on the Allocation Plan

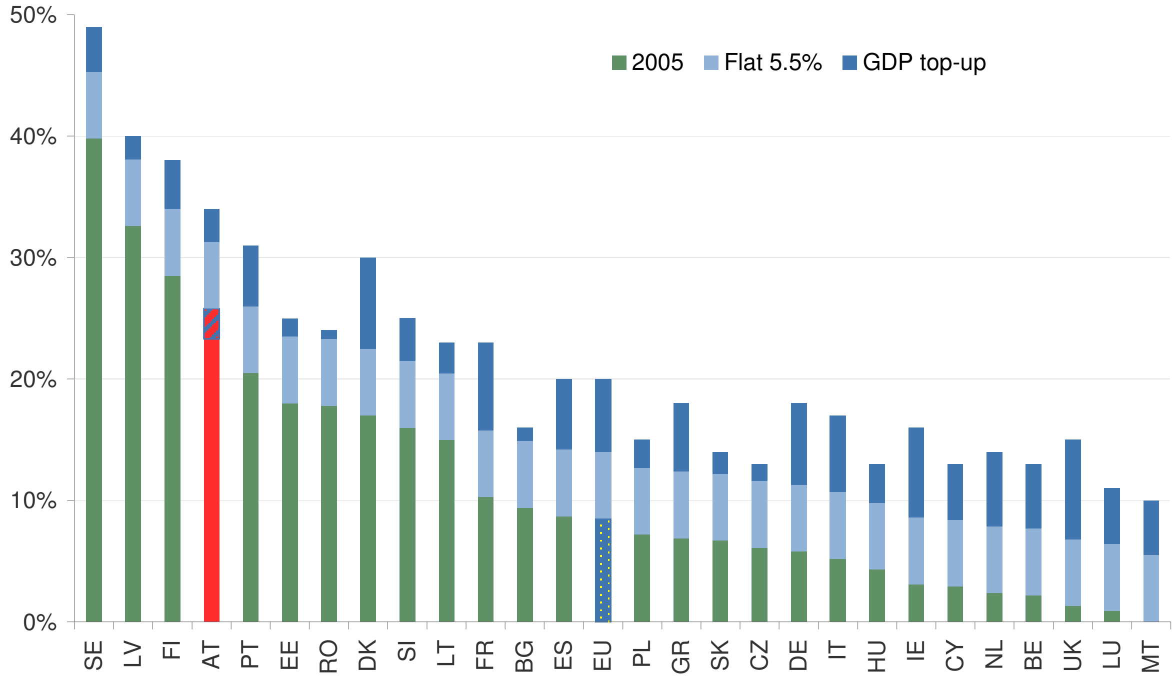
| Renewable contributions to the total energy mix 2005 and 2020 targets pursuant to Directive 2009/28/EC | | |
|---|---|---|
| | 2005 | 2020 |
| SE | 39.8% | 49.0% |
| LV | 32.6% | 40.0% |
| FI | 28.5% | 38.0% |
| AT | 23.3% or 25.8%[1)] | 34.0% |
| PT | 20.5% | 31.0% |
| EE | 18.0% | 25.0% |
| RO | 17.8% | 24.0% |
| DK | 17.0% | 30.0% |
| SI | 16.0% | 25.0% |
| LT | 15.0% | 23.0% |
| FR | 10.3% | 23.0% |
| BG | 9.4% | 16.0% |
| ES | 8.7% | 20.0% |
| EU | 8.5% | 20.0% |
| PL | 7.2% | 15.0% |
| GR | 6.9% | 18.0% |
| SK | 6.7% | 14.0% |
| CZ | 6.1% | 13.0% |
| DE | 5.8% | 18.0% |
| IT | 5.2% | 17.0% |
| HU | 4.3% | 13.0% |
| IE | 3.1% | 16.0% |
| CY | 2.9% | 13.0% |
| NL | 2.4% | 14.0% |
| BE | 2.2% | 13.0% |
| UK | 1.3% | 15.0% |
| LU | 0.9% | 11.0% |
| MT | 0.0% | 10.0% |

[1)] 25.8% according to updated EU definitions

[Sources: Directive 2009/28/EC, E-Control GmbH, Statistics Austria]

**Table 37: National targets according to Directive 2009/28/EC**

When setting the targets each member state was initially allocated an additional renewable share of 5.5%. The additional quotas were weighted according to member states' gross domestic product, and adjusted to reflect their starting points. In addition a cap of 50% – most likely to be reached by Latvia and Sweden – was built into the targets (Figure 15).




[Sources: Directive 2009/28/EC, E-Control GmbH]

**Figure 15: Share of renewable energy in total supply in the EU, 2005 levels and 2020 targets**

Austria is among the European countries with the highest renewable shares; only Sweden, Latvia and Finland rank above it (in that order).

As in the 2009 Green Electricity Report, attention is drawn to the method established by the directive for calculating the renewable shares.

**Renewable share of energy consumption – a matter of definitions**

In 2007 the renewable contribution to gross domestic consumption was 25.3%. However, the target shares established by the Renewables Directive (2009/28/EC) are relative to gross final consumption of energy rather than gross domestic consumption, and take other factors into account apart from final energy consumption. The formula for calculating the renewable share is as follows:

$$\textbf{Renewable share} = \frac{\text{final renewable energy consumption + renewable electricity + renewable pumped storage}}{\text{total final energy consumption + losses + energy sector own use}}$$

In addition the new Directive contains a normalisation rule for electricity generated from hydropower and wind power, to be used when calculating the renewable share. The formula for the rule is as follows:[35]

[35] Source: Directive 2009/28/EC

$$Q_{N(norm)} = C_N * \left[ \sum_{i=N-14}^{N} \frac{Qi}{Ci} \right] / 15$$

where:

$N$ = reference year;

$Q_{N(norm)}$ = normalised electricity generated by all hydropower plants of the member state in year N, for accounting purposes;

$C_N$ = the total installed capacity of all hydropower plants;

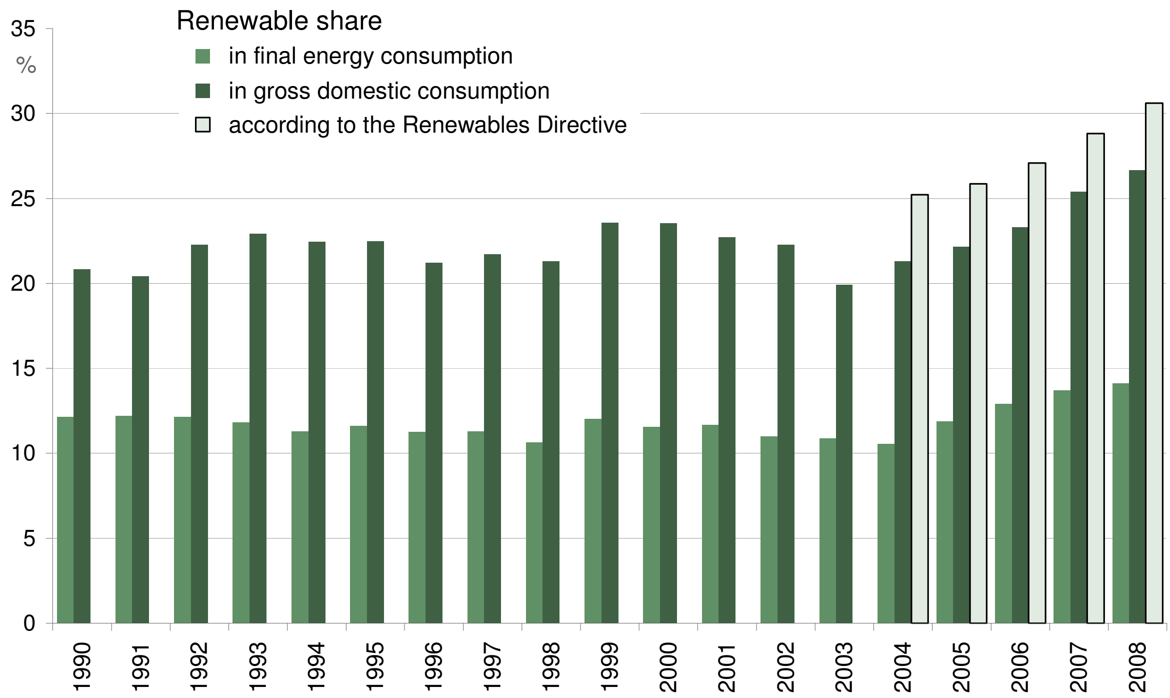
$Qi$ = the quantity of electricity actually generated in year *i* by all hydropower plants of the member state measured in GWh;

$Ci$ = the total installed capacity, net of pumped storage, of all hydropower plants of the member state at the end of year *i*, measured in MW.

The normalisation formula employed favours new power stations with high capacities but below-average full-load hours, as these are accounted for not according to their actual output but in terms of the average full-load hours of all hydropower stations in Austria, i.e. the renewable share includes higher imputed quantities of electricity generated from renewable sources.

Figure 16 shows the Austrian renewable share when measured by gross domestic consumption and by final energy consumption. A striking feature of the figures is the fact that in 2008 the renewable share in terms of gross final energy consumption, calculated as required by the new Renewables Directive, was 30.6%, or 28.8% of gross domestic consumption.[36]

[36] Source: E-Control calculations based on data from Statistics Austria




[Source: Statistics Austria]

**Figure 16: Renewables as a percentage of energy consumption, 1990–2008**

### 5.1.2.2 Guarantees of origin

E-Control runs the Austrian electricity guarantee of origin database, which tracks the entire life cycle of a guarantee of origin (GO). We are also the issuing body for guarantees of origin under the EU Directive, and are responsible for auditing power labelling disclosure.

Guarantees of origin evidence the energy mix of the power delivered to consumers by an electricity supplier. Their purpose is to ensure that the origin of electricity can be guaranteed in accordance with "objective, transparent and non-discriminatory criteria".[37] Guarantees of origin are issued for electricity generated at plants that meet certain requirements and are certified. They are either sold on or are cancelled when they are used for power labelling purposes.

The table below compares the requirements imposed on guarantees of origin by Directive 2001/77/EC with those of the new Directive 2009/28/EC:

[37] Article 15(1) Directive 2009/28/EC

| | EU Directive 2001/77/EC | Article | EU Directive 2009/28/EC | Article |
|---|---|---|---|---|
| Unit | 1 kWh | 5 | 1 MWh | 15(2) |
| Guarantee of origin despite support | - | | Discretionary provision on national level: only if not supported | 15(2) |
| Validity | - | | 12 months | 15(3) |
| Issue | - | | electronic | 15(5) |
| Mimimum indications on the guarantee of origin | Primary energy source of the electricity | 5(3) | Primary source of the energy | 15(6)(a) |
| | Time and place of generation | 5(3) | Beginning and end of generation | 15(6)(a) |
| | For hydropower stations: capacity | 5(3) | Indication of whether it relates to electricity; or heating or cooling | 15(6)(b) |
| | | | Name, location, type and capacity of the plant | 15(6)(c) |
| | | | Receipt and amount of investment grants | 15(6)(d) |
| | | | Type of support | 15(6)(d) |
| | | | Operational date of the installation | 15(6)(e) |
| | | | Date and country of issue and a unique identification number | 15(6)(f) |

**Table 38: Comparison of the requirements for guarantees of origin under Directives 2001/77/EC and 2009/28/EC**

The changes with regard to the validity of guarantees, their issue and the additional information that the GOs must contain will require adjustments to the Austrian guarantee of origin database and the GOs issued in this country.

## 5.2 Comparison of the electricity supported under the German EEG and the Austrian Green Electricity Act

In 2009 the contribution of supported renewable electricity to final consumption in Germany was 15.03%, compared to 9.63% in Austria.

| Quantities of electricity attracting compensation under the German EEG in 2009 and shares of consumption, compared with supported green power in Austria | | | | |
|---|---|---|---|---|
| | Supported green power in Germany in GWh | Share of supported green power in Germany[1] | Supported green power in Austria in GWh | Share of supported green power in Austria[2] |
| Wind | 37,809 | 7.93% | 1,915 | 3.58% |
| Biomass (solid, liquid, gaseous) | 20,525 | 4.30% | 2,522 | 4.72% |
| Photovoltaics | 6,200 | 1.30% | 21 | 0.04% |
| Landfill, sewage and mine gas | 2,397 | 0.50% | 44 | 0.08% |
| Geothermal energy | 18 | 0.00% | 2 | 0.00% |
| Hydropower | 4,766 | 1.00% | 644 | 1.21% |
| **Total "other" green electricity** | **71,715** | **15.03%** | **5,148** | **9.63%** |

1) Compared to a total consumption of 477,000 GWh (preliminary value). Other publications deduct priviledged consumption (2009: 70,000 GWh) from total consumption, resulting in larger shares.
2) Compared to a total supply from the public grid of 53,439 GWh (preliminary values)

[March 2010 | Sources: German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety; OeMAG, E-Control GmbH]

**Table 39: Quantities of electricity attracting compensation under the German EEG in 2009 and shares of consumption, compared with supported green power in Austria**

In 2009 the EEG contribution was 1.1 cent/kWh. Electricity suppliers may charge this contribution on to consumers. The resultant cost burden for a household consumer with an annual electricity demand of 3,500 kWh was € 38.50. The EEG contribution set for 2010 is 2.047 cent/kWh, meaning that German households will be paying more for renewable electricity.[38]

## 5.3 Targets under the Green Electricity (Amendment) Act 2009

The Green Electricity (Amendment) Act 2009 set new targets for 2015.

Section 4(3) of the Act calls for the construction of an additional 700 MW of hydropower capacity (including 350 MW of small and medium-sized hydro), 700 MW of wind power capacity and 100 MW of biomass capacity (subject to the availability of fuel/feedstock).

Section 4(2) states that sufficient new and expanded capacity is to be put in place by 2015 for 15% of all supplies to consumers from the public grid to come from facilities under contract to OeMAG or eligible for investment grants. This target includes electricity generated at new small and medium-sized hydropower plants, and additional output resulting from upgrading and expanding existing small hydro stations since the entry into force of the Green Electricity Act 2002. Hydropower plants with maximum electric capacities of over 20 MW are excluded.

[38] In 2010 the annual cost for a household with an annual electricity consumption of 3,500 GWh will be € 71.64.

Due to the availability of funding by way of investment grants for small and medium-sized hydropower stations, the number of projects is likely to grow. OeMAG is expected to support some 1,218 GWh generated at small and medium hydro stations by means of investment grants. In addition, 285 GWh of supported power from black liquor fired generating stations is seen by 2015.

The high feed-in tariff for wind power in 2010 has touched off a wave of project planning. Several hundred MW of wind power capacity are awaiting accreditation by provincial governments as renewable electricity plants. Consequently it is probable that the target of an extra 700 MW of wind capacity by 2015 will be met.[39]

In 2009 biomass again received a top-up payment – this time of 3 cent/kWh – to cover high fuel/feedstock costs, thereby creating an additional investment incentive. However, the relatively high plant construction and power generation costs are obstacles to investment. Forecast target attainment in 2015 also reflects the anticipated development of 100 MW of biomass capacity with an output of 600 GWh, most of it supported.

Overall, some 4,503 GWh of “other” renewable electricity supported by means of OeMAG feed-in tariffs is forecast for 2015.

According to current forecasts the supply of renewable electricity to consumers from the public grid will represent 14.4% of total consumption by 2015. Another 344 GWh of green electricity would be needed to hit the 15% target.

[39] In 2009 OeMAG took some 1915 GWh of wind power; an additional annual 1,540 GWh are projected by 2015.

| Trajectory of renewable generation towards the 15% target for 2015 | GWh (rounded) in 2009/2010 |
|---|---|
| *Public grid - supply to consumers (2015 forecast)* | *56,600* |
| **15% target** | **8,500** |
| Small hydro (< 10 MW), supported new and rehabilitated plants | 980 |
| of these: construction or rehabilitation approved by mid-2010 (feed-in tariffs, investment grants) | 800 *1 |
| of these: construction or rehabilitation application filed by mid-2010 (investment grants) | 180 *2 |
| Medium-sized hydro (10-20 MW, eligible for investment grants pursuant to the Green Electricity [Amendment] Act) | 300 *3 |
| "Other" supported green power (wind, biomass, biogas, etc) | 4,500 |
| Black liquor (investment grant pursuant to the Green Electricity Act) | 300 *4 |
| Additional wind power by 2015 foreseen by the Green Electricity Act | 1,500 *5 |
| Additional "other" green power foreseen by the Green Electricity Act (subject to raw material availability) | 600 *6 |
| *Total electricity output from renewable energy sources (excluding large hydro)* | *8,180* |
| **Renewable contribution to supplies to consumers from the public grid** | **14.5%** |

*1 180 MW newly constructed, 90 MW rehabilitated

*2 Applications for some 45 MW received by 31/7/2010, assuming that 80% will be approved (4,000 full load hours, 20% rehabilitation share)

*3 Additional capacity of some 67 MW, approved by 31/7/2010, multiplied by 4,500 full load hours

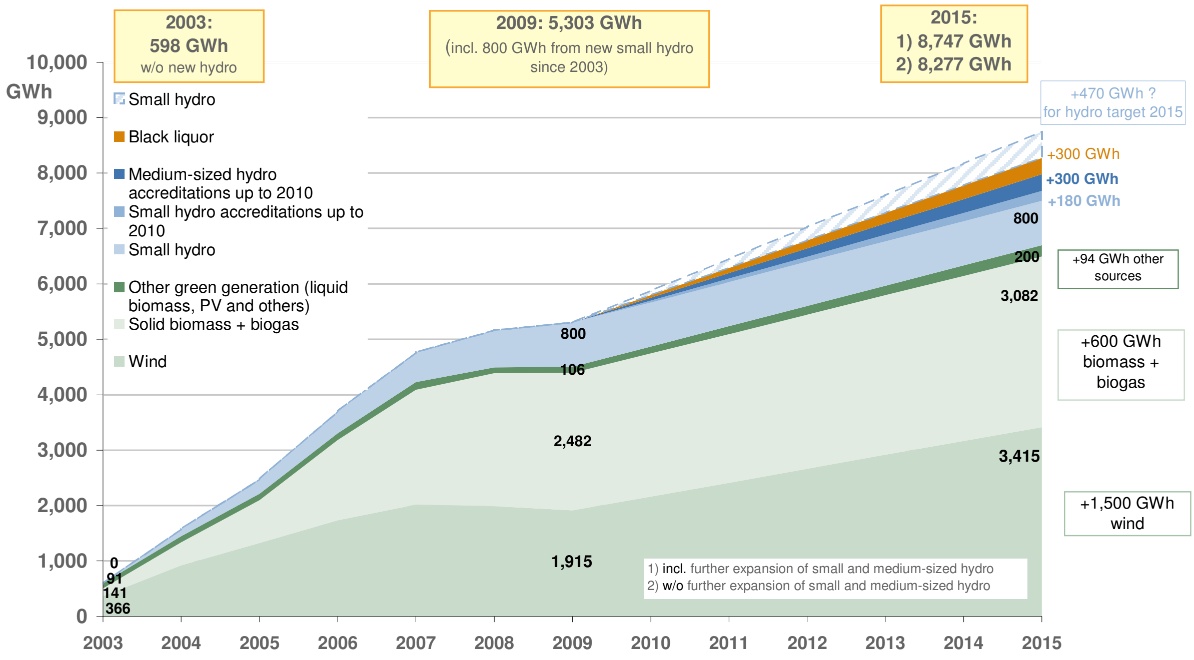
*4 Approved capacity of some 34 MW multiplied by 8,400 full load hours

*5 Expansion target of additional 700 MW capacity by 2015, multiplied by 2,200 full load hours

*6 Expansion target of additional 100 MW capacity by 2015, multiplied by 6,000 full load hours

**Table 40: Trajectory of renewable generation towards the 15% target for 2015**

The charts below depict the projected growth of renewable electricity output up to 2015.




[Sources: E-Control GmbH, OeMAG]

**Figure 17: Expected growth of supported renewable electricity generation up to 2015 by technologies, in GWh**

As can be seen, further development of wind power from 2009 to 2015 (an additional 1,500 GWh) is anticipated. Hydropower output is expected to grow by 1,280–1,750 GWh as a result of up to 20 MW in capacity created by investments in new plants attracting grants extended in accordance with the Green Electricity Act. The total quantity of supported renewable electricity is thus projected to climb to between 8,280 and 8,750 GWh by 2015.

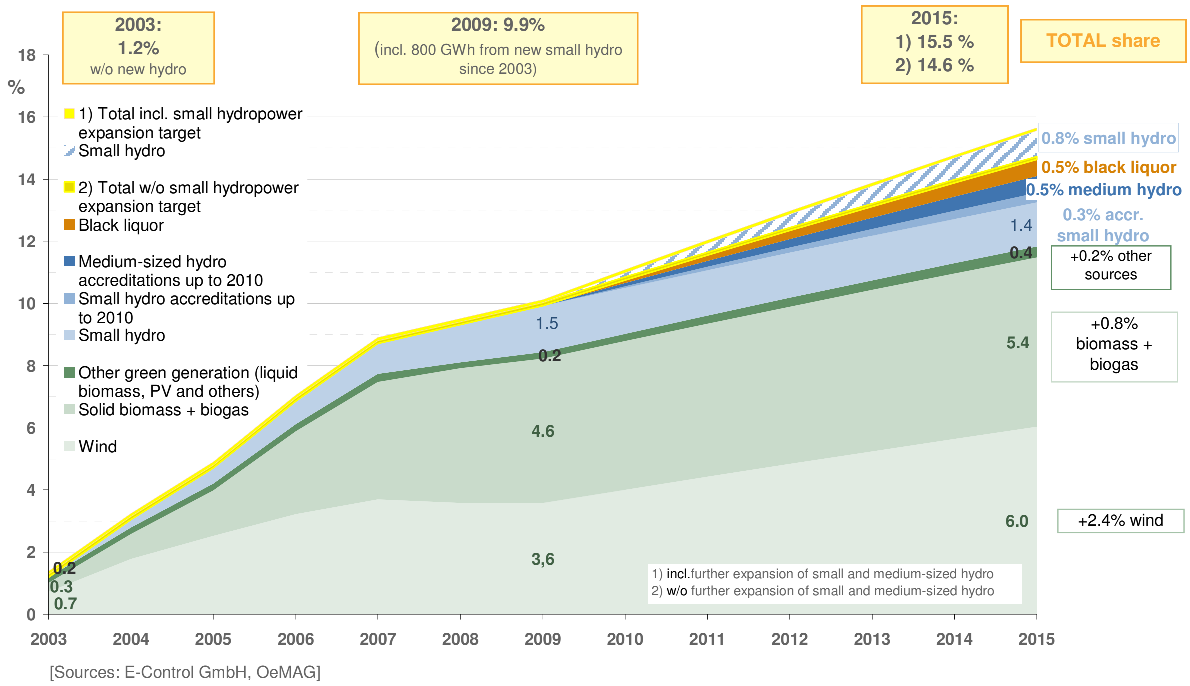


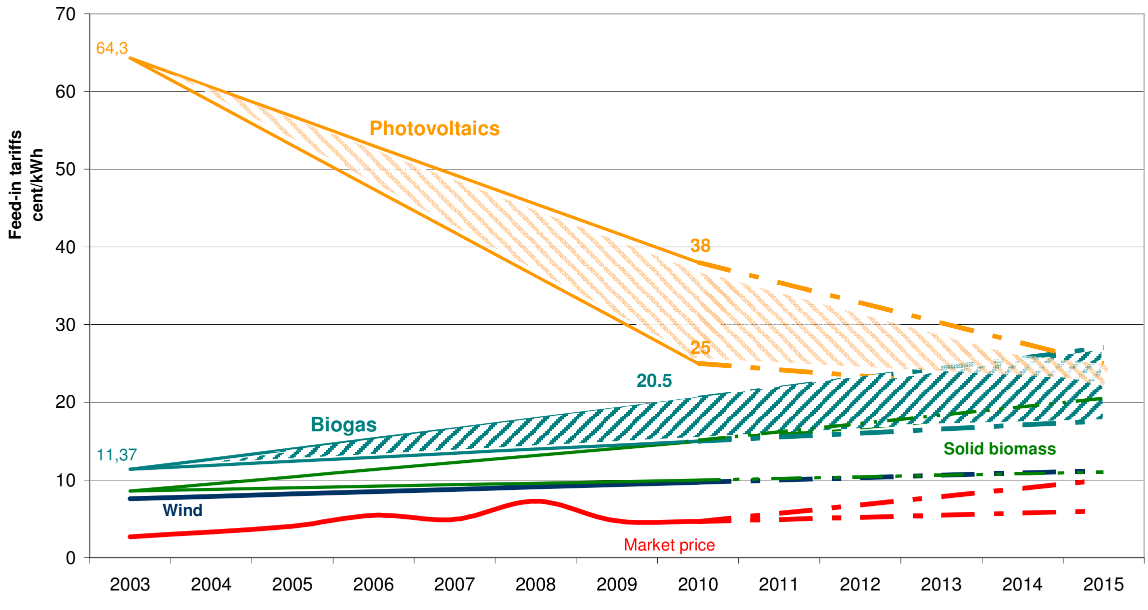

**Figure 18: Expected growth of supported renewable electricity generation up to 2015 by technologies, in %**

According to the forecast, wind power's share of total generation will rise from 3.6% in 2009 to 6.0% in 2015. Up to 20 MW of expansions and new plants, in addition to capacity that has already been approved, will add up to a share of at least 2.2% of final electricity consumption, and further approvals awarded in coming years could boost this to 3%. These trends point to an overall renewable share of supply from the public grid of 14.6–15.5% by 2015 – in line with the 15% target set by the Green Electricity Act.

## 5.4 Commercial maturity and efficient use of resources

In recent years the support extended to small hydropower has largely conformed to the objectives of the Green Electricity Act. This technology reached commercial maturity for the first time in 2006 when the supported feed-in tariff (an average of 5.16 cent/kWh) was below the market price (average of 5.44 cent/kWh).

The main priorities as regards the attainment of commercial maturity are thus the new technologies. In 2009 the average market price was 4.72 cent/kWh.[40] The chart below shows the progress of the feed-in tariffs for photovoltaics, biogas, solid biomass and wind towards commercial maturity




Source: E-Control GmbH

**Figure 19: Progress of photovoltaics, biogas, wind power and solid biomass towards commercial maturity in terms of convergence with the market price, 2003–2015**

Wind power generating costs are marginally above the market price. A feed-in tariff of 9.7 cent/kWh has been paid in 2010.[41] In a high-price scenario with a market price of 10 cent/kWh, in 2015 wind would almost have converged with the market price.

The feed-in tariffs for photovoltaics have been between 25 and 38 cent/kWh in 2010.[42] If the decline in the cost of photovoltaic modules continues at the same rate, the generating costs could fall to 20-25 cent/kWh.

[40] Deviations from the mean market price given in other publications reflect different statistical treatments and periods. The market price published pursuant to section 20 Green Electricity Act may differ significantly from actual traded prices as a result of the relatively low proportion of the wholesale market represented by the Leipzig EEX exchange.

[41] In volume weighted terms the feed-in tariffs paid for wind power in 2009 averaged 7.77 cent/kWh (see Figure 8).

[42] In volume weighted terms the feed-in tariffs paid for PV in 2009 averaged 60.04 cent/kWh (see Figure 8).

A price level of this order would mark a major advance in the direction of commercial maturity for autogeneration without recourse to the public grid (grid parity). In the case of grid connected systems (infeed to the public grid) generating costs remain several times those of conventional technologies.

However, there has been no convergence of the generating costs of raw material-dependent renewable generating technologies (biomass and biogas) with market price levels. In the case of biogas, the feed-in tariffs commanded by many plants have risen by 3 cent/kWh due to the top-up payments to compensate operators for higher fuel/feedstock prices, and have thus departed still further from market price levels.
It is striking that electricity generated from agricultural products (at biogas plants) could be dearer than power from PV arrays in some years.

The charts below compare movements in feed-in tariffs for the various renewable generating technologies with the consumer price index (base year 2003 for both). The average prices paid by the green power settlement agent to the operators of all existing renewable generating plants between 2003 and 2009 are applied. The feed-in tariffs for new plants established by the Green Electricity Order 2010 are used for 2010.

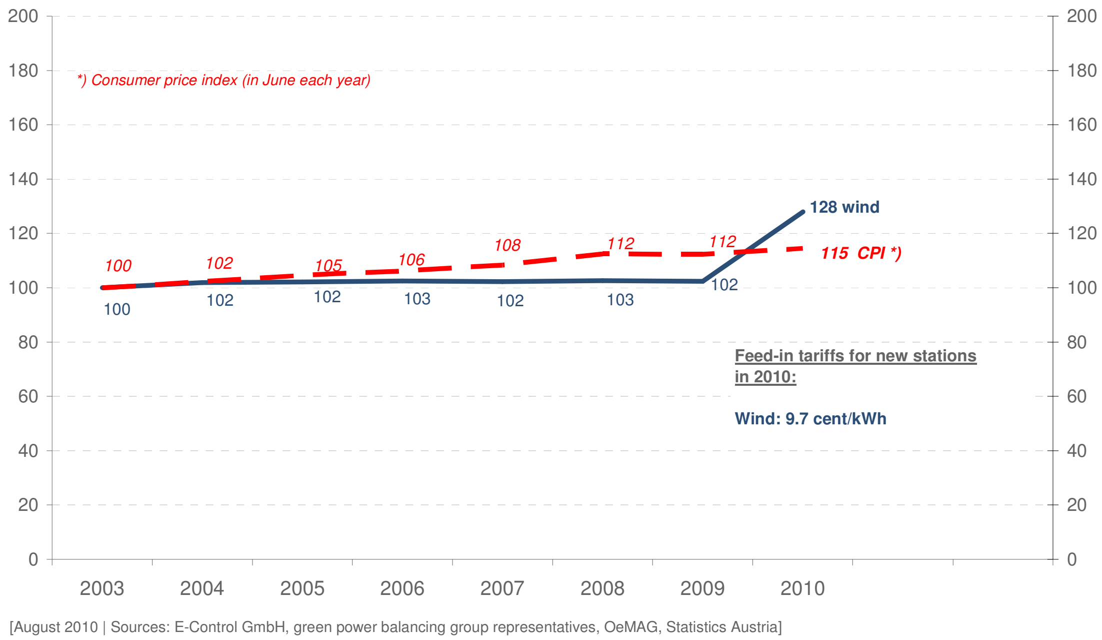



**Figure 20: Comparison of wind power feed-in tariffs with the consumer price index (2003 = 100), 2003–2010**

The feed-in tariff for wind farms was virtually unchanged at about 7.8 cent/kWh throughout the 2003–2009 period. However, the 9.7 cent/kWh tariff for new capacity established by the Green Electricity Order 2010 is a jump of about 24%.

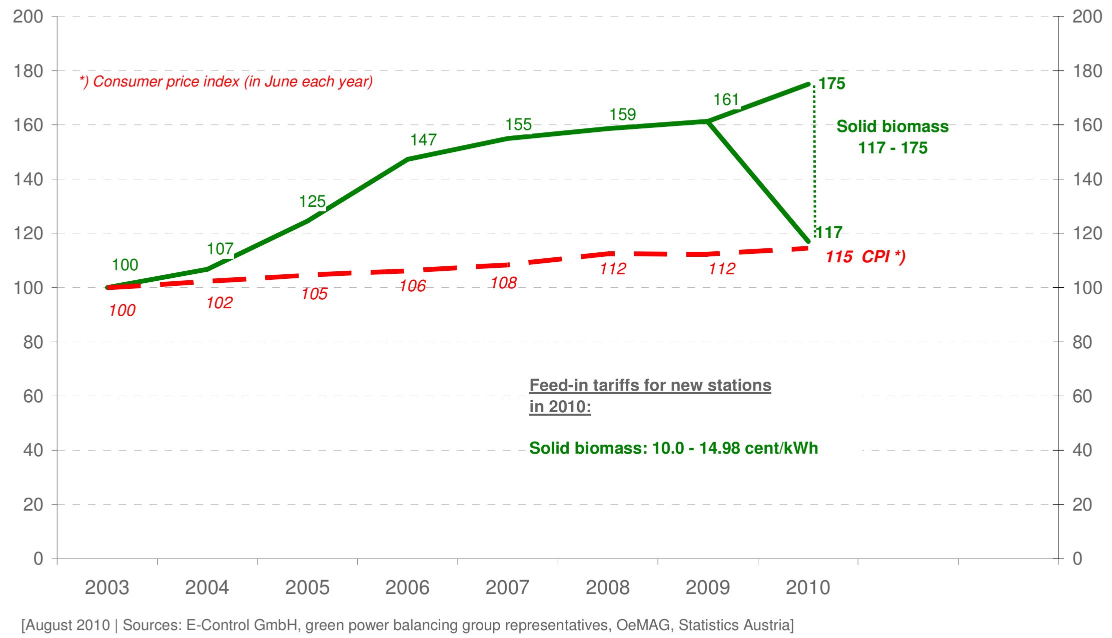



**Figure 21: Comparison of solid biomass electricity feed-in tariffs with the consumer price index (2003 = 100), 2003–2010**

In 2006 feed-in tariffs for electricity generated from solid biomass were 47% up on 2003. The reasons for this were the increased construction of small plants which attract high feed-in tariffs, and greater use of forest wood chips, which are more expensive than biomass waste. The biomass feed-in tariff for new capacity under the Green Electricity Order 2010, ranging from 10.0 to 14.98 cent/kWh, is somewhat lower on average than for existing plants.

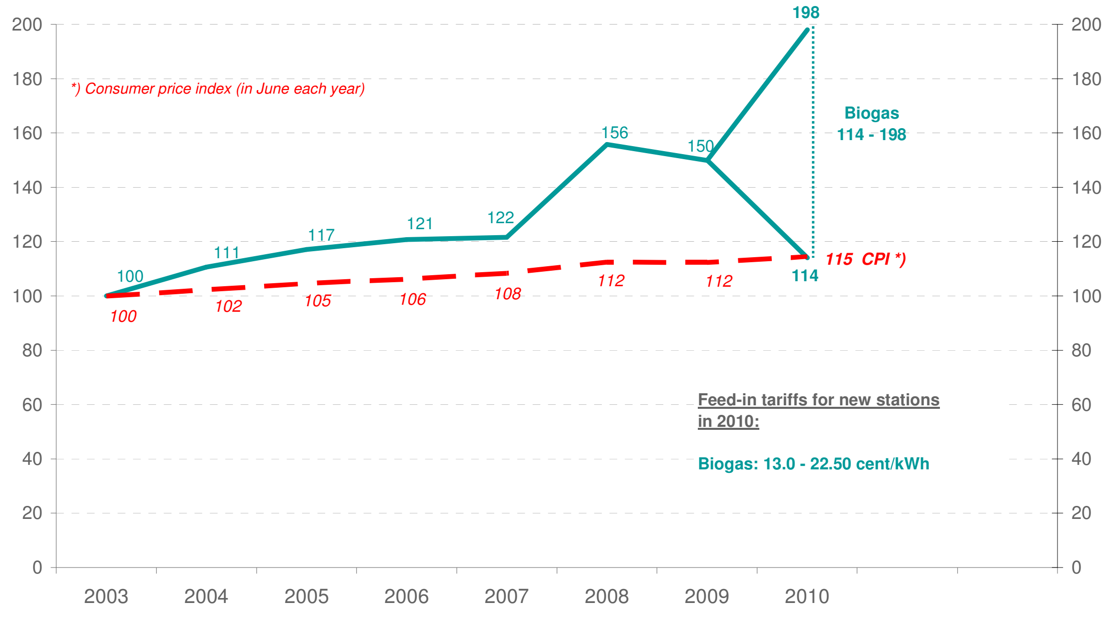
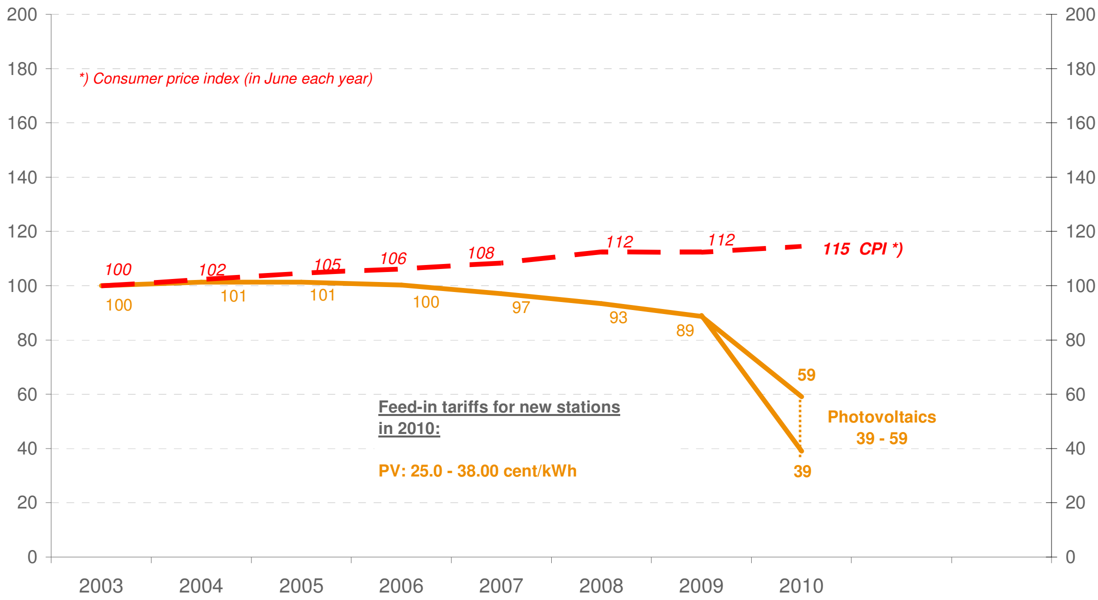



**Figure 22: Comparison of biogas electricity feed-in tariffs with the consumer price index (2003 = 100), 2003–2010**

Feed-in tariffs for electricity generated from biogas rose steadily from 2003 to 2007, and jumped by about 28% in 2008 as a result of the top-up payments to compensate generators for higher feedstock prices. The biogas feed-in tariff of 13.0–22.5 cent/kWh for new capacity, set by the Green Electricity Order 2010, represents another sharp increase.




[August 2010 | Sources: E-Control GmbH, green power balancing group representatives, OeMAG, Statistics Austria]

**Figure 23: Comparison of PV feed-in tariffs with the consumer price index (2003 = 100), 2003-2010**

Feed-in tariffs for electricity generated by photovoltaic systems drifted down between 2003 and 2009, but remained at exceptionally high levels. The reduction over the period was from 64 cent/kWh to 57 cent/kWh. The PV feed-in tariff for new capacity established by the Green Electricity Order 2010, ranging from 25 to 38 cent/kWh (for plants over 5 kW capacity), represents a sharp fall.

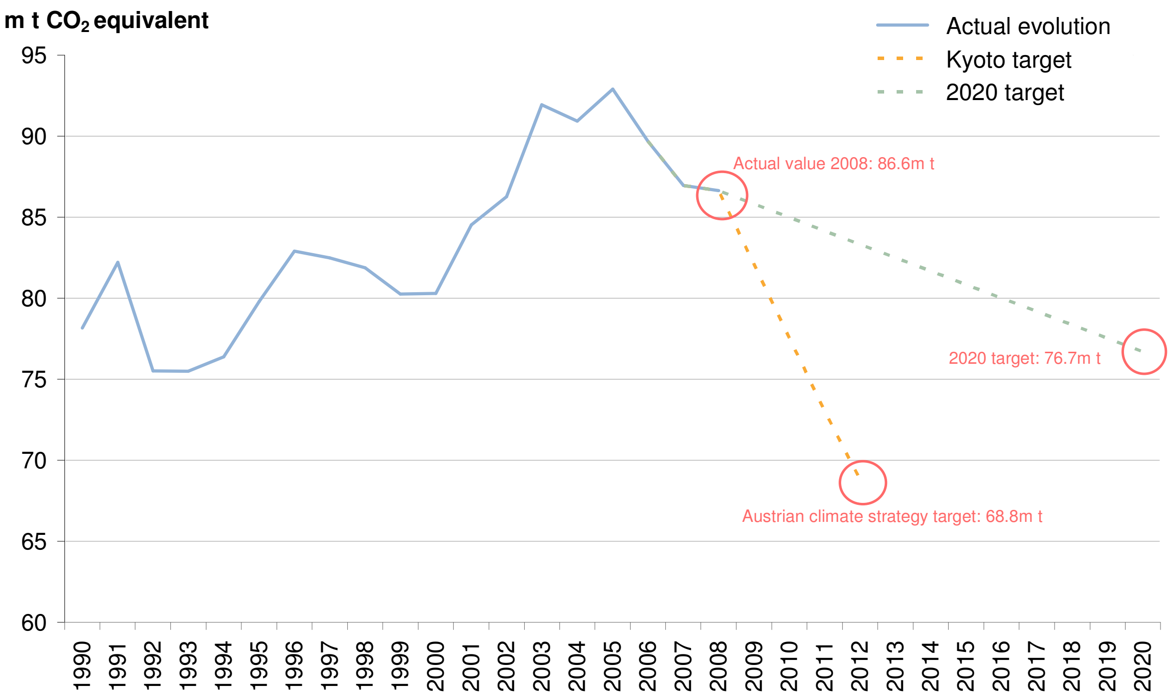
## 5.5 $CO_2$ reduction

The EU has adopted new $CO_2$ reduction targets for 2020. It is aiming for a 20% cut in overall greenhouse gas emissions by 2020, compared with the reference year, 2005. The breakdown of the emission savings is as follows:

- 16% cut in emissions by sectors that are not included in the Emission Trading Scheme (mainly households, small and medium-sized enterprises, and transport);
- 21% cut in emissions by sectors included in the Emission Trading Scheme (mainly energy intensive industries and the energy sector).

What will this mean for Austria? Total emissions were 93.3m tonnes (t) of $CO_2$ equivalent in 2005. Taking into account the targets established by the EU climate and energy package, Austria must trim its greenhouse gas emissions to about 76.7m t by 2020 – a reduction of 16.6m t compared to 2005 and 10m t compared to 2008 (the most recent available figure).[43] The goal for 2020 is higher than the original target set by the Austrian climate strategy (see Figure 24). Like the figures for 2007, the latest data (for 2008) show a slight decrease in greenhouse gas emissions.[44] Some interesting sectoral trends have emerged as compared to last year:

- Space heating and small consumers: +1.1m t or 10%
- Industry: +0.4m t or 1.5%
- Energy production (power, heat and refining): -0.5m t or 3.6%
- Transport: -1.3m t or 5.4%




Sources: Austrian Federal Environment Agency and E-Control calculations

**Figure 24: Evolution of greenhouse emissions from 1990 to 2008 and trajectories up to 2020, in m t CO2 equivalent**

[43] E-Control calculations
[44] See Austrian Federal Environment Agency, *Klimaschutzbericht 2010* (2010 Climate Report)

# 6 Energy Strategy Austria

In March 2010 the Ministry of Economy, Family and Youth and the Ministry of Agriculture, Forestry, Environment and Water Management unveiled the **Energy Strategy Austria**, which sets out comprehensive objectives for the country's future energy supply. The main aim is to ensure that final energy consumption stabilises at the current level of 1,100 PJ by 2020.

## 6.1 Renewable energy objectives

The strategy calls for renewable energy sources to be used in ways that maximise the benefits relative to the costs. Hydropower and wind are identified as the key renewable energy sources for electricity generation. The strategy argues that priority should be given to using energy crops to produce biofuels, and solid biomass, where available for energy use, to supply heat. The extent to which PV technology is deployed should be determined by cost trends.

The table below shows the contributions of renewable generation as a whole and the various technologies concerned as proportions of final energy consumption in 2008.

**Energy consumption and renewable electricity generation in 2008**

| | | PJ | % of final energy consumption | TWh |
|---|---|---|---|---|
| **Gross energy consumption** | | **1428 (1440)** | | |
| Losses and production of materials | | 340 | | |
| **Final energy consumption** | | **1100** | **100%** | |
| **Total electricity consumption** | | **255** | **23%** | **70.9** |
| Own consumption | | 56 | 5% | |
| **Electricity supplied from the public grid** | | **199** | **18%** | **55.4** |
| Electricity generation from hydropower (without power for pumping) | | 146 | 13% | 40.6 |
| Supported green electricity (without small hydropower) | | 16 | 1.5% | 4.5 |
| of which: | Wind | 7.2 | 0.7% | 2 |
| | Solid biomass | 6.8 | 0.6% | 1.9 |
| | Biogas | 1.8 | 0.2% | 0.5 |
| | Photovoltaics | 0.06 | 0.01% | 0.017 |
| | Others | 0.3 | 0.03% | 0.09 |
| Residual public supply | | 37 | 3% | |

[Source: E-Control GmbH]

**Table 41: Energy consumption and renewable electricity generation, 2008**

Electricity accounted for 23% (255 PJ/70.9 TWh) of Austria's total final energy consumption of 1,100 PJ in 2008. Hydropower contributed 146 PJ (40.6 TWh) or 13% of consumption, and the supported renewable technologies (wind, biomass and PV) 16 PJ (4.5 TWh) or some 1.5%.

Table 42 tracks the changes in energy supply up to 2020, as outlined in the Energy Strategy.

**The Austrian Energy Strategy in numbers (in PJ)**

| | 2005 | 2008 | 2020 |
|---|---|---|---|
| **Oil products** | 496.0 | 444.2 | 362.3 |
| **Coal** | 24.8 | 24.3 | 27.3 |
| **Natural gas** | 202.7 | 187.8 | 191.2 |
| **District heat** | 55.1 | 62.2 | 59.0 |
| **Conventional electricity generation** | 57.7 | 44.1 | 42.9 |
| **Electricity generated from renewables** | 147.8 | 163.0 | 179.9 |
| **District heat produced from renewables** | 14.9 | 23.5 | 38.2 |
| **Heat produced from renewables** | 117.0 | 121.6 | 143.4 |
| **Biofuels** | 2.3 | 17.9 | 34.0 |
| **Total renewable energy** | **282.0** | **326.0** | **395.6** |
| **Total final energy consumption** | **1,118.4** | **1,088.5** | **1,078.3** |
| **Own use and losses for electricity and district heat** | 37.7 | 43.2 | 36.6 |
| **Gross final energy consumption*** | **1,156.0** | **1,131.8** | **1,114,9** |
| **Renewable contribution to gross final energy consumption** | **24.40%** | **28.80%** | **35.48%** |

** Final energy consumption + own use and losses for electricity and district heat. Reference for calculating the renewables contribution in line with the EU Directive*

Source: Energy Strategy Austria, March 2010 (translation by E-Control GmbH)

**Table 42: Energy supply trajectory according to the Energy Strategy Austria**

According to the strategy, renewable electricity generation should be raised by 17 PJ (4.7 TWh) between 2008 and 2020; this is equivalent to 1.5% of the total final energy consumption of 1,100 PJ. However, the expansion targets for the individual technologies overshoot this objective: hydropower development is expected to contribute an additional 13 PJ (3.5 TWh), less the effects of the Water Framework Directive, and wind up to 10 PJ (2.8 TWh) by 2020.

Taking into account the new plant constructions and expansions brought about by subsidies under the Green Electricity Act (i.e. feed-in tariffs and investment grants), small and medium-sized plants will contribute about half of the targeted increase in hydropower generation. A rise in the number of hydropower plants with capacities of over 20 MW to the extent outlined in the strategy is not yet in sight, since only a small number of construction permits have been granted for such facilities.

The development trajectories outlined in the Energy Strategy Austria have also been incorporated in the **2010 National Action Plan** for renewable energy, which was submitted to the European Commission at the end of June 2010, pursuant to Directive 2009/28/EC. The plan outlines the measures that Austria will take to attain its 34% renewable target.[45]

## 6.2 Energy efficiency

As the E-Control Green Paper on Energy Efficiency[46] shows, achieving long-term energy and climate policy objectives is heavily dependent on improvements in energy efficiency. Reducing energy consumption and raising efficiency levels is crucial to attaining the 20-20-20 targets.

The Energy Strategy Austria also reflects this requirement.[47] The strategy assumes total final energy consumption in Austria of around 1,100 PJ (base year 2008), and the measures put forward by the strategy are intended to keep this level constant until 2020, taking into consideration the full range of projected economic, structural, social and demographic trends during that period. Some background information on final energy consumption is outlined briefly below. Its main uses are:

- Transport: 32% (comprising: 15% freight and aviation; 17% personal and public transport)
- Space heating and air conditioning: 29%
- Energy-intensive industry: 16%
- Other manufacturing industries: 13%
- Household electricity consumption: 7%
- Other final consumption: 3%

The energy mix is also relevant in this connection. The various energy sources as a percentage of final consumption in 2008 were as follows:

- Oil: 42%
- Electricity: 19%
- Gas: 17%
- Renewables: 14%
- District heating: 6%
- Coal: 2%

Regarding the structure of energy consumption, a range of long-term measures and instruments need to be implemented to promote energy-efficient space heating. These include:

- Improved insulation of 20% of the building stock by 2020;

[45] An additional 28 PJ (7.8 TWh) of renewable electricity generation by 2020 as compared to 2008, including additional solar and biogenous generation
[46] See E-Control, *Grünbuch Energieeffizienz* (Green Paper on Energy Efficiency), October 2008 (German only)
[47] See http://www.energiestrategie.at/

- Compliance with mandatory energy consumption limits as a requirement for securing construction permits for new residential, and commercial and public buildings;
- Modernisation and upgrading of central heating systems;
- Near-realtime energy consumption data capture, combined with energy advice services;
- Expansion of district heating;
- Increased use of heat pumps.

Minimising energy conversion losses in electricity and heat generation is central to boosting energy efficiency. Every year around 50-60 PJ of waste heat from electricity generation (or around 5% of final energy consumption)[48] remains unused. It is therefore recommended to redirect electricity generation towards increased use of waste heat and thus improved overall efficiency. Combined heat and power generation, and the utilisation of waste heat by households and industrial processes are cornerstones of any future energy policy.[49]

Besides adopting individual policy measures, adjustments need to be made to the overall operating environment for the electricity industry. It is recommended to introduce wide-ranging legal amendments as part of a package of energy efficiency legislation.[50]

It goes without saying that reducing electricity consumption is another important consideration. Pursuant to section 25 Green Electricity Act, this issue is discussed in more detail in the next chapter.

[48] Based on total annual output infed to the public grid
[49] See the Austrian energy consumption data in Annex II
[50] See E-Control, *Grünbuch Energieeffizienz* (Green Paper on Energy Efficiency), October 2008 (German only)

# 7 Action to reduce energy and electricity consumption

Section 25 Green Electricity Act requires the Green Electricity Report to give an account of action to reduce electricity consumption. This year's report focuses on two aspects of these efforts:

- Smart metering: the costs, benefits and impact of future developments in metering are explained.
- E-Control SOS Children's Villages project: this is using a pilot project to investigate potential electricity savings.

## 7.1 Smart metering raises awareness on electricity use

Austrian households and businesses use electromechnical electricity (and gas) meters to measure consumption. These:

- are read manually; and
- their functionality is restricted to displaying meter counts.

Modern metering and telecommunication technologies offer new possibilities for energy consumption metering, opening the way for new information and other services.

The European Union aims to change the current situation and is calling on all member states to roll out intelligent, digital electricity and gas metering – so-called "smart metering". The legislative framework for these moves is created by the 3rd energy package (Directives 2009/72/EC for electricity and 2009/73/EC for gas) and the Energy Efficiency Directive (2006/32/EC). The 3rd package requires the introduction of smart electricity metering by 2020, subject to a positive economic assessment of smart meters by member states. The Energy Efficiency Directive also relies on modern metering technologies to implement, evaluate and communicate energy efficiency measures (and their impact).

Smart metering technologies support more transparent and flexible energy use by households and businesses.[51] Sustainable reductions in energy use can undoubtedly be achieved by a simple feedback system consisting of:

- A single, web-based information platform; and
- Monthly printed energy consumption information (for clients who cannot access data online).

[51] Apart from these aspects, smart metering offers many other possibilities. These include customised pricing models, remote meter activation and deactivation, and putting an end to statistical estimation of consumption data.

Consultants PricewaterhouseCoopers were commissioned by E-Control to carry out a cost-benefit study of the nationwide roll-out of smart metering in Austria.[52] This reached the conclusion that the economic benefits of introducing the technology would clearly outweigh the costs. The benefits are:

- Energy savings (3.5% of electricity and 7% of gas consumption);
- $CO_2$ emission reductions;
- Shifts in consumption from peak to off-peak periods;
- Less administrative red tape in connection with meter reading, billing and supplier switching;
- More efficient business processes at system operators.

The costs are:

- Installation;
- Maintenance;
- Operation.

At € 4.4bn the cost of smart metering compares with benefits amounting to almost € 5bn.[53]

The study makes a number of recommendations aimed at gaining the full benefits of roll-out. These are:

- Coordinated roll-out across the electricity industry (the same applies to gas);
- Uniform, open standards for meter technologies and data formats;
- Introduction of smart electricity meters ahead of intelligent gas meters so as to use the former's communication modules for the latter (avoidance of infrastructure duplication);
- Efforts to keep the transition from conventional to smart metering as short as possible, so as to avoid the expense of providing two different systems at the same time;
- Blanket coverage with replacement of at least 95% of all meters by the new technology, rather than 80% roll-out, because of the greater overall benefits and the fact that at 80% it would be necessary to continue to operate existing meters (two systems);
- Customer-friendly, transparent, usable energy consumption information (on websites, and for consumption updates on at least a monthly basis).

[52] See PWC, *Analyse der Kosten-Nutzen einer österreichweiten Einführung von Smart Metering* (Cost-benefit analysis of the nationwide roll-out of smart metering in Austria); download at http://www.e-control.at/de/industrie/news/aktuelle-meldungen/studie-smart-metering (German only)

[53] See the above cost-benefit analysis for the detailed results, which are based on a variety of scenarios.

## 7.2 Pilot energy use monitoring project

Towards the end of 2009 E-Control, the *Bundesgremium des Radio- und Elektrohandels* (Austrian Association of Radio and Electrical Dealers) and *Forum Hausgeräte* (Domestic Appliances Forum) launched a project entitled "The ideal household – SOS Children's Villages saving electricity". The aim of this pilot project was to demonstrate the amount of energy and money that can be saved if obsolete domestic appliances are replaced with new ones rated in the top energy efficiency classes.

To this end E-Control provided the project with its EVM electricity consumption monitoring system, which measures power consumption in the user's home and displays the consumption data on the E-Control website in near-realtime (every five minutes). We developed a special device, called the *EVM-Master*, that reads off data from a wide range of meters and transmits it to E-Control in encrypted form. The data pinpoints potential energy savings and makes it possible to assess the effectiveness of such measures once they have been taken.
The EVM system was installed at eight selected houses in SOS Children's Villages free of charge, with the help of local electricians. In the first measurement series, which began at the same time, the power consumption of all the appliances in use, including the old ones, was recorded. A second series took place after replacement of all the old appliances and light bulbs at the end of January and the start of February 2010. E-Control experts then compared and analysed electricity consumption before and after the appliances were exchanged.

In the run-up to the project, the energy and cost savings through the replacement of the appliances were estimated at anything up to 30%. A before-and-after comparison of the measurement data does, indeed, indicate satisfactory results.
The measurements show that total consumption by the family houses at the Children's Villages fell from an average of 1,300 kWh to 960 kWh per week after exchanging appliances – a saving of 26% or about € 60 per week.

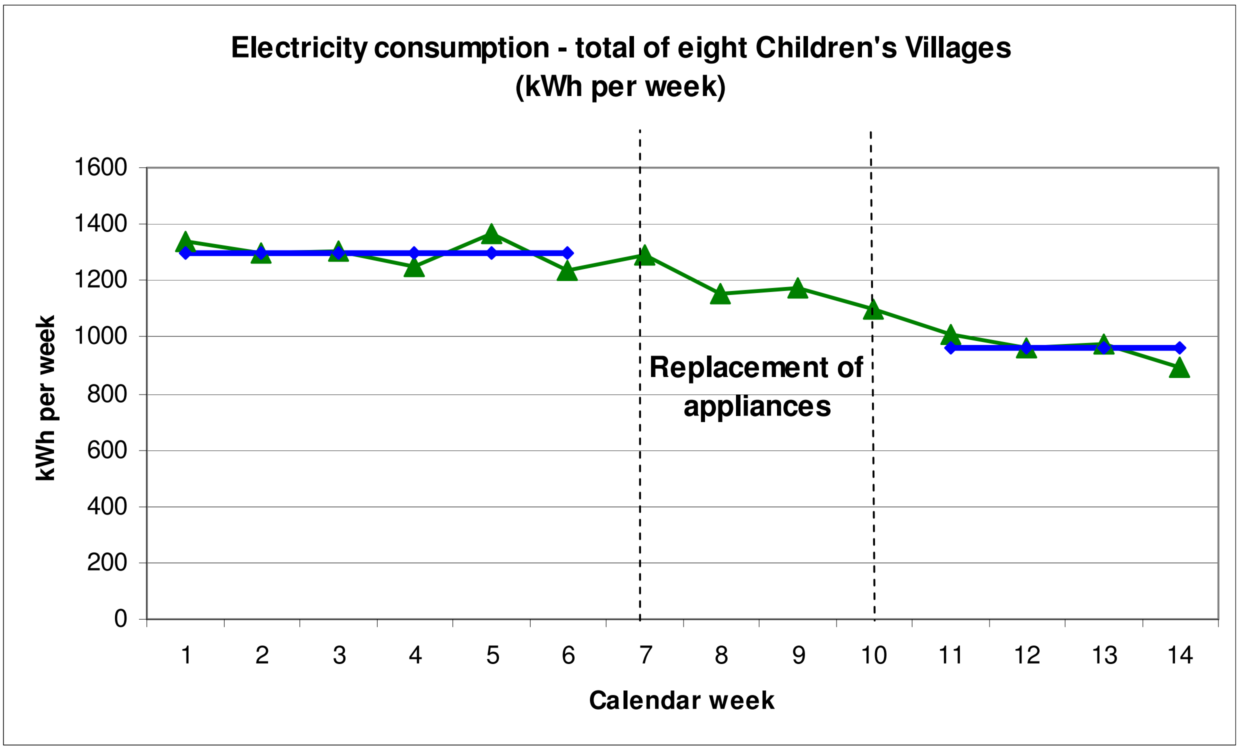



**Figure 25: Total electricity consumption at eight SOS Children's Village houses (kWh per week)**

On an annualised basis this 26% reduction in power use results in a saving of some € 400 per Children's Village house or around € 3,200 for all eight sample households.

The chart below depicts power use over time at the various Children's Villages.

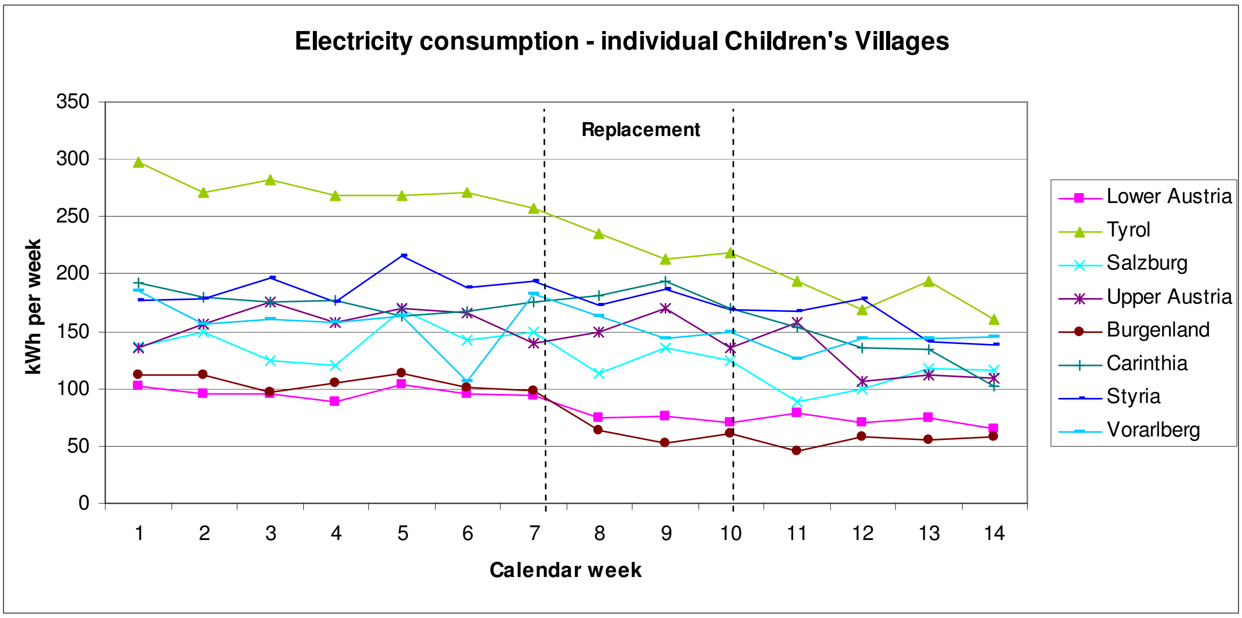



**Figure 26: Electricity consumption at individual Children's Village houses**

Particularly high savings were identified at the Children's Village family houses in Burgenland, Tyrol and Carinthia. Total savings of about 48%, 30% and 26% were recorded at the houses in Burgenland, Tyrol and Carinthia, respectively. Power use fell somewhat less at the other houses, but all made significant savings. The biggest reductions were achieved where appliances were not just replaced, but their operation was optimised, too.

A new dishwasher at the family house in the Lower Austrian SOS Children's Village brought an energy saving of 43% as compared to the old one and cut the household electricity bill by over € 50 per year.

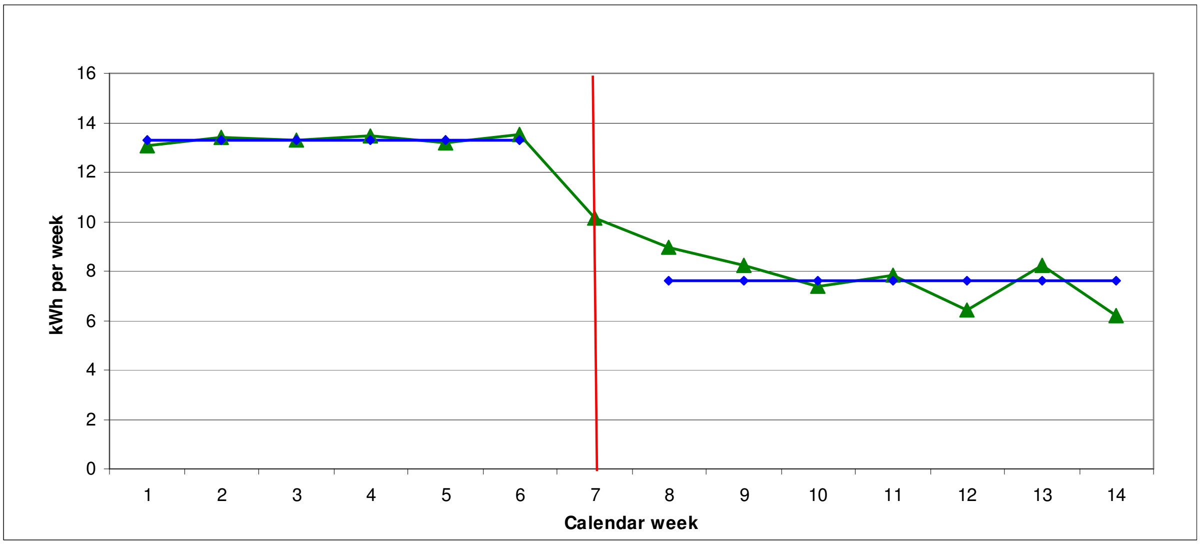



**Figure 27: Savings achieved by a new dishwasher**

The experience of the family house in Tyrol showed what a difference a new upright freezer can make. Here, the old-new comparison reveals a drop of 56% in power consumption and of some € 70 in annual spending.

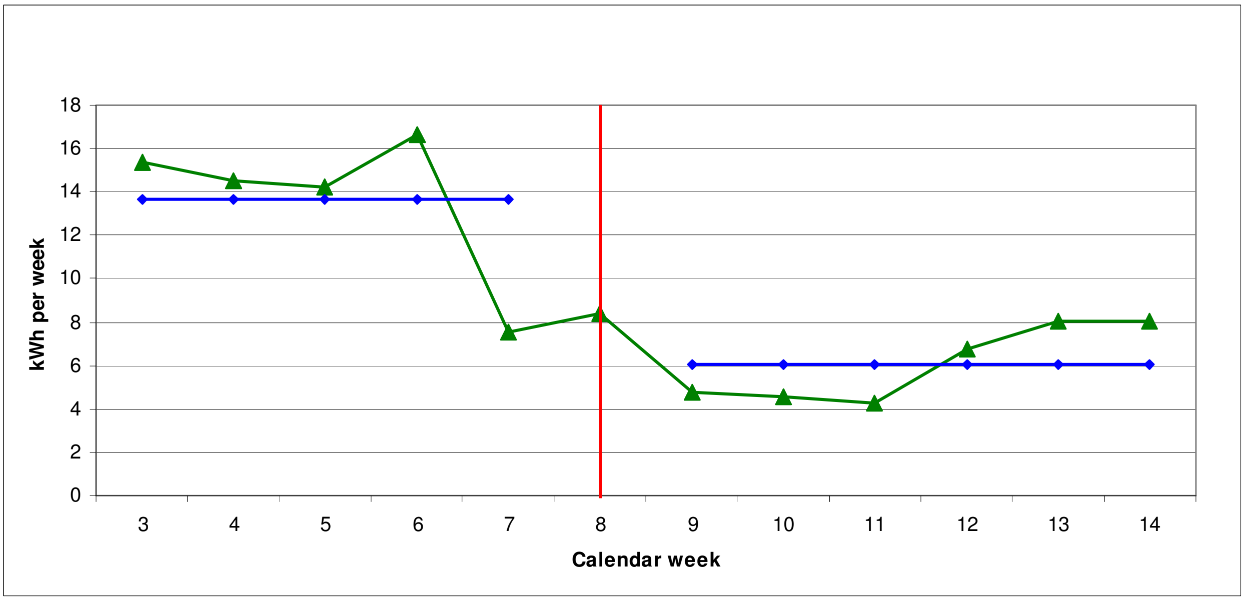



**Figure 28: Savings achieved by two new freezers**

More efficient refrigerators can also prune power consumption. Replacing an old model brought a 46% fall in electricity use by the refrigerator at the family house in Upper Austria, leading to a € 14 cost reduction.

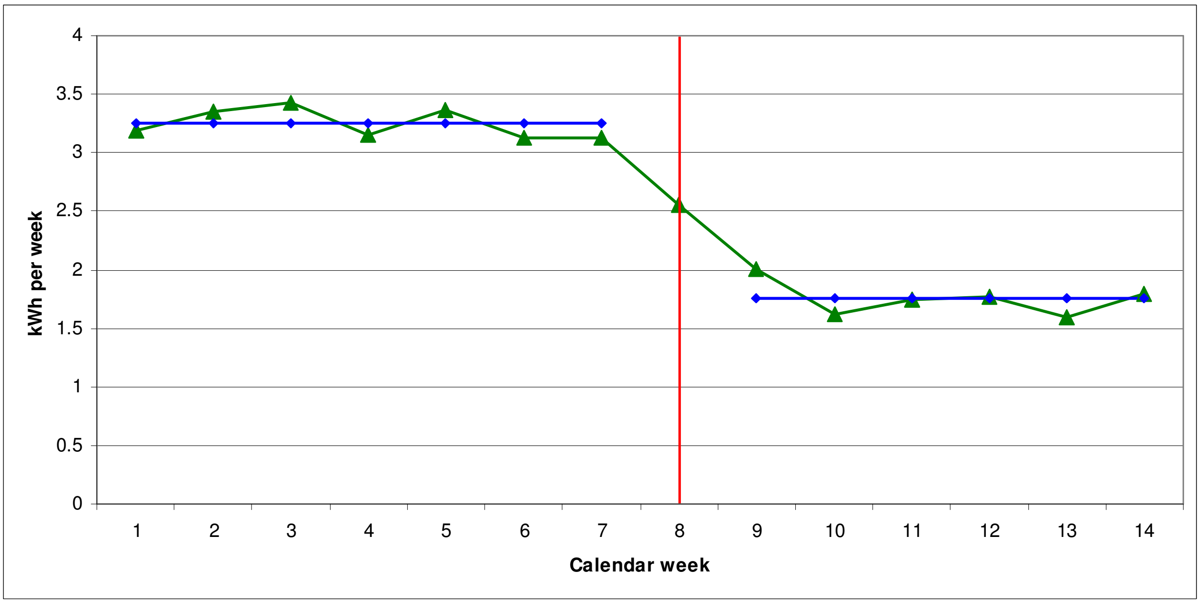



**Figure 29: Savings achieved by a new refrigerator**

# 8 $CO_2$ reduction costs and emission allowance price trends

One of the main aims of supporting the generation of electricity from renewable sources is to help reduce $CO_2$ emissions as part of climate change programmes. Generating electricity at state-of-the-art combined cycle power stations[54] causes some 0.44 t of $CO_2$ emissions per MWh. No $CO_2$ is emitted when electricity is generated from hydro and wind power, and emissions from electricity generation at biogas and biomass plants are recaptured during forest/crop growth if forestry and agriculture abide by the principle of sustainability.

The $CO_2$ reduction costs associated with supported renewable electricity shown in the chart below have been calculated by dividing the subsidy per kWh (in the interest of simplicity, the feed-in tariff less an average market price of 5.9 cent/kWh) by the average emissions from a modern combined cycle plant that are avoided (0.44 t $CO_2$/MWh or 0.44 kg $CO_2$/kWh).

On the basis of the average feed-in tariffs in 2009 and the above ratios, the Green Electricity Act gives rise to the $CO_2$ avoidance costs depicted in Figure 30. The cost of balancing energy for wind power is also taken into account.

[54] The benchmark for new renewable generating stations

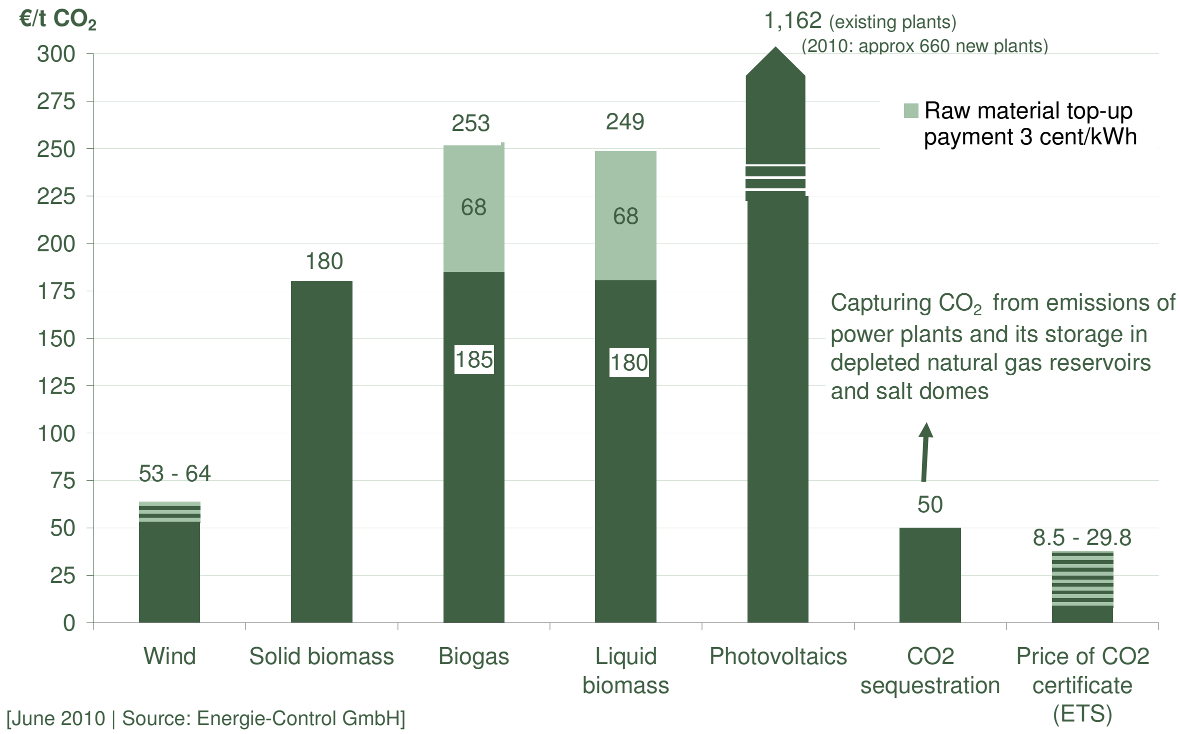



**Figure 30: $CO_2$ reduction costs associated with various renewable technologies, 2009**

With the exception of small hydropower these are relatively high cost levels as compared to other approaches such as $CO_2$ sequestration (€ 30–50/t $CO_2$) or the conventional Kyoto mechanisms (emission trading, and the Joint Implementation and Clean Development Mechanism [JI/CDM] with reduction costs of € 5–7/t $CO_2$ for JI/CDM and € 20/t $CO_2$ for emission trading).[55]

It should be noted that, due to the fall in PV generating costs, at a feed-in tariff of about 35 cent/kWh,[56] new PV systems give rise to average carbon reduction costs of € 660/t. This is considerably lower than the € 1,162/t $CO_2$ shown in the chart, which was calculated on the basis of the average feed-in tariff of about 57 cent/kWh paid by OeMAG in 2009 – a figure that includes old systems which attract higher tariffs.

A comparison of the carbon reduction costs occasioned by the payment of feed-in tariffs (as illustrated in Figure 30) with those incurred as a consequence of investment grants dispersed under the KLI.EN programme underlines the latter's considerably higher efficiency. On the assumption of 1,000 full-load hours and a useful life of 13 years, which is comparable to the guarantee period for feed-in tariffs, the

[55] Source: Point Carbon
[56] Assumed; it will only be possible to determine the actual average feed-in tariff for PV at the end of 2010.

KLI.EN subsidy of € 1,300 per kW of installed photovoltaic capacity is equivalent to a $CO_2$ reduction cost of € 230/t.[57] This is less than half the cost incurred under the feed-in tariff system.

**$CO_2$ allowances and the EU Emission Trading Scheme**

The EU Emission Trading Scheme (EU ETS) is the world's first multi-country scheme for trade in $CO_2$ emission allowances. It is designed to support the attainment of the EU's climate policy goals using market-based approaches. The scheme also aims to provide incentives to reduce emissions where cuts can be made most efficiently.

The EU ETS currently applies to $CO_2$ produced by electricity generators and other large-scale industries. Generating stations which cannot evidence the necessary allowances face heavy fines. The pilot phase was concluded in 2007.

The second phase, which is now underway, comprises allowances for total annual emissions of 2.08bn t of $CO_2$. In contrast to the first trading period, a shortfall in allowances can be covered by implementing $CO_2$ reduction projects in third countries. The number of installations involved in the system has also been increased.

During the third phase of the EU ETS, which will run from 2013 to 2020, the rules will be tightened. From 2013 on, allowances will no longer be distributed free of charge, and the industries covered by the system will be given 21% $CO_2$ reduction targets.
Market forces determine the value of the allowances. Prices on the allowances market have been fairly volatile so far, and peaked at about € 30/t in mid-2008.
Figure 31 shows price movements on the EEX exchange from late 2003 to the middle of 2010. The chart depicts the prices for various annual contracts. The dramatic slump in 2009 was due to an oversupply of allowances brought about by the economic downturn and the resulting fall in consumption and emissions in the industrial and energy sectors. The price slide also had the effect of cutting the cost of generation at coal and gas-fired power stations, and pushing down electricity prices due to the change in marginal costs.

[57] A one-off subsidy of € 1,300, based on output of 13,000 kWh (13 MWh) as compared to the 5.7 t (0.44 t $CO_2$/MWh) of emissions produced by generation at a combined cycle power station

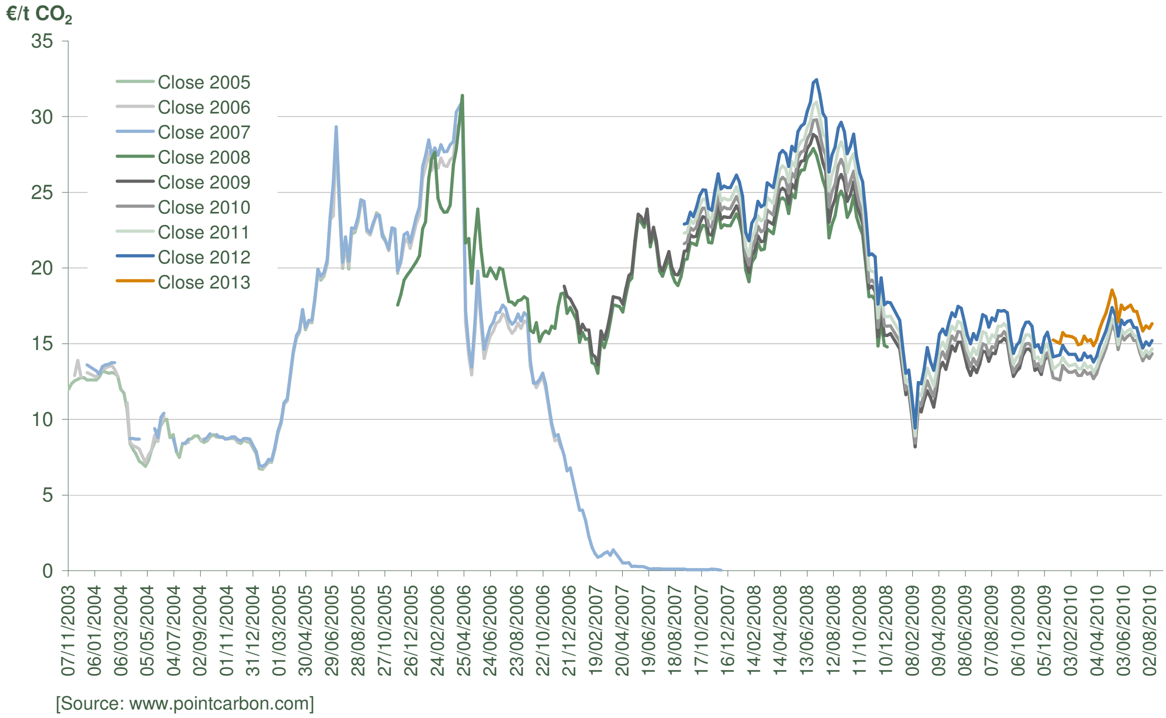



**Figure 31: $CO_2$ prices (2005–2010 ETS), November 2003 to August 2010**

# 9 Fossil combined heat and power (CHP)

Between 2003 and 2008 existing and modernised combined heat and power (CHP) plants received financial support under sections 12 and 13 Green Electricity Act. This took the form of a CHP support tariff expressed in cents per kWh of electricity. Up to 2006 the CHP support payments were financed by a surcharge (CHP surcharge) added to the system charges, which was degressive and was payable by all electricity consumers. After the Green Electricity (Amendment) Act 2006 the funding was by means of a flat renewables charge.

In 2008 the legislation governing fossil CHP funding was removed from the Green Electricity Act and incorporated in a separate CHP Act, published on 8 August 2008, which came into force on 23 February 2009 following its approval by the European Commission.

The legislation for the support scheme for renewable-based CHP plants remains part of the Green Electricity Act.

## 9.1 CHP support schemes

The table below summarises the support schemes for fossil CHP plants in force under the Green Electricity and CHP Acts from 2003 to 2012.

| | Existing CHP plants | Modernised CHP plants | New CHP plants |
|---|---|---|---|
| Definitions | CHP stations for which the necessary construction permits were issued before 1 January 2003 | CHP plants commissioned after 1 October 2001, where the modernisation costs amount to at least 50% of the cost of the entire new investment in the facility (apart from the building) | CHP plants on which work began after 1 July 2006, which are awarded all the necessary first-instance construction permits by 30 September 2012, and which are commissioned not later than 31 December 2014, provided that the modernisation costs amount to at least 50% of the cost of the entire new investment in the facility (including the building) |
| Support criteria | 1. Operated to provide public district heating services<br>2. Meets efficiency standard established by section 13(2) Green Electricity Act<br>3. Proof of additional expense, in excess of revenues, to maintain operations | 1. Operated to provide public district heating services<br>2. Meets efficiency standard established by section 8(2) CHP Act (previously 13[2] Green Electricity Act)<br>3. Proof of additional expense, in excess of revenues, to maintain operations | 1. Capacity > 2 MW<br>2. Operated to provide district heating or process heat<br>3. Meets efficiency standard established by section 13(2) Green Electricity Act<br>4. Primary energy saving in the meaning of Article 4 Directive 2004/8/EC |

| | | | |
|---|---|---|---|
| **Type of support** | **CHP support tariff based on additional expense (costs less revenues) to maintain operations (excluding a reasonable return on capital employed as a recognised cost)** | **CHP support tariff based on additional expense (costs less revenues) to maintain operations (including a reasonable return on capital employed as a recognised cost)** | **Investment grant:**<br>▪ **Max 10% of total investment**<br>▪ **Capacity up to 100 $MW_e$: € 100/kW**<br>▪ **Capacity 100–400 $MW_e$: € 60/kW**<br>▪ **Capacity over 400 $MW_e$: max € 40/kW** |
| **Expiry of support** | **2008** | **2010** | **2012** |
| **Amount of support payments** | **2007: max € 54.5m (incl. € 10m for new CHP plants*)**<br>**2008: max € 54.5m (incl. € 10m for new CHP plants*)**<br>**2009: max € 28.0m (incl. € 10m for new CHP plants*)**<br>**2010: max € 28.0m (incl. € 10m for new CHP plants*)**<br>**2011: max € 10m (only for new CHP plants*)**<br>**2012: max € 10m (only for new CHP plants*)**<br>***2006-2012: total support available for new CHP plants max € 60m** | | |
| **Legal basis** | **Sections 12 and 13 Green Electricity Act** | **Sections 7 and 8 CHP Act (previously 12 and 13 Green Electricity Act)** | **Sections 7 and 8 CHP Act (previously 12 and 13 Green Electricity Act)** |

**Table 43: Support schemes for fossil CHP plants**

As can be seen from the table, support payments for existing CHP plants expired in 2008. Support for modernised facilities will expire on 31 December 2010. After 31 December 2012 no more applications for investment grants for new CHP plants will be accepted.

If the available funding is insufficient, the support payments for all existing and modernised plants are reduced on a pro rata basis.

## 9.2 Applications, CHP electricity and CHP support payments from 2003 to 2009

The table below shows CHP support applications from 2003 to 2009.

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| **Number of CHP stations for which support applications were made** | **53** | **44** | **41** | **40** | **40** | **31** | **4** |
| **Total CHP electricity in GWh** | **6,169** | **6,524** | **6,701** | **6,165** | **5,877** | **5,299** | **2,558** |
| **CHP surcharge in cent/kWh** | **0.15** | **0.15** | **0.13** | **0.07** | **Part of the renewables charge[58]** | | |

**Table 44: Supported CHP electricity, 2003–2009 (as of May 2010)**

In 2009 only modernised CHP plants were eligible for support tariffs under the CHP Act. A total of four support applications were submitted. One of these plants was adjudged not to be modernised.

[58] Since the start of 2007 the resources for CHP support funding have been raised by means of the flat renewables charge.

# 10 ANNEX I

## Statistical analyses of accredited renewable generating capacity

This annex contains detailed statistical analyses of renewable generating capacity.

The chapter begins with summary data outlining the evolution of accredited and operational renewable generating capacity over time, and broken down by energy sources. This is followed by detailed analyses of each renewable energy source (small hydro, wind power, biomass, biogas, landfill and sewage gas, geothermal and PV). These show the number and capacity of the approved (and accredited) renewable generating stations, as well as information on station capacity. Analyses of plants that were under contract to the green power settlement agent OeMAG as of 31 December 2009, and formerly to the green power balancing group representatives (GPBGRs), broken down by provinces, are also presented. For data protection reasons, some data is aggregated.

The following summary table is an analysis of accreditation notices for renewable generating stations throughout Austria. Some of these plants will not be built despite the fact that they have been approved.

| Evolution of accredited* "other" green power capacity at year-end 2002-2009 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Wind | | Solid biomass incl. HBF waste | | Biogas | | Photovoltaics | | Landfill and sewage gas | | Liquid biomass | | Geothermal | | Total | |
| | MW | number | MW | number | MW | number | MW | number | MW | number | MW | number | MW | number | MW | number |
| **2002** | 204.84 | 85 | 81.77 | 26 | 12.19 | 97 | 9.81 | 1,265 | 17.62 | 43 | 1.63 | 15 | 0.92 | 2 | 328.78 | 1,533 |
| **2003** | 431.45 | 111 | 114.34 | 42 | 24.15 | 141 | 22.97 | 2,366 | 29.07 | 59 | 10.02 | 40 | 0.92 | 2 | 632.92 | 2,761 |
| **2004** | 729.26 | 148 | 308.29 | 115 | 59.66 | 261 | 26.48 | 2,861 | 29.41 | 61 | 17.29 | 60 | 0.92 | 2 | 1,171.30 | 3,508 |
| **2005** | 962.68 | 169 | 397.78 | 164 | 81.01 | 325 | 29.68 | 3,316 | 29.55 | 62 | 24.07 | 79 | 0.92 | 2 | 1,525.68 | 4,117 |
| **2006** | 1,028.62 | 175 | 420.76 | 173 | 84.49 | 334 | 35.33 | 3,926 | 30.28 | 64 | 26.07 | 82 | 0.92 | 2 | 1,626.47 | 4,756 |
| **2007** | 1,034.13 | 178 | 401.53 | 174 | 90.12 | 341 | 39.56 | 4,838 | 28.65 | 63 | 26.17 | 87 | 0.92 | 2 | 1,621.07 | 5,683 |
| **2008** | 1,047.80 | 190 | 407.94 | 181 | 92.07 | 344 | 48.49 | 6,634 | 29.16 | 64 | 26.24 | 90 | 0.92 | 2 | 1,652.62 | 7,505 |
| **2009** | 1,059.58 | 201 | 413.87 | 186 | 94.45 | 341 | 71.31 | 10,525 | 29.12 | 65 | 25.26 | 92 | 0.92 | 2 | 1,694.51 | 11,412 |
| Contract with OeMAG at year-end 2009 | 984.15 | 136 | 313.37 | 118 | 77.02 | 291 | 26.81 | 4,150 | 21.15 | 43 | 9.56 | 46 | 0.92 | 2 | 1,432.98 | 4,786 |

* Green electricity plants accredited by provincial governors. The accreditation notices do not provide information on whether or not these plants have already been built or entered into operation.

The data in this table may diverge from past evaluations of this type (in previous Green Electricity Reports). This is due to corrections made on the basis of a database redesign and changes in the accreditation notices (concerning e.g. capacity changes, revocations, shutdowns, etc).

[8/7/2010 | Source: E-Control GmbH, subject to modifications]

**Table 45: Evolution of accredited "other" green power capacity according to the accreditation notice database, 2002–2009 (status at year end)**

# Use of data derived from accreditation notices

Under section 7 Green Electricity Act, the accreditation of renewable generating stations is the responsibility of provincial governors. Copies of accreditation notices must be sent to the system operator, OeMAG and E-Control.

The renewable generating station accreditation notices issued by provincial governors are an important tool for forecasting green power trends. These accreditation notices have been used for the statistical analyses below. Not all of the plants in question are necessarily operating.

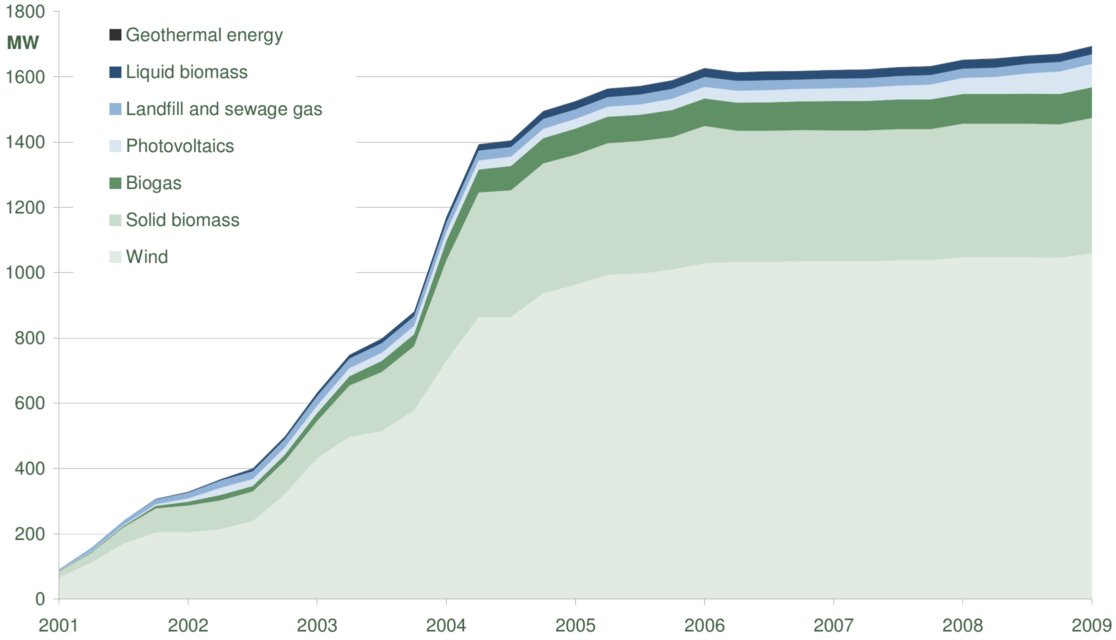
To arrive at an accurate assessment of future trends the following weaknesses of the data yielded by accreditation notices must be taken into account:

- At present accreditation notices are also issued by the provincial authorities for generating stations that have not yet entered service. This means that the notices are not a guide to installed capacity.
- E-Control's statistics start in 2001 when renewable energy promotion was still a provincial responsibility, and the approaches taken to the classification of generating capacity by primary energy sources were correspondingly varied. Only with the inception of a nationwide renewable electricity support regime did standardised assignment to primary energy sources become possible.
- Thanks to adjustments using the statistics compiled by OeMAG and the GPBGRs, variations in the attribution of capacity to energy sources can largely be ruled out, though shifts in classification remain a theoretical possibility.
- In order to harmonise the treatment of primary energy sources with that of OeMAG (and the former GPBGRs), the "cofiring" category, still in existence in 2004, was dropped and the capacity concerned reallocated.
- The E-Control database classifies renewable generating stations that are ineligible for support payments or have ceased to be covered by the support regime according to information from OeMAG (or the former GPBGRs) as "no support". However, no such distinction is drawn in the presentation of generating capacity by primary energy sources in this report.
- There can be grey areas in the allocation of capacity to given injection tariff classes (e.g. solid biomass, liquid biomass and biogas) due to incomplete or inaccurate information in accreditation notices.
- Since the E-Control database has been redesigned since the publication of the 2004 Green Electricity Report, and this has resulted in the reassignment of some stations to other primary energy sources (disaggregation of the cofiring category), the presentation of the historical trends may not be consistent with previous publications.

- The information from the provincial governments is very varied and not always complete. Moreover follow-up information on accredited plants, such as facilities that were never built despite accreditations or are no longer in operation, i.e. have been shut down, is not always sent to E-Control.
- The position is similar with the information sent to E-Control about small hydropower rehabilitation projects. For example, the information on plants that have since been rehabilitated is incomplete, and may still be recorded under other categories. A survey of the classification of small hydropower plants in the provinces, which had until then been categorised as new facilities according to the accreditation notices, was carried out in December 2007.

Nevertheless, the information derived from the accreditation notices, which is supplemented by data reported by OeMAG, such as the number of generating stations under contract to OeMAG (or previously the GPBGRs) and the capacity of each such plant, is sufficient for a reliable trend analysis.
Additional tools, such as regular questionnaires, surveys on a sample basis and expert interviews must also be used to reflect corrections, updates and documentation regarding amendments to notices.

Figure 32 depicts the evolution of accredited “other” renewable generating capacity in Austria over the 2002–2009 period.




[July 2010 | Source: E-Control GmbH]

**Figure 32: Evolution of accredited “other” renewable generating capacity, 2002–2009 (at year end)**

The analysis is augmented by a comparison with the figures for stations that were under contract to OeMAG (or formerly the GPBGRs) on the respective cut-off dates. These figures are summarised in tabular form below.

| Evolution of capacity under contract to OeMAG/GPBGRs at the cut-off date indicated and accredited generating stations, in MW | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Primary energy source | Under contract to GPBGRs at year-end 2003 | Under contract to GPBGRs at year-end 2004 | Under contract to GPBGRs at year-end 2005 | Under contract to OeMAG at year-end 2006 | Under contract to OeMAG at year-end 2007 | Under contract to OeMAG at year-end 2008 | Under contract to OeMAG at year-end 2009 2) | Accredited plants at year-end 2009 3) |
| Biogas | 15.0 | 28.4 | 50.7 | 62.5 | 74.9 | 76.2 | 77.0 | 94.5 |
| Solid biomass | 41.1 | 87.5 | 125.9 | 257.9 | 309.1 | 311.7 | 313.4 | 413.9 |
| Liquid biomass | 2.0 | 6.8 | 12.4 | 14.7 | 16.5 | 14.5 | 9.6 | 25.3 |
| Landfill and sewage gas | 22.7 | 20.3 | 21.2 | 13.7 | 21.4 | 21.2 | 21.1 | 29.1 |
| Geothermal energy | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| Photovoltaics | 14.2 | 15.1 | 15.4 | 15.3 | 18.8 | 21.7 | 26.8 | 71.3 |
| Wind | 395.6 | 594.6 | 816.9 | 953.5 | 972.0 | 960.9 | 984.1 | 1,059.6 |
| Total “other” green power | 491.4 | 753.6 | 1,043.4 | 1,318.5 | 1,413.6 | 1,407.1 | 1,433.0 | 1,694.5 |
| Small hydro capacities up to 10 MW (supported) 1) | 858.1 | 851.5 | 709.7 | 320.9 | 380.2 | 124.7 | 200.9 | 1,210.8 |

1) Many small hydropower plant operators have left the support scheme and sell at market prices instead.

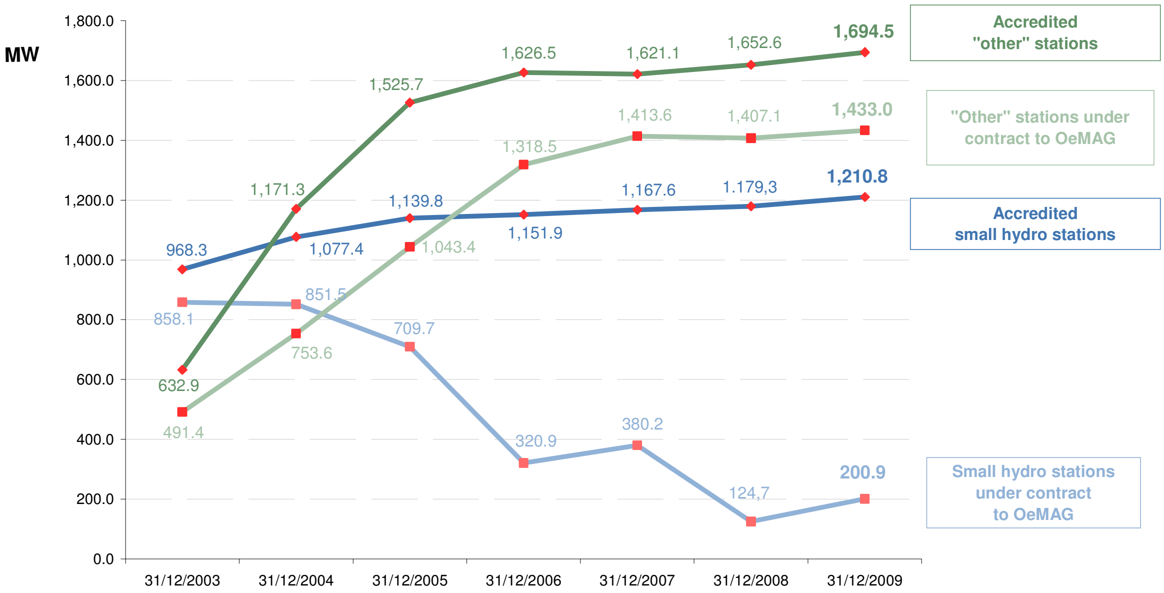
2) Entitled to granted sales and feed-in tariffs, almost all in operation

3) Accredited plants, not all of which have been built

[Sources: E-Control GmbH, green power balancing group representatives, OeMAG - preliminary values as of July 2010]

**Table 46: Comparison of accredited renewable generating stations and facilities under contract to OeMAG / GPBGRs, 2003–2009**

The curves in Figure 33 reveal that the number of “other” renewable generating stations under contract to OeMAG / GPBGRs has risen steadily over the years, while the fall in the number of small hydropower stations under contract reflects the withdrawal of many operators from the support scheme. The low point in the curve comes at a time when the market price was very high, and was well above the subsidised feed-in tariff. Meanwhile there was an increase in the number of accredited small hydropower stations every year.




[Sources: E-Control GmbH, OeMAG, green power balancing group representatives]

**Figure 33: “Other” renewable generating stations and small hydropower stations, 2003–2009: comparison of accredited plants (approved but in some cases not built) with facilities under contract to OeMAG (normally in operation)**

Table 47 presents a summarised breakdown of the capacity and number of accredited renewable generating stations by energy sources. The following sections look in detail at the evolution of the various technologies and primary energy sources.

| Detailed analysis<br>Accredited green power plants at year-end 2009 | | | | | |
|---|---|---|---|---|---|
| **Primary energy source** | **Average plant capacity (kW)** | **Total maximum capacity (kW)** | | **Number** | |
| **Existing small hydro** | | | | | |
| Total | 469 | 100% | 941,084 | 100% | 2007 |
| Up to 500 kW | | 17% | 163,696 | 82% | 1639 |
| Up to 1 MW | | 29% | 275,616 | 89% | 1795 |
| Up to 2 MW | | 46% | 434,644 | 95% | 1902 |
| Over 5 MW | | 30% | 280,415 | 2% | 35 |
| **New small hydro** | | | | | |
| Total | 567 | 100% | 180,195 | 100% | 318 |
| Up to 1 MW | | 27% | 48,957 | 85% | 269 |
| Up to 2 MW | | 55% | 99,095 | 95% | 302 |
| Over 2 MW | | 45% | 81,100 | 5% | 17 |
| **Rehabilitated small hydro, increase of over 50%** | | | | | |
| Total | 174 | 100% | 23,882 | 100% | 137 |
| Up to 1 MW | | 63% | 15,147 | 97% | 133 |
| Up to 2 MW | | 72% | 17,092 | 98% | 134 |
| **Rehabilitated small hydro, increase of over 15%** | | | | | |
| Total | 341 | 100% | 65,397 | 100% | 192 |
| Up to 1 MW | | 49% | 31,983 | 93% | 178 |
| Up to 2 MW | | 61% | 40,197 | 96% | 184 |
| Largest plant | | 10% | 6,500 | 1% | 1 |
| **Wind** | | | | | |
| Total | 5,272 | 100% | 1,059,581 | 100% | 201 |
| Up to 5 MW | | 16% | 164,981 | 72% | 144 |
| Over 25 MW | | 23% | 245,000 | 3% | 7 |
| **Solid biomass** | | | | | |
| Total | 2,225 | 100% | 413,874 | 100% | 186 |
| Up to 2 MW | | 27% | 111,746 | 74% | 137 |
| Up to 5 MW | | 69% | 285,573 | 94% | 174 |
| **Biogas** | | | | | |
| Total | 277 | 100% | 94,414 | 100% | 341 |
| Up to 500 kW | | 67% | 63,721 | 90% | 306 |
| 500-1000 kW | | 28% | 26,625 | 9% | 32 |
| Over 1 MW | | 4% | 4,068 | 1% | 3 |
| **Liquid biomass** | | | | | |
| Total | 275 | 100% | 25,263 | 100% | 92 |
| Up to 200 kW | | 28% | 7,005 | 85% | 78 |
| Up to 500 kW | | 40% | 10,048 | 92% | 85 |
| Over 1 MW | | 60% | 15,215 | 8% | 7 |
| **Landfill and sewage gas** | | | | | |
| Total | 448 | 100% | 29,119 | 100% | 65 |
| Up to 200 kW | | 6% | 1,892 | 37% | 24 |
| Up to 1 MW | | 59% | 17,155 | 92% | 60 |
| Over 1 MW | | 41% | 11,964 | 8% | 5 |
| **Photovoltaics** | | | | | |
| Total | 6.8 | 100% | 71,308 | 100% | 10,525 |
| Up to 5 kW | | 43% | 30,547 | 74% | 7,804 |
| Up to 10 kW | | 62% | 44,262 | 91% | 9,592 |
| Over 20 kW | | 23% | 16,239 | 2% | 252 |
| Over 100 kW | | 11% | 7,502 | 0.2% | 16 |

[Source: E-Control GmbH]

**Table 47: Analysis of the capacity of accredited green power plants by technologies, at year-end 2009**

## Comments on large hydro

Apart from the accreditation notices set out in Table 47, most of which are for plants subsidised by means of feed-in tariffs under the Green Electricity Act, there are also accreditations of hydropower plants with capacities in excess of 10 MW, shown below.

| Evolution of accredited large hydro capacity - capacity over 10 MW - 2001-H1 2010 (status at year end) | | |
|---|---|---|
| | Number | Capacity in MW |
| 2002 | 1 | 9.8 |
| 2003 | 52 | 3,507.4 |
| 2004 | 110 | 8,599.6 |
| 2005 | 124 | 10,440.6 |
| 2006 | 124 | 10,440.6 |
| 2007 | 124 | 10,595.4 |
| 2008 | 124 | 10,603.3 |
| 2009 | 126 | 10,640.5 |
| H1 2010 | 129 | 10,729.6 |

[July 2010 | Source: E-Control GmbH]

**Table 48: Evolution of accredited large hydro capacity from 2002 to H1 2010**

By way of comparison, according to the E-Control plant statistics (capacity in place in 2008 according to 2009 data) 154 large hydropower plants with a total capacity of 11,324 MW are in operation in Austria.

# Analysis of accredited renewable generating stations by technologies

## 10.1 Small hydropower

Due to the different historical backgrounds, the presentation of the data relating to small hydro stations differs from that of the information on “other” renewable generating stations.

Prior to the entry into force of Green Electricity (Amendment) Act 2009, the annual feed-in tariff orders distinguished between the following categories of small hydropower plants:

- Existing stations;
- New stations to be built;
- Rehabilitated stations:
    - Rehabilitation projects resulting in increases in mean energy capability of over 50% (classification as new facilities);
    - Rehabilitation projects resulting in increases in mean energy capability of over 15%.

Since the entry into effect of the Green Electricity (Amendment) Act 2009, new and rehabilitated plants have been supported by means of investment grants. The grants are subject to the legal limits shown below.

| **Plant capacity** | **Statutory limit for investment grants** |
|---|---|
| Up to 500 kW | max 30%,<br>max € 1,500 per kW |
| 500 kW – 2 MW | max 20%,<br>max € 1,000 per kW |
| 2–10 MW | max 10%,<br>max € 400 per kW |

**Table 49: Statutory limits to small hydro investment grants**

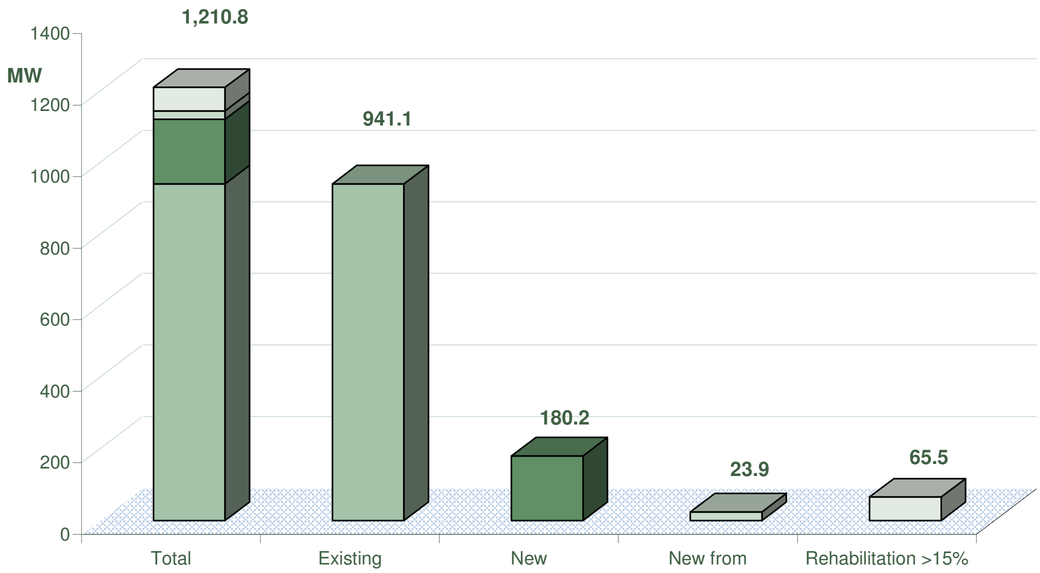
Table 50 and Figure 34 show the aggregate capacity in the four categories of small hydropower stations recognised by the feed-in tariff orders at year-end 2009 on the basis of the accreditation notices under section 7 Green Electricity Act.

| Total accredited small hydro capacity at year-end 2009, in MW | | | | | |
|---|---|---|---|---|---|
| | Total | Existing | New | New from rehabilitation >50% | Rehabilitation >15% |
| 2009 | 1210.8 | 941.1 | 180.2 | 23.9 | 65.5 |

[Source: E-Control GmbH]

**Table 50: Accredited small hydro capacity by categories at year-end 2009**

There was an overall year-on-year increase of 31.5 MW in small hydropower plants; the new capacity category alone accounted for 28.1 MW. As regards the capacity of the existing small hydropower plants, which rose from 940.7 MW (at 31 March 2008) to 941.1 MW, it should be noted that the rehabilitation of some existing facilities led to their reclassification as “rehabilitated small hydropower plants” or “new small hydropower generating stations created by rehabilitation projects”.




[Source: E-Control GmbH]

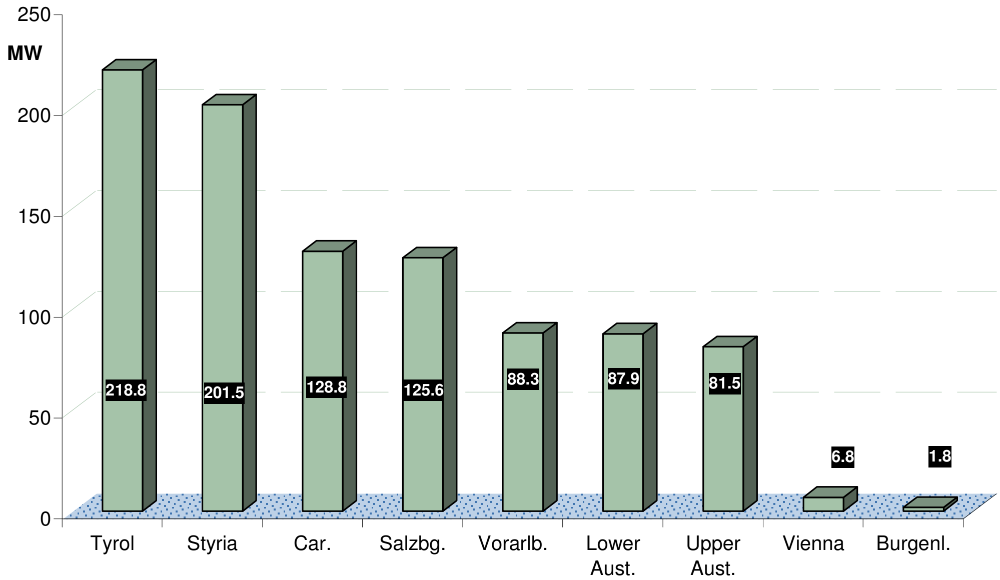
**Figure 34: Aggregate capacity of existing, partly rehabilitated and new small hydropower plants at year-end 2009**

### 10.1.1 Existing small hydropower plants

Most of the “existing plants” (some of which have been in operation for several decades) were accredited as green electricity plants by provincial governors upon introduction of the small hydropower certificate system pursuant to section 40 *Elektrizitätswirtschafts- und -organisationsgesetz* (Electricity Act) as amended by FLG I no 121/2000. Because of this, the dates of the accreditation notices are not a guide to the growth in capacity over time. The cut-off date for classification as an existing station was set to 30 June 2003. On that day the data in the small hydro database, which was by then no longer being used, were exported to the E-Control accreditation notice database. Since the transfer was purely administrative, in June 2004 E-Control sent a questionnaire to the provincial governments and green power balancing group representatives in order to arrive at a correct classification of generating stations as existing, new or rehabilitated. The last survey of small hydropower plants classified as new capacity, conducted on a sample basis, was carried out near the end of 2007. The figures shown below represent a mixture of the existing data up to and including December 2009 and the results of this survey.

The majority of the “existing stations” are “old stations” in the meaning of section 5(1)(2) Green Electricity Act as amended (all the permits needed for their construction had been issued by 1 January 2003). The accreditation of existing small hydropower plants has continued to the present day, as accreditation notices are a condition of eligibility for feed-in tariffs. Where a facility is explicitly classified as an “old station” in the notice it has been assigned to the “existing plants” category.

Figure 35 and Table 51 give a breakdown of the locations of existing capacity by provinces.




[Source: E-Control GmbH]

**Figure 35: Existing accredited small hydropower plants ("old stations") by provinces, year-end 2009**

| Existing accredited small hydropower plants at year-end 2009 | | |
|---|---|---|
| **Province** | **MW** | **Number** |
| Tyrol | 218.82 | 328 |
| Styria | 201.49 | 333 |
| Carinthia | 128.83 | 218 |
| Salzburg | 125.61 | 206 |
| Lower Austria | 88.33 | 85 |
| Vorarlberg | 87.90 | 467 |
| Upper Austria | 81.52 | 358 |
| Vienna | 6.77 | 4 |
| Burgenland | 1.80 | 8 |
| **Total** | **941.08** | **2,007** |

[Source: E-Control GmbH]

**Table 51: Existing accredited small hydropower plants at year-end 2009**

The *Einspeisetarif-Verordnung* (Feed-in Tariff Order) established graduated tariffs which vary according to the amount of electricity fed into the grid. The tariffs thus implicitly classify stations by capacity, as is the case with most "other" renewable generating stations. This is also shown in the relevant charts below.

Small hydropower plants that were already in operation before 2003 and had not achieved the required capacity increases as a result of rehabilitation measures ceased to qualify for feed-in tariffs at the end of 2008.

The chart below shows the distribution of existing small hydro generating plants by size. Some 95% of the stations, accounting for 46% of total capacity (435 MW), have capacities of less of 2 MW, and the average capacity is 469.26 kW.

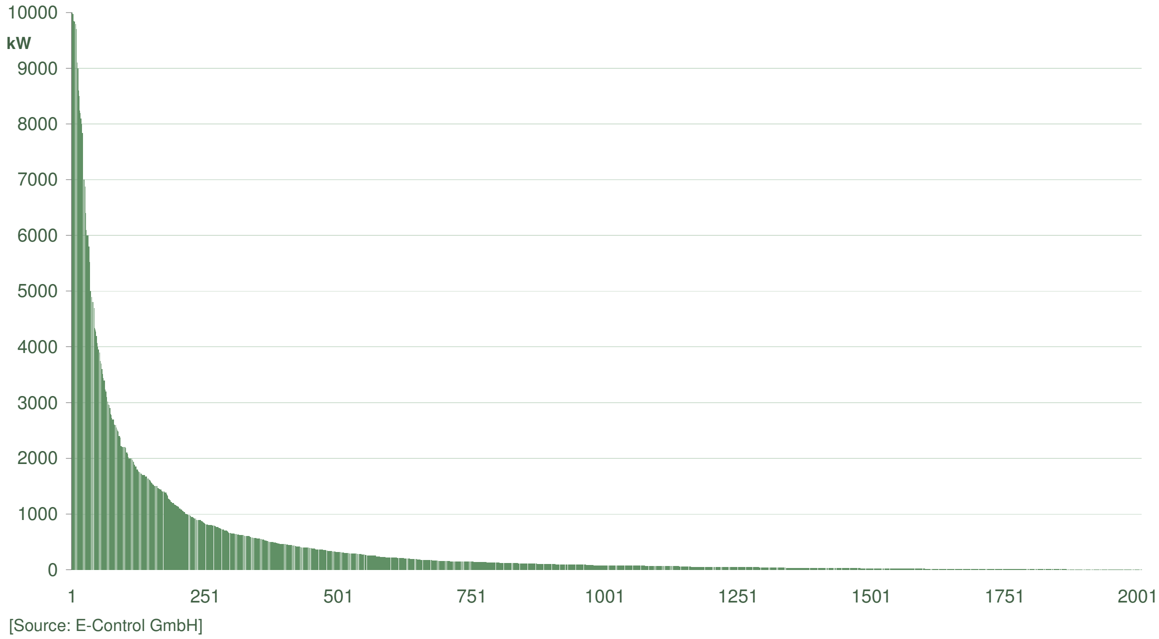
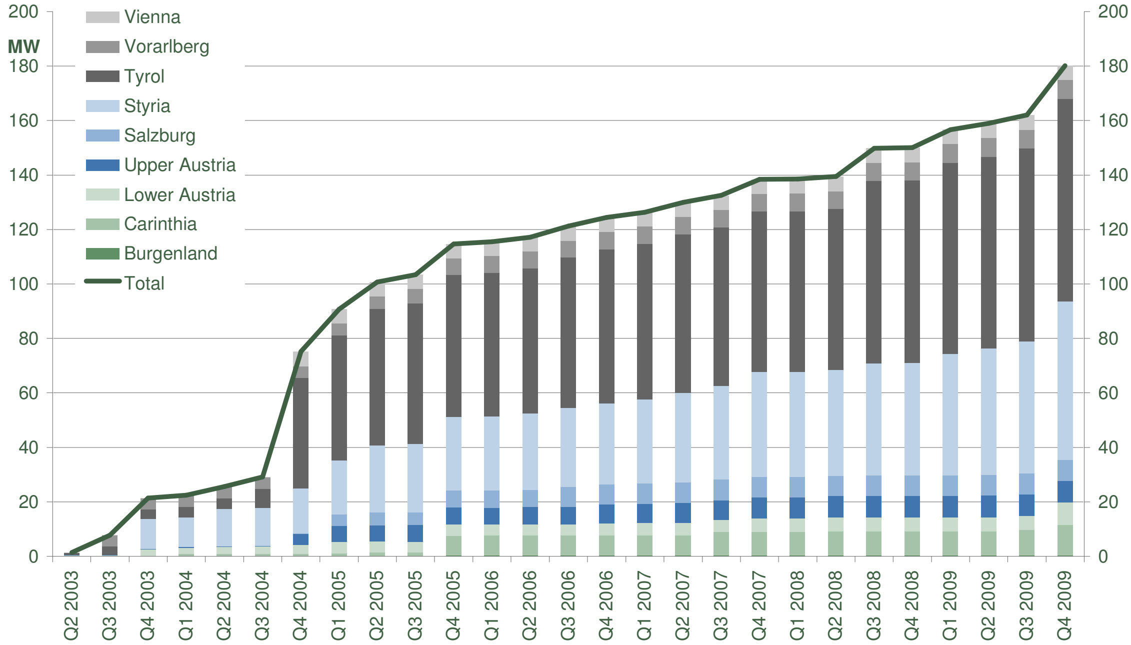



**Figure 36: Size of existing accredited small hydropower plants (total: 2007 stations; 941 MW) at year-end 2009**

## 10.1.2 New small hydropower plants

Plants that received the necessary approvals after 31 December 2003 are “new plants” in the meaning of the Green Electricity Act. The provincial governors do not always explicitly identify new plants as such in the accreditation notices, and E-Control has therefore made follow-up investigations in an attempt to arrive at a more accurate classification. Nevertheless, errors cannot be excluded.

New accredited small hydropower capacity totalled 180.2 MW at year-end 2009 (see Figure 37 and Table 52). Some projects were designed for lower capacities than the theoretical maximum because of the cut-off point for subsidies. This is undesirable in energy efficiency terms, since it means that some of the generating potential is left untapped.To counteract this practice investment grants for medium-sized hydropower plants were introduced by the Green Electricity (Amendment) Act 2006 in May 2006.




[Source: E-Control GmbH]

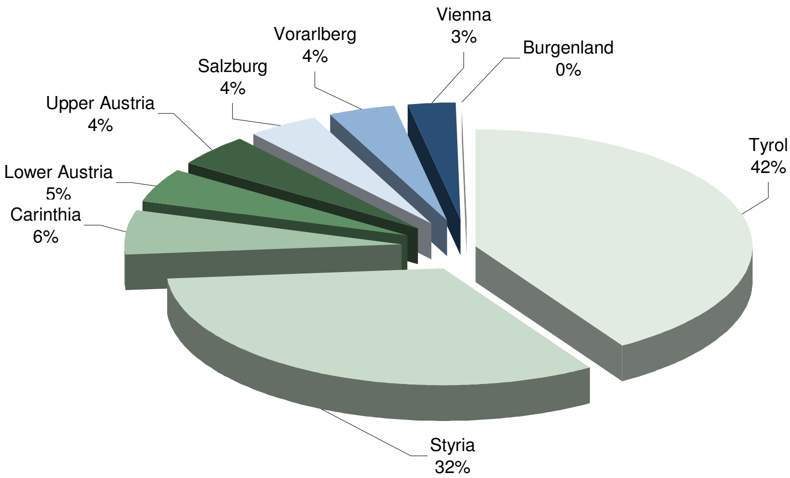
**Figure 37: Evolution of new accredited small hydropower generating capacity, Q2 2003 to Q4 2009**

| Accredited new small hydropower plants at year-end 2009 | | |
|---|---|---|
| **Province** | **MW** | **Number** |
| Tyrol | 74.22 | 90 |
| Styria | 58.30 | 72 |
| Carinthia | 11.33 | 25 |
| Lower Austria | 8.13 | 33 |
| Upper Austria | 7.98 | 53 |
| Salzburg | 7.62 | 13 |
| Vorarlberg | 6.90 | 28 |
| Vienna | 5.36 | 3 |
| Burgenland | 0.34 | 1 |
| **Total** | **180.19** | **318** |

[Source: E-Control GmbH]

**Table 52: Accredited new small hydropower plants at year-end 2009**

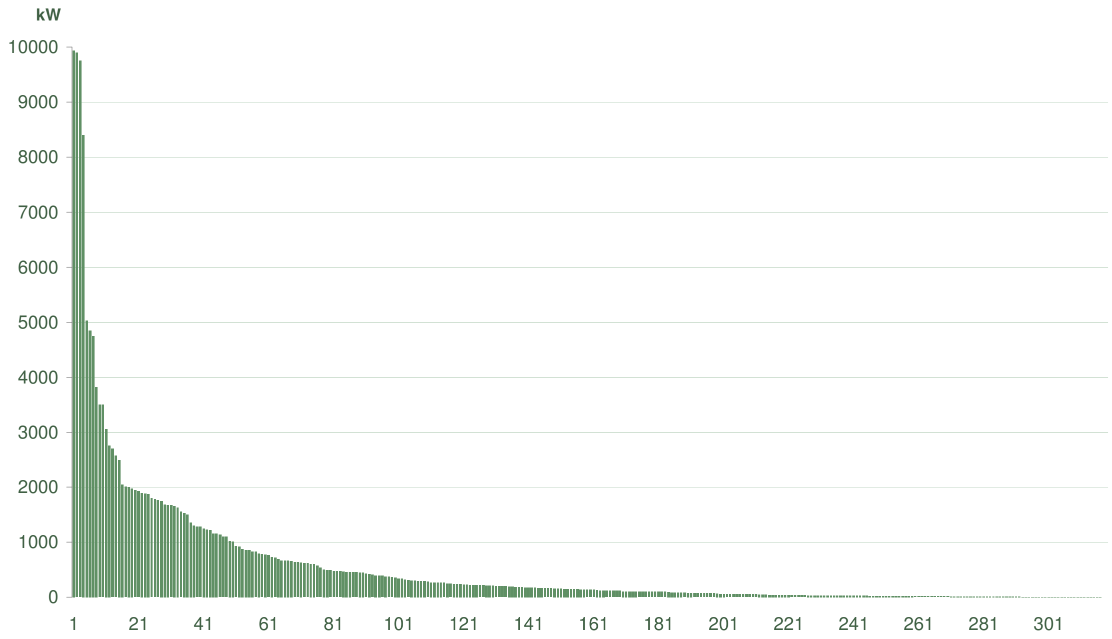
A look at the geographical distribution of capacity reveals that about three-quarters (74%) of the new plants are located in Tyrol and Styria (Figure 38).




[Source: E-Control GmbH]

**Figure 38: Geographical distribution of new accredited small hydropower capacity (in MW) by provinces at year-end 2009**

The average capacity of new small hydropower plants is 567 kW (Figure 39). Some 95% of stations, representing 55% of total capacity (99.1 MW), have capacities of less than 2 MW.



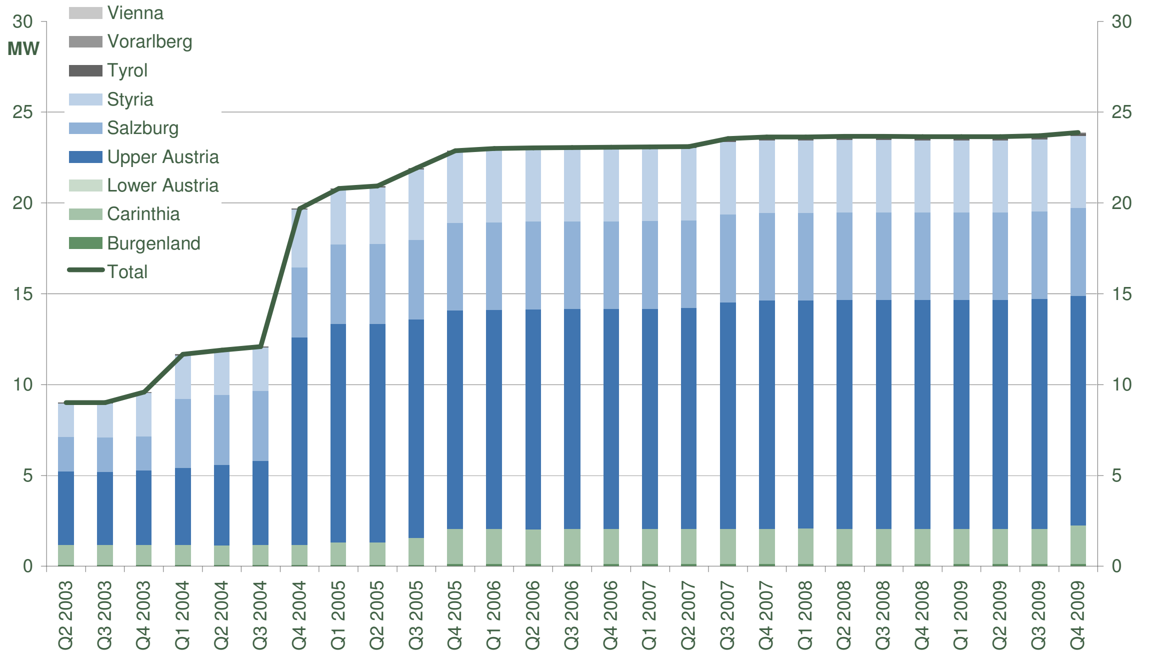

[Source: E-Control GmbH]

**Figure 39: Size of new accredited small hydropower plants (total: 318 stations; 180 MW) at year-end 2009**

### 10.1.3 "New" small hydropower plants created by rehabilitation (mean energy capability increases of over 50%)

The same tariffs as for new stations apply to small hydropower plants that have undergone rehabilitation resulting in an increase of more than 50% in mean energy capability (see section 3[2] Feed-In Tariff Order, FLG II no 508/2002 as amended by FLG II no 254/2005).

Complete statistical capture of such stations is not possible under current legislation, as accreditation by notice is not mandatory. However, where provincial governors accredit rehabilitated stations, thereby recognising their entitlement to a higher tariff, the notices are forwarded to E-Control. This data is partly supplemented by the expert reports needed to evidence compliance with the statutory requirements (see section 3[4] Feed-In Tariff Order, FLG II no 508/2002 as amended by FLG II no 254/2005).




[Source: E-Control GmbH]

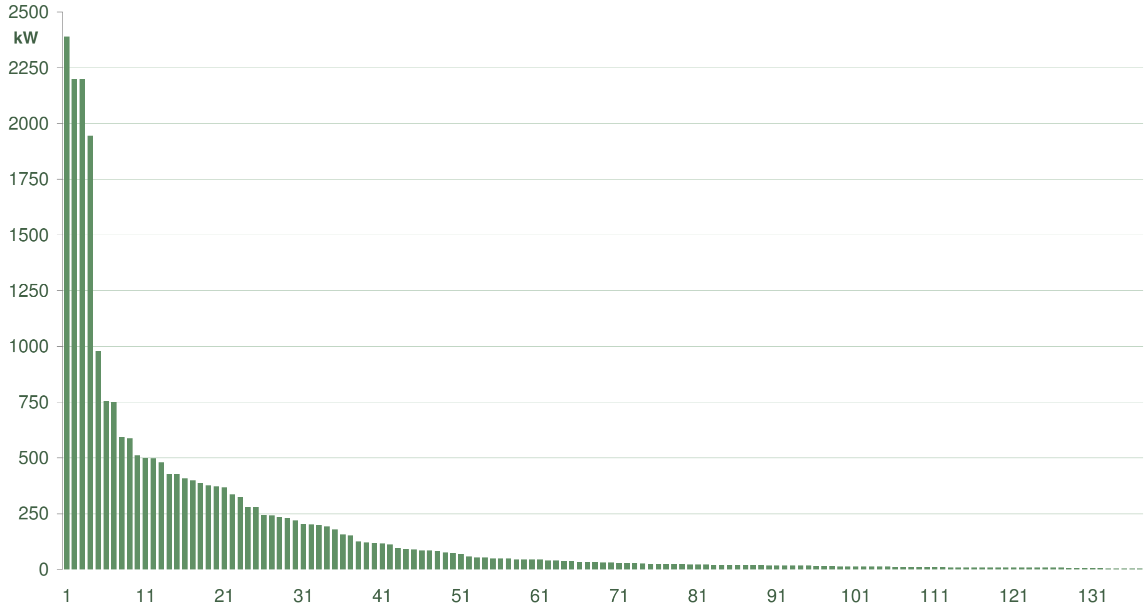
**Figure 40: Evolution of “new” accredited small hydropower generating capacity created by rehabilitation projects (> 50% increase in mean energy capability), Q2 2003 to Q4 2009**

| Accredited "new" small hydropower plants created by rehabilitation, at year-end 2009 | | |
|---|---|---|
| **Province** | **MW** | **Number** |
| Upper Austria | 12.64 | 88 |
| Salzburg | 4.83 | 5 |
| Styria | 3.97 | 19 |
| Carinthia | 2.13 | 15 |
| Other provinces | 0.31 | 10 |
| **Total** | **23.88** | **137** |

[Source: E-Control GmbH]

**Table 53: Accredited “new” small hydropower plants created by rehabilitation (> 50% increase in mean energy capability), at year-end 2009**

The picture with regard to the size of generating stations which have undergone rehabilitation resulting in mean energy capability increases of more than 50% is somewhat different (Figure 41). At 174 MW average capacity is well below that of the new and existing small hydropower plants; 98% of these stations, representing 72% of total capacity (17.1 MW), have capacities of up to 2 MW.

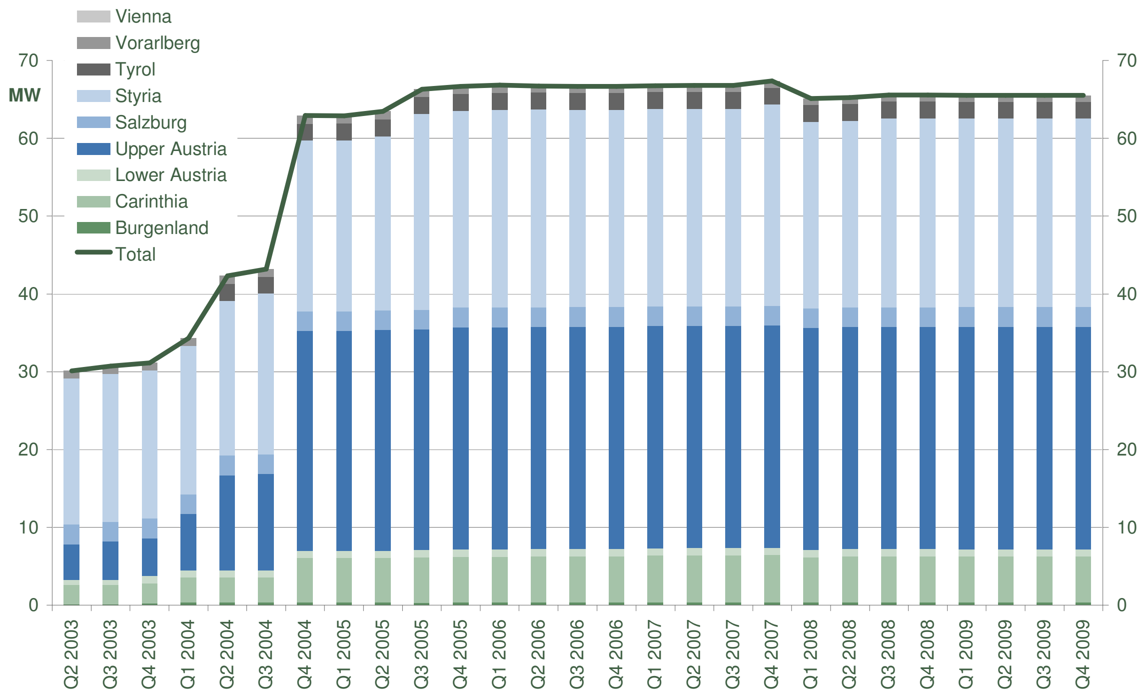



[Source: E-Control GmbH]

**Figure 41: Size of accredited "new" small hydropower plants created by rehabilitation (> 50% increase in mean energy capability) (total: 137 stations; 23.9 MW), at year-end 2009**

### 10.1.4 Rehabilitated small hydropower plants (mean energy capability increases of over 15%)

The third category in the E-Control accreditation notice database is that of small hydropower plants which have undergone rehabilitation resulting in an increase in mean energy capability of at least 15%. This derives from the legal framework established by the Feed-In Tariff Order (FLG II no 508/2002 as amended by FLG II no 254/2005). Here, too, provincial governors are not obliged to accredit stations by notice. Figure 42 and Table 54 reflect only the data available to E-Control from accreditation notices or expert reports.




[Source: E-Control GmbH]

**Figure 42: Evolution of accredited rehabilitated small hydropower capacity (> 15% increase in mean energy capability), Q2 2003 to Q4 2009**

| Accredited rehabilitated small hydropower plants at year-end 2009 | | |
|---|---|---|
| **Province** | **MW** | **Number** |
| Upper Austria | 28.54 | 117 |
| Styria | 24.25 | 38 |
| Carinthia | 5.90 | 21 |
| Salzburg | 2.52 | 5 |
| Lower Austria | 0.93 | 5 |
| Other provinces | 3.38 | 6 |
| **Total** | **65.53** | **192** |

[Source: E-Control GmbH]

**Table 54: Accredited rehabilitated small hydropower plants (> 15% increase in mean energy capability) at year-end 2009**

Some 96% of these small hydropower plants have capacities of up to 2 MW (corresponding to 40.2 MW or 61% of total capacity), and 93% have capacities of less than 1 MW. The largest accredited plant, with a capacity of 6.5 MW, accounts for 10% of total capacity, and the average capacity in this category is 341 kW (Figure 43).

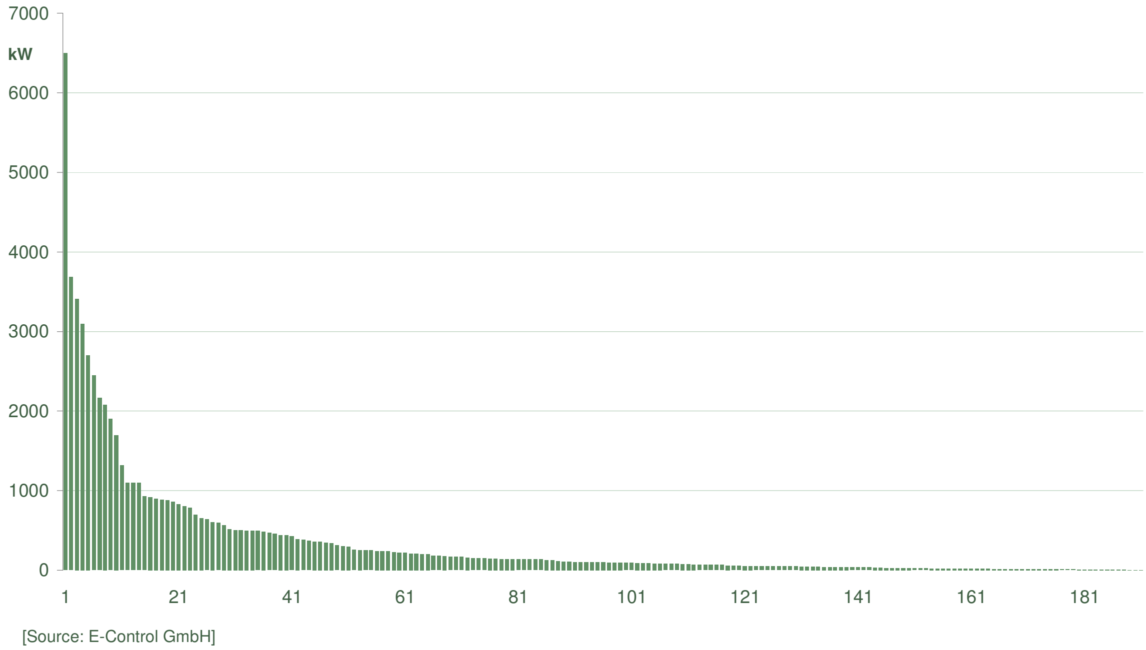
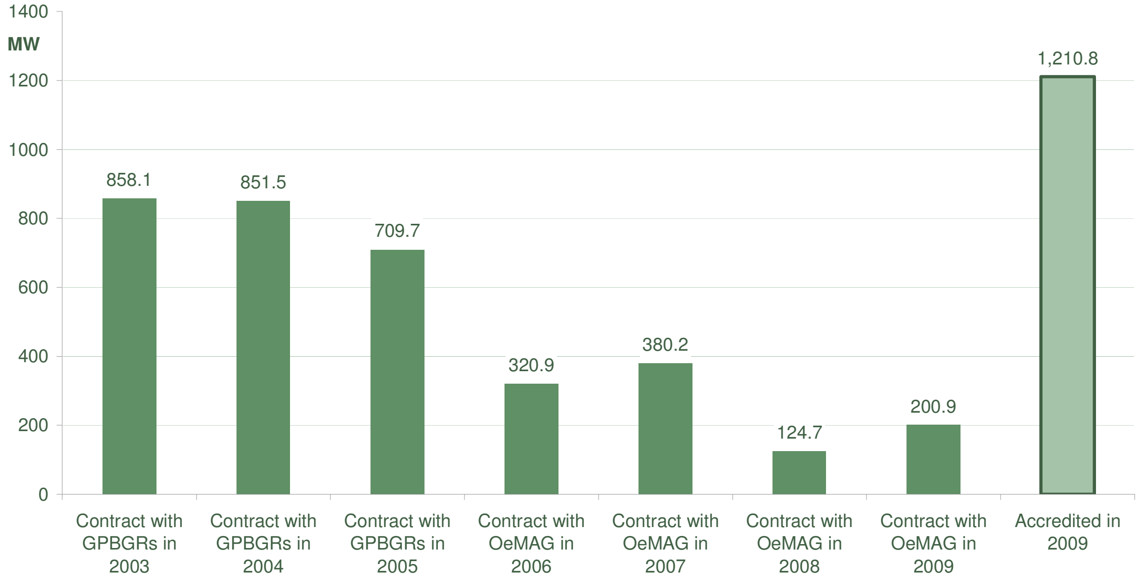



**Figure 43: Size of accredited rehabilitated small hydropower plants (> 15% increase in mean energy capability) (total: 192 stations; 63.5 MW) at year-end 2009**

## 10.1.5 Accredited and supported small hydropower plants

The information available on existing supported small hydropower plants is not as detailed as that provided by the accreditation notices. Because of this the evolution of small hydro capacity can only be presented in summarised form. The decline in the capacity under contract to the green power settlement agent over time is explained by temporary withdrawals from the green power balancing groups (see section 12.1.6) and does not mean that plants have ceased operating.




[July 2010 | Sources: E-Control GmbH, green power balancing group representatives, OeMAG]

**Figure 44: Evolution of small hydropower capacity (supported and in operation vs. accredited), at year-end 2003–2009**

Another reason for the decline is the fact that existing small hydropower plants ceased to be eligible for supported feed-in tariffs at the end of 2008; since then they have only been able to sell their power at market prices. As Figure 44 shows, the total capacity of the plants under contract hit a low of 124.7 MW (10% of the approved capacity) by the end of 2008. However, the figure then steadily rebounded, as section 12a Green Electricity Act FLG I no 104/2009 provides for investment grants for small hydropower plants.

| Small hydro stations and capacity | | | | | |
|---|---|---|---|---|---|
| Province | Under contract to OeMAG at year-end 2009 | | | Accredited plants at year-end 2009 | |
| | Number | Capacity in MW | Energy infeed 2009 in GWh | Number | Capacity in MW |
| Carinthia | 165 | 28.07 | 71.84 | 279 | 148.18 |
| Lower Austria | 325 | 23.08 | 76.72 | 505 | 96.96 |
| Upper Austria | 477 | 34.13 | 106.48 | 616 | 130.69 |
| Salzburg | 74 | 12.16 | 39.99 | 229 | 140.59 |
| Styria | 227 | 59.82 | 193.48 | 462 | 288.02 |
| Tyrol | 193 | 40.20 | 143.09 | 422 | 295.36 |
| Vorarlberg | 12 | 0.83 | 3.47 | 118 | 96.10 |
| Other provinces | 15 | 2.64 | 9.33 | 23 | 14.78 |
| **Total** | **1,488** | **200.92** | **644.40** | **2,654** | **1,210.68** |

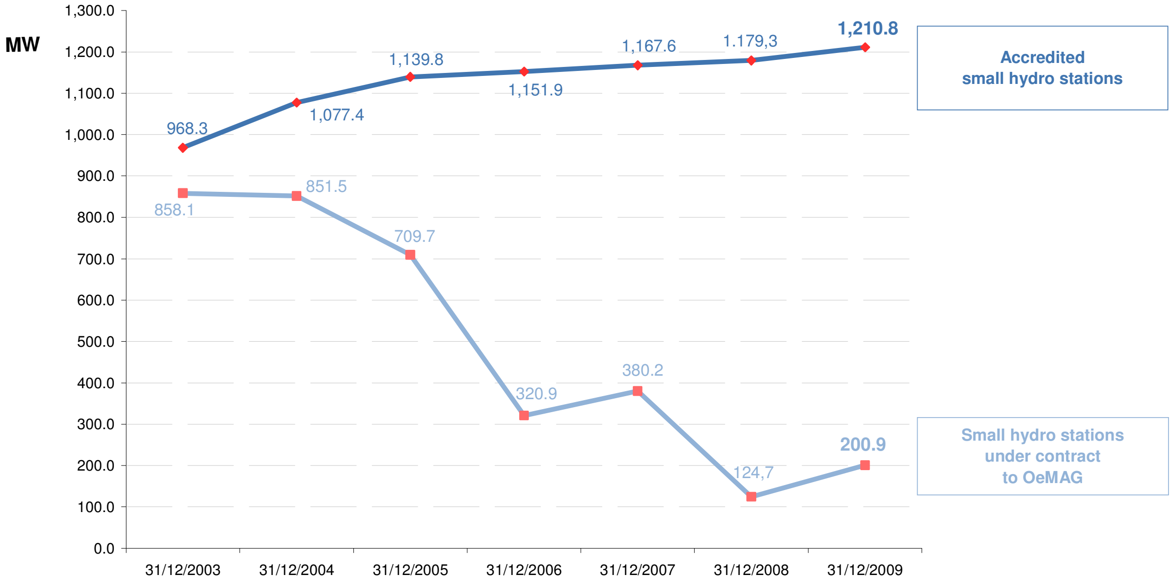
Values may differ from previously published data and other data sources.
[Sources: E-Control GmbH, OeMAG]

**Table 55: Comparison of small hydropower generating stations under contract to OeMAG and accredited stations, by provinces**

### 10.1.6 Temporary withdrawal from green power balancing groups

The compensation scheme for small hydropower plants creates incentives — especially for larger existing plants — to switch from the support regime to the free market towards the end of the year when market prices are higher than the feed-in tariff. The opposite tendency is observable at times of falling market prices (Figure 45).[59] Between 2006 and 2009 the market price converged on the small hydro feed-in tariff and in some cases actually exceeded it (see Figure 11 in section 3.6).

[59] E-Control advocates continuing to count the output of small hydropower plants that have withdrawn from the green power balancing groups but are still feeding power into the public grid towards the 9% target set by section 4(1)(5) Green Electricity Act, as the environmental benefits they bring are undiminished and it is a welcome development for renewable generating capacity to be competitive without receiving support.

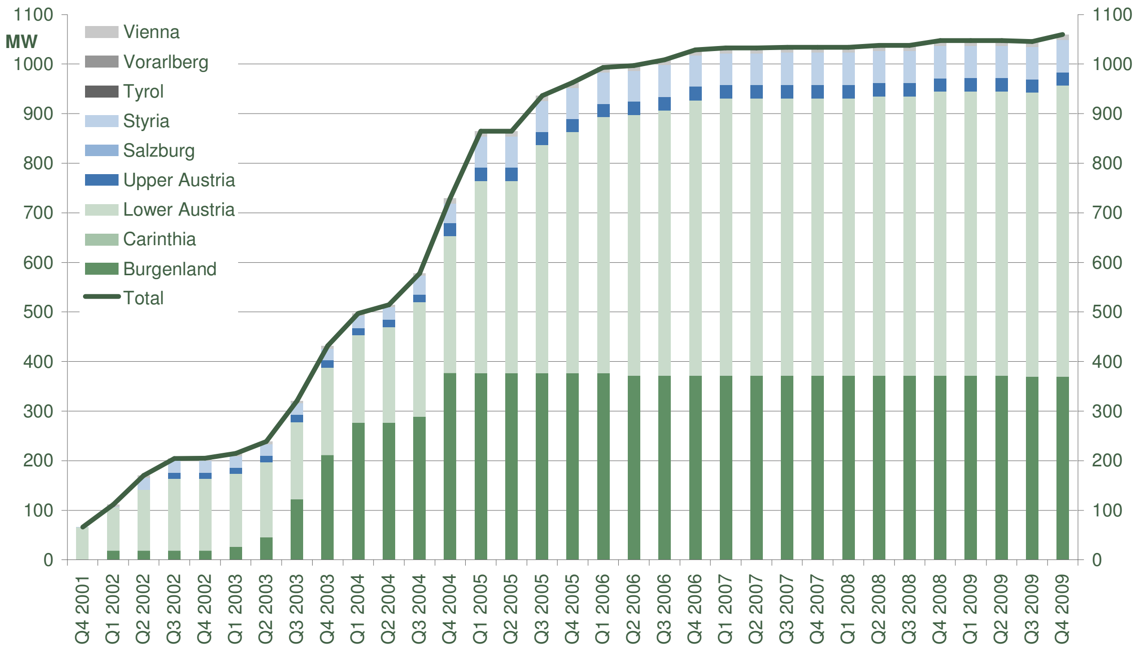



[Sources: E-Control GmbH, OeMAG, green power balancing group representatives]

**Figure 45: Evolution of small hydropower capacity under contract vs. accredited capacity, 2003–2009**

## 10.2 Wind power

By the end of 2009 the combined capacity of accredited wind farms had reached 1,060 MW (see Figure 46 and Table 56). The increase of about 24 MW in 2009 came from twelve new facilities, comprising two large wind farms (with several 2 MW turbines) and ten small generating stations (less than 10 kW per unit).




[Source: E-Control GmbH]

**Figure 46: Evolution of accredited wind power capacity, Q4 2001 to Q4 2009**

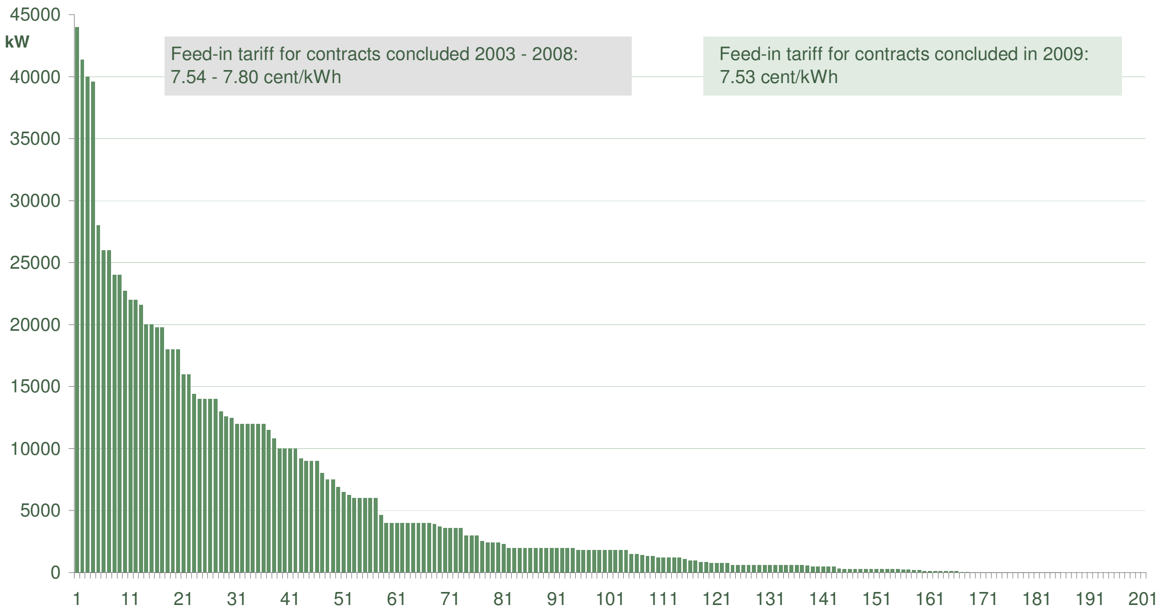
| Accredited wind farms at year-end 2009 | | | |
|---|---|---|---|
| Province | MW | Number of wind farms | Number of wind turbines |
| Lower Austria | 586.72 | 129 | 484 |
| Burgenland | 368.93 | 32 | 211 |
| Styria | 65.35 | 15 | 52 |
| Upper Austria | 27.33 | 15 | 31 |
| Other provinces | 11.25 | 10 | 14 |
| **Total** | **1,059.58** | **201** | **792** |

[Source: Energie-Control GmbH]

**Table 56: Accredited wind farms at year-end 2009**

More than half of the accredited wind power capacity (55%) is located in Lower Austria; Burgenland comes second with 35% and Styria third with 6%.

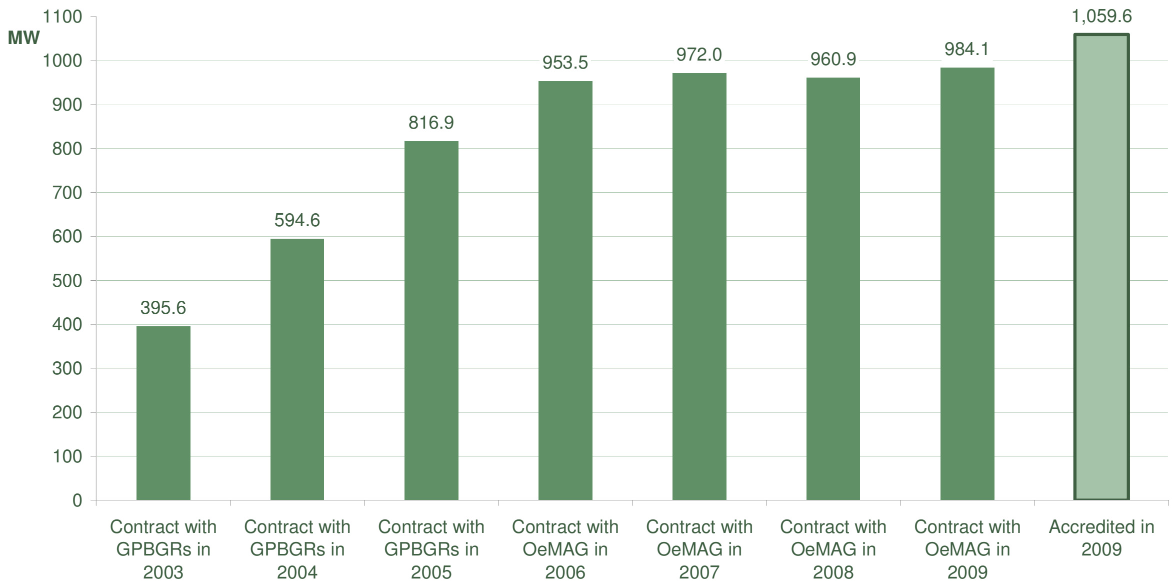
The average capacity of a wind turbine is 1.34 MW, and that of a wind farm 5.3 MW. Some 72% of the wind farms, representing just 16% of total capacity (165 MW), are rated at no more than 5 MW, while 23% of the total (245 MW) is accounted for by seven facilities with capacities of more than 25 MW.




[Source: E-Control GmbH]

**Figure 47: Size of accredited wind farms (total: 201 wind farms; 1,059.6 MW) at year-end 2009**

Figure 48 compares supported stations that are in operation with accredited capacity.




[July 2010 | Sources: E-Control GmbH, green power balancing group representatives, OeMAG]

**Figure 48: Evolution of wind capacity (supported and in operation vs. accredited), at year-end 2003–2009**

An analysis of wind farms under contract to OeMAG by provinces at year-end 2009 yields the following results:

| Wind power stations and capacity | | | | | |
|---|---|---|---|---|---|
| Province | Under contract to OeMAG at year-end 2009 | | | Accredited plants at year-end 2009 | |
| | Number of wind power plants | Capacity in MW | Energy infeed 2009 in GWh | Number of wind power plants | Capacity in MW |
| Burgenland | 34 | 369.23 | 689.45 | 32 | 368.93 |
| Lower Austria | 80 | 531.68 | 1,076.73 | 129 | 586.72 |
| Upper Austria | 11 | 26.46 | 42.34 | 15 | 27.33 |
| Styria | 8 | 50.56 | 100.18 | 15 | 65.35 |
| Other provinces | 3 | 6.23 | 5.84 | 10 | 11.25 |
| **Total** | **136** | **984.15** | **1,914.53** | **201** | **1,059.58** |

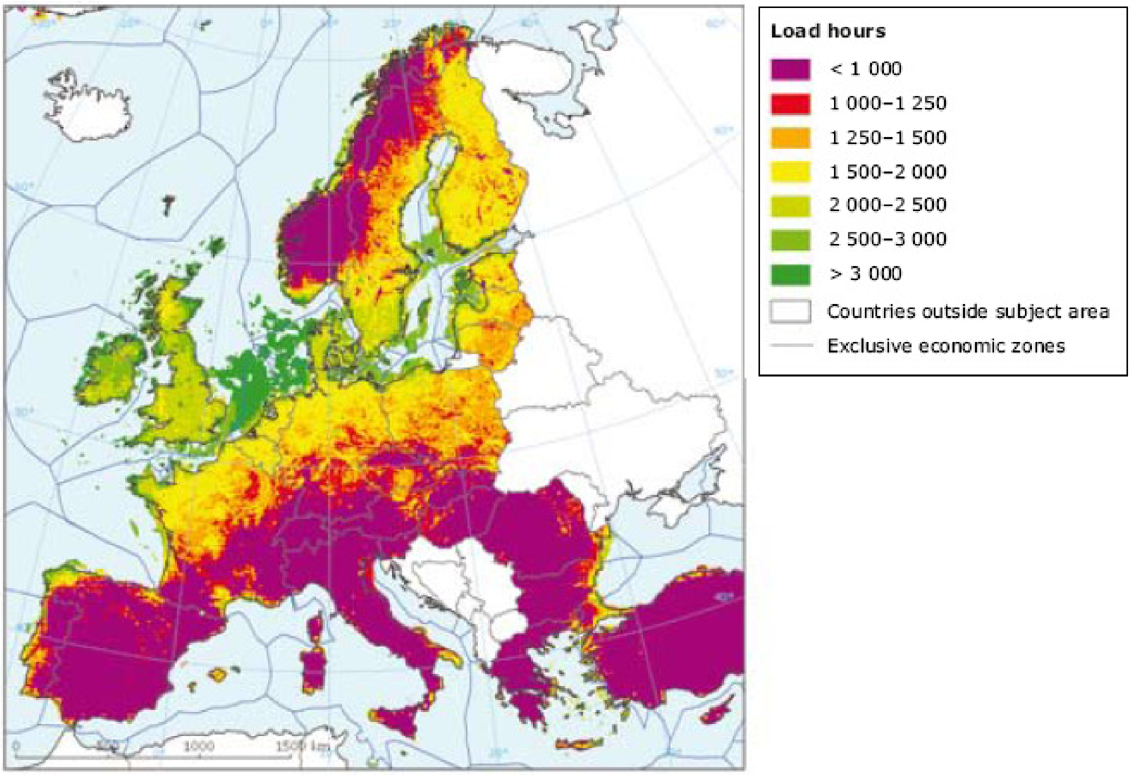
Values may differ from previously published data and other data sources, due to, for instance, partial comissioning, the contractual situation at year-end or incomplete data provision.

[Sources: E-Control GmbH, OeMAG]

**Table 57: Comparison of wind farms under contract to OeMAG with accredited facilities, by provinces**

## Comments on wind power development in Europe

Figure 49 below depicts regional wind quality in Europe, measured by average annual full-load hours.

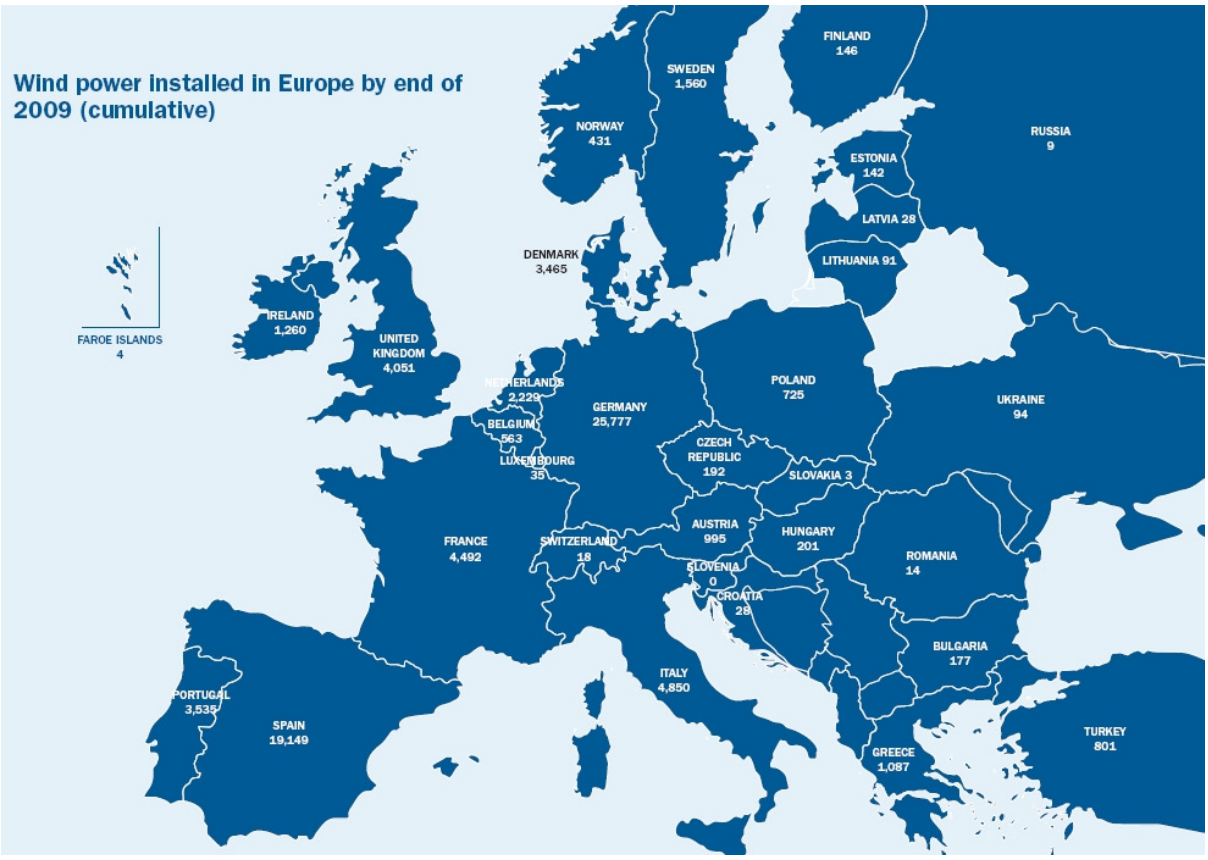



Source: EEA, 2008.

**Figure 49: Wind resources in Europe: average full-load hours at 80 metres above ground level**

Wind generation in Austria grew rapidly between 2003 and 2007. By the end of 2009 a total capacity of 995 MW was in operation, and some 1,060 MW was approved. This places Austria eighth in Europe (EU-27) in terms of per capita installed wind capacity (see Figure 50 and Table 58).

These wind farms generated 1,915 GWh of electricity in 2009 (Table 57) – about 3.6% of total supply to Austrian consumers from the public grid.




[Source: EWEA 2010]

**Figure 50: Installed wind capacity in Europe compared with Austria at year-end 2009, in MW**

| Country | Capacity at year-end in MW | Inhabitants | Inhabitants per MW capacity | Watt per inhabitant |
|---|---|---|---|---|
| Denmark | 3,465 | 5,450,700 | 1,573 | 636 |
| Spain | 19,149 | 40,397,900 | 2,110 | 474 |
| Portugal | 3,535 | 10,605,900 | 3,000 | 333 |
| Ireland | 1,260 | 3,969,600 | 3,150 | 317 |
| Germany | 25,777 | 82,422,300 | 3,198 | 313 |
| Sweden | 1560 | 9016600 | 5,780 | 173 |
| Netherlands | 2,229 | 16,491,500 | 7,399 | 135 |
| **Austria** | **995** | **8,192,900** | **8,234** | **121** |
| Estonia | 142 | 1,324,300 | 9,326 | 107 |
| Greece | 1,087 | 10,688,100 | 9,833 | 102 |
| Norway | 431 | 4610900 | 10,698 | 93 |
| Faroe Islands | 4 | 47,300 | 11,825 | 85 |
| Italy | 4,850 | 58,133,500 | 11,986 | 83 |
| France | 4,492 | 60,876,200 | 13,552 | 74 |
| Luxembourg | 35 | 474,500 | 13,557 | 74 |
| United Kingdom | 4,051 | 60,609,200 | 14,962 | 67 |
| Belgium | 563 | 10,379,100 | 18,435 | 54 |
| Finland | 146 | 5,231,400 | 35,832 | 28 |
| Lithuania | 91 | 3,585,900 | 39,405 | 25 |
| Bulgaria | 177 | 7,385,400 | 41,725 | 24 |
| Hungary | 201 | 9,981,400 | 49,659 | 20 |
| Poland | 725 | 38,536,900 | 53,154 | 19 |
| Czech Republic | 192 | 10,235,500 | 53,310 | 19 |
| Latvia | 28 | 2,274,800 | 81,243 | 12 |
| Turkey | 801 | 70,175,100 | 87,609 | 11 |
| Croatia | 28 | 4,494,800 | 160,529 | 6 |
| Switzerland | 18 | 7,524,000 | 418,000 | 2 |
| Ukraine | 94 | 46,710,800 | 496,923 | 2 |
| Romania | 14 | 22,303,600 | 1,593,114 | 1 |
| Slovak Republic | 3 | 5,439,500 | 1,813,167 | 1 |
| Russia | 9 | 142,893,600 | 15,877,067 | 0 |
| Iceland | 0 | 299,400 | - | 0 |
| Liechtenstein | 0 | 34,000 | - | 0 |
| Malta | 0 | 400,200 | - | 0 |
| Slovenia | 0 | 2,010,400 | - | 0 |
| Cyprus | 0 | 784,300 | - | 0 |
| **TOTAL** | **76,152** | **763,991,500** | **10,032** | **100** |

[9/2/2010 | Sources: wind data from EWEA, as of February 2010;
data on inhabitants from www.welt-in-zahlen.de, April 2007]

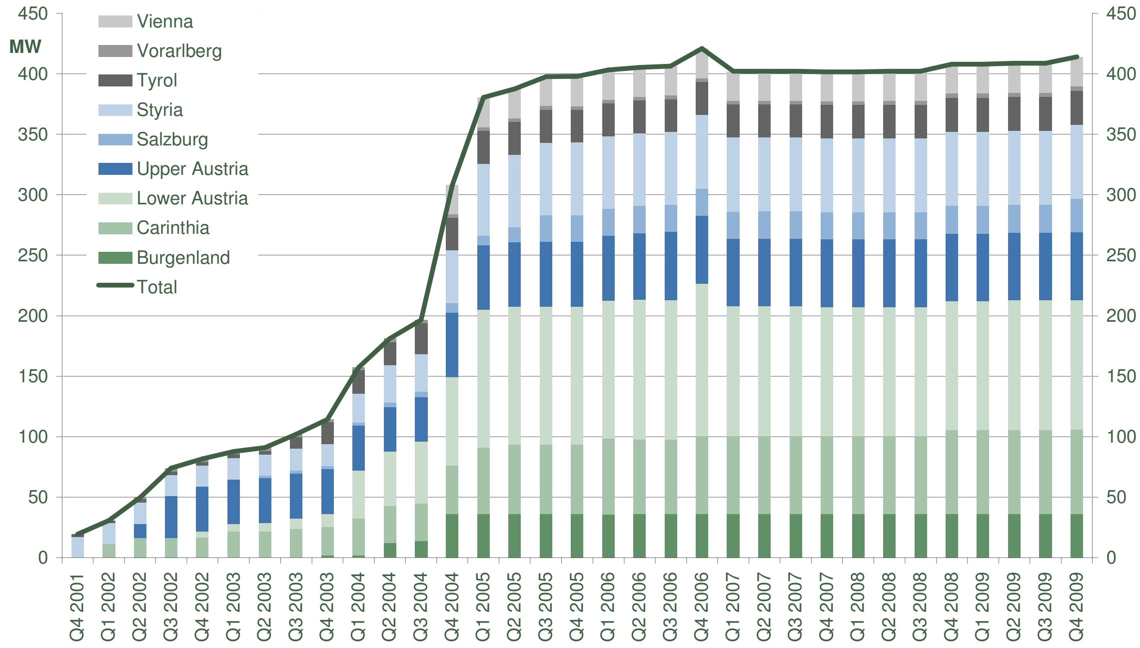
**Table 58: Per capita installed wind capacity in Europe, 2009**

The Green Electricity (Amendment) Act 2009 sets development targets of 700 MW of extra capacity and 1,500 GWh of additional output for wind power by 2015. The Energy Strategy Austria envisages the development of 1,400 MW of new capacity by 2020.

As of the summer of 2010 the approval procedures for several hundred MW of new wind capacity were underway.

## 10.3 Solid biomass and wastes containing high biogenic fractions

A total of 186 facilities of this type, with a combined capacity of 414 MW, were accredited by year-end 2009 (see Figure 51 and Table 59). Last year growth was mainly driven by accreditations of very small units and expansions of existing plants.




[Source: E-Control GmbH]

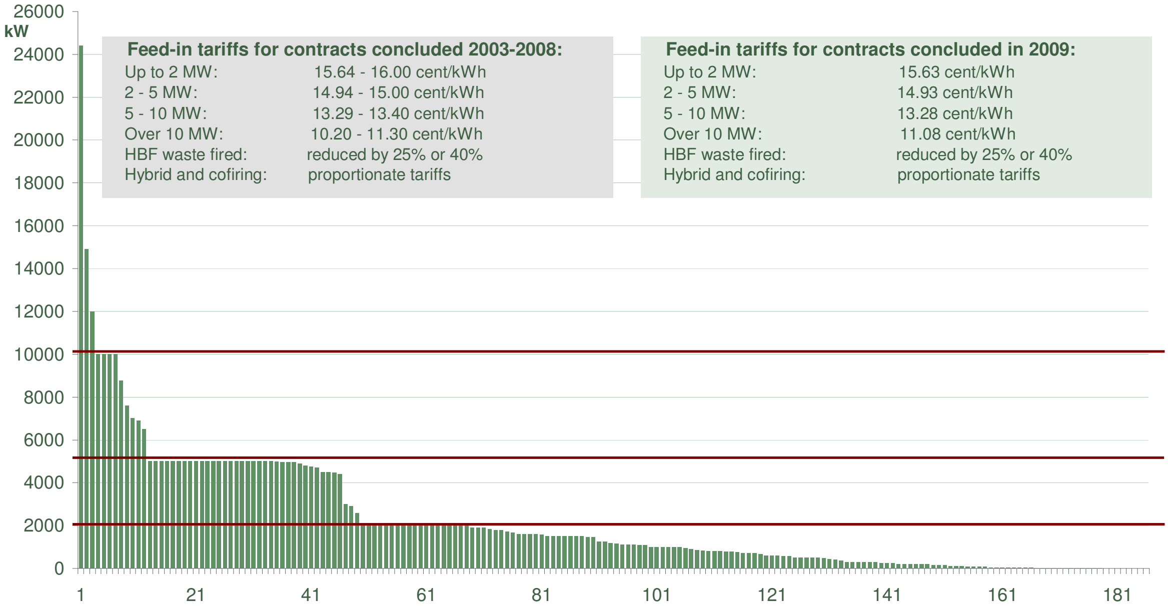
**Figure 51: Evolution of accredited solid biomass capacity (inc. HBF waste fired), Q4 2001 to Q4 2009**

| Accredited solid biomass plants at year-end 2009 | | |
|---|---|---|
| **Province** | **MW** | **Number** |
| Lower Austria | 107.35 | 51 |
| Carinthia | 69.73 | 27 |
| Styria | 61.20 | 48 |
| Upper Austria | 56.06 | 17 |
| Burgenland | 35.97 | 11 |
| Tyrol | 28.25 | 12 |
| Salzburg | 27.55 | 14 |
| Other provinces | 27.76 | 6 |
| **Total** | **413.88** | **186** |

[Source: E-Control GmbH]

**Table 59: Accredited solid biomass plants (inc. HBF waste fired) at year-end 2009**

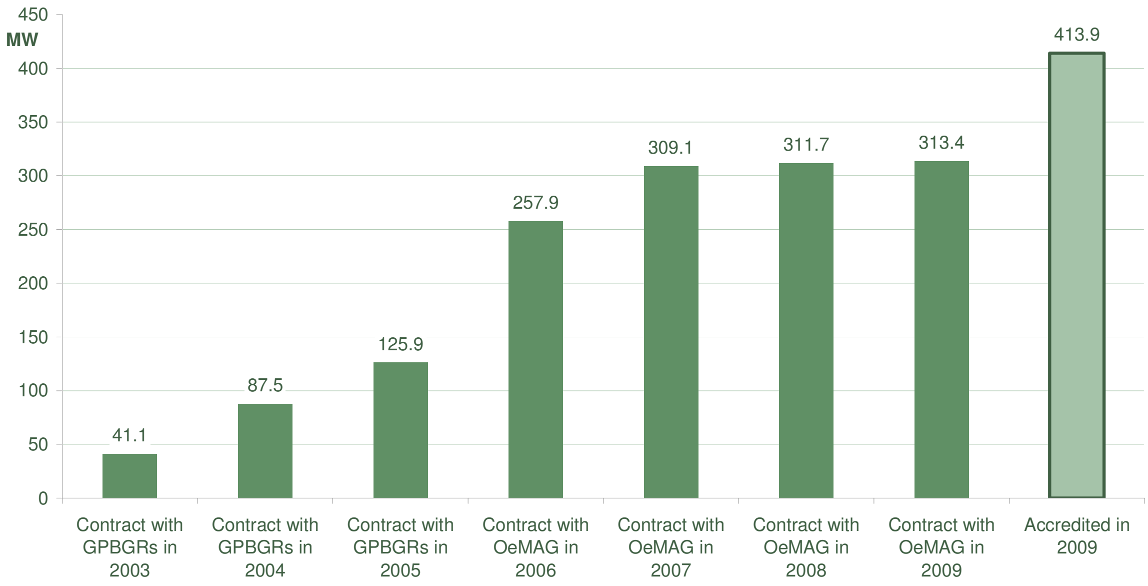
Average plant capacity is 2.2 MW. Some 74% of plants, accounting for only 27% of total capacity (112 MW), have capacities of less of 2 MW. The 13 largest plants (6% of facilities) have capacities of over 5 MW and contribute 31% of total capacity (128 MW), as shown in Figure 52.




[Source: E-Control GmbH]

**Figure 52: Size of accredited solid biomass plants (incl. HBF waste fired) (total: 186 plants; 413.8 MW) at year-end 2009**

Figure 53 gives an overview of the growth in the capacity of supported plants that are already in operation and those that have been accredited as renewable generating stations (but have not all been built).




[July 2010 | Sources: E-Control GmbH, green power balancing group representatives, OeMAG]

**Figure 53: Evolution of solid biomass capacity (incl. HBF waste fired) (supported and in operation vs accredited), at year-end 2003–2009**

An analysis of capacity under contract to OeMAG yields the following results:

| Solid biomass stations and capacity | | | | | |
|---|---|---|---|---|---|
| Province | Under contract to OeMAG at year-end 2009 | | | Accredited plants at year-end 2009 | |
| | Number | Capacity in MW | Energy infeed 2009 in GWh | Number | Capacity in MW |
| Burgenland | 11 | 36.22 | 243.62 | 11 | 35.97 |
| Carinthia | 16 | 55.51 | 289.43 | 27 | 69.73 |
| Lower Austria | 30 | 89.92 | 634.55 | 51 | 107.35 |
| Upper Austria | 10 | 34.33 | 221.64 | 17 | 56.06 |
| Salzburg | 11 | 17.55 | 116.64 | 14 | 27.55 |
| Styria | 24 | 24.20 | 126.39 | 48 | 61.20 |
| Tyrol | 12 | 28.24 | 179.39 | 12 | 28.25 |
| Other provinces | 4 | 27.40 | 146.28 | 6 | 27.76 |
| **Total** | **118** | **313.37** | **1,957.94** | **186** | **413.87** |

Values may differ from previously published data and other data sources.
[Sources: E-Control GmbH, OeMAG]

**Table 60: Comparison of solid biomass plants under contract to OeMAG with accredited facilities, by provinces**

## 10.4 Biogas

At year-end 2009 there were 341 accredited biogas plants with a combined capacity of 94.5 MW in Austria; over one-third were located in Lower Austria (see Figure 54 and Table 61).

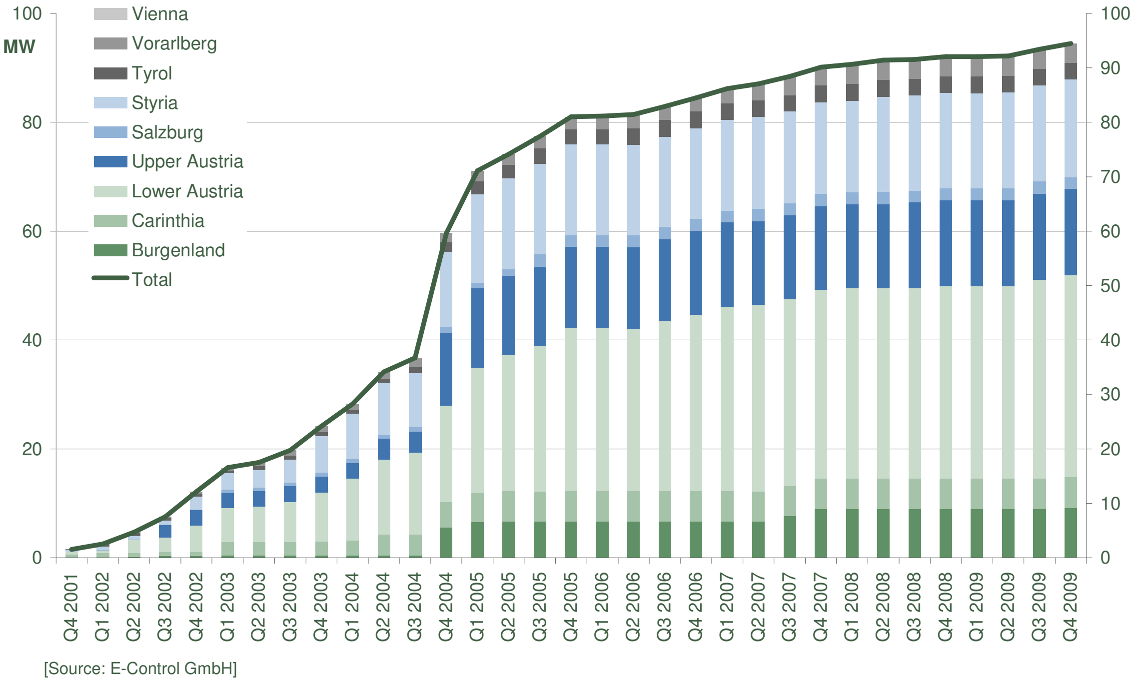


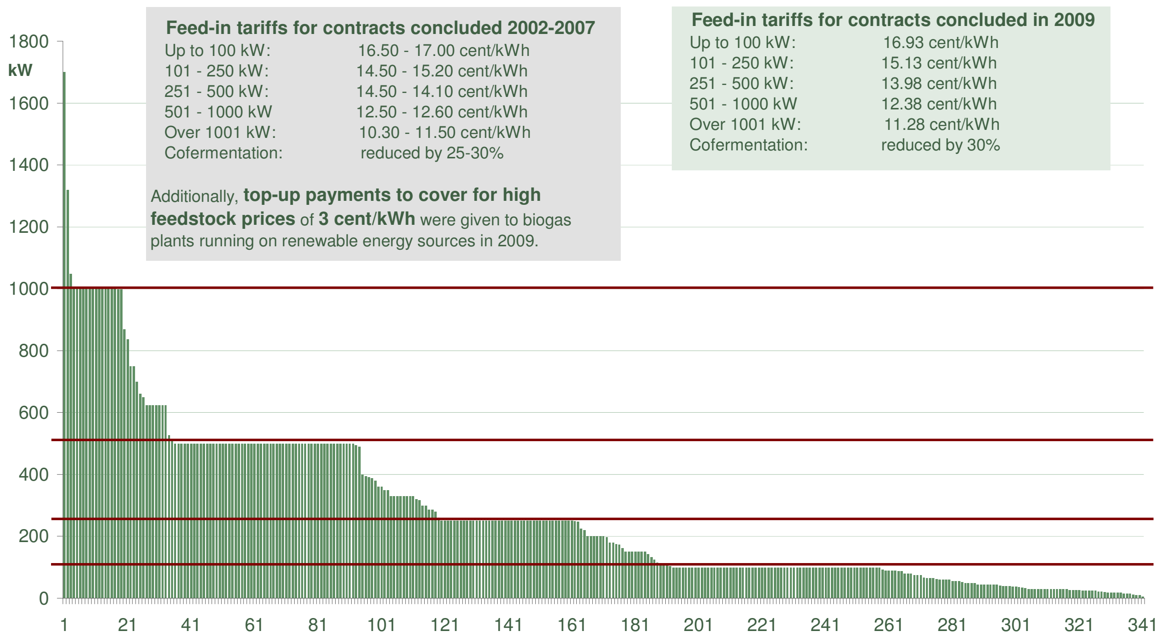

**Figure 54: Evolution of accredited biogas capacity, Q4 2001 to Q4 2009**

| Accredited biogas plants at year-end 2009 | | |
|---|---|---|
| **Province** | **MW** | **Number** |
| Lower Austria | 37.11 | 100 |
| Styria | 17.99 | 47 |
| Upper Austria | 15.79 | 79 |
| Burgenland | 9.18 | 19 |
| Carinthia | 5.65 | 34 |
| Vorarlberg | 3.51 | 33 |
| Tyrol | 3.04 | 18 |
| Salzburg | 2.19 | 11 |
| Vienna | - | - |
| **Total** | **94.45** | **341** |

[Source: E-Control GmbH]

**Table 61: Accredited biogas plants at year-end 2009**

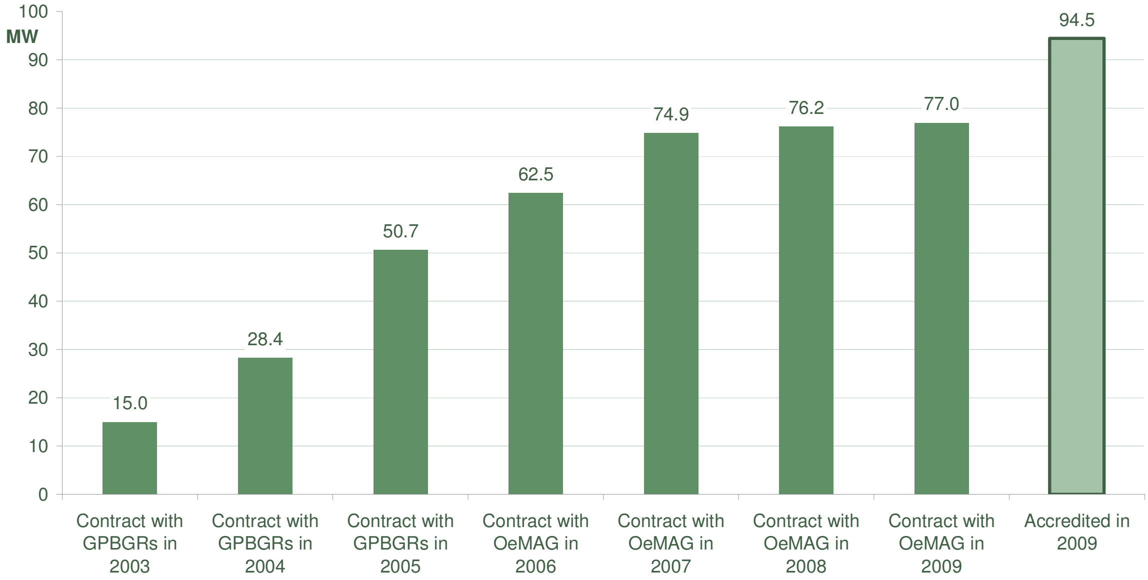
The average capacity of a biogas plant is 277 kW. The vast majority (90%) have capacities lower than 500 kW; the combined capacity of these facilities is 63.7 MW, representing 67% of the total. Only three have capacities in excess of 1 MW (Figure 55).




[Source: E-Control GmbH]

**Figure 55: Size of accredited biogas plants (total: 341 plants; 94.5 MW) at year-end 2009**

Figure 56 gives an overview of capacity that is already in operation and accredited systems.




[July 2010 | Sources: E-Control GmbH, green power balancing group representatives, OeMAG]

**Figure 56: Evolution of biogas capacity (supported and in operation vs. accredited), 2003–2009**

An analysis of biogas capacity under contract to OeMAG by provinces at year-end 2009 yields the following results:

| Biogas stations and capacity | | | | | |
|---|---|---|---|---|---|
| Province | Under contract to OeMAG at year-end 2009 | | | Accredited plants at year-end 2009 | |
| | Number | Capacity in MW | Energy infeed 2009 in GWh | Number | Capacity in MW |
| Burgenland | 11 | 4.50 | 34.62 | 19 | 9.18 |
| Carinthia | 30 | 5.40 | 35.75 | 34 | 5.65 |
| Lower Austria | 90 | 31.83 | 219.43 | 100 | 37.11 |
| Upper Austria | 64 | 13.08 | 90.38 | 79 | 15.79 |
| Salzburg | 11 | 1.73 | 7.68 | 11 | 2.19 |
| Styria | 38 | 14.94 | 108.68 | 47 | 17.99 |
| Tyrol | 16 | 2.15 | 11.32 | 18 | 3.04 |
| Vorarlberg | 31 | 3.40 | 16.66 | 33 | 3.51 |
| Vienna | - | - | - | - | - |
| **Total** | **291** | **77.02** | **524.51** | **341** | **94.45** |

Values may differ from previously published data and other data sources.
[Sources: E-Control GmbH, OeMAG]

**Table 62: Comparison of biogas plants under contract to OeMAG with accredited facilities, by provinces**

Figure 57 shows that biogas capacity grew rapidly over the 2003–2007 period. New contracts concluded with the green power settlement agent peaked at 72, for a combined capacity of 22.3 MW, in 2005. In 2007 a total of 41 plants, rated at 12.5 MW, concluded contracts with OeMAG.

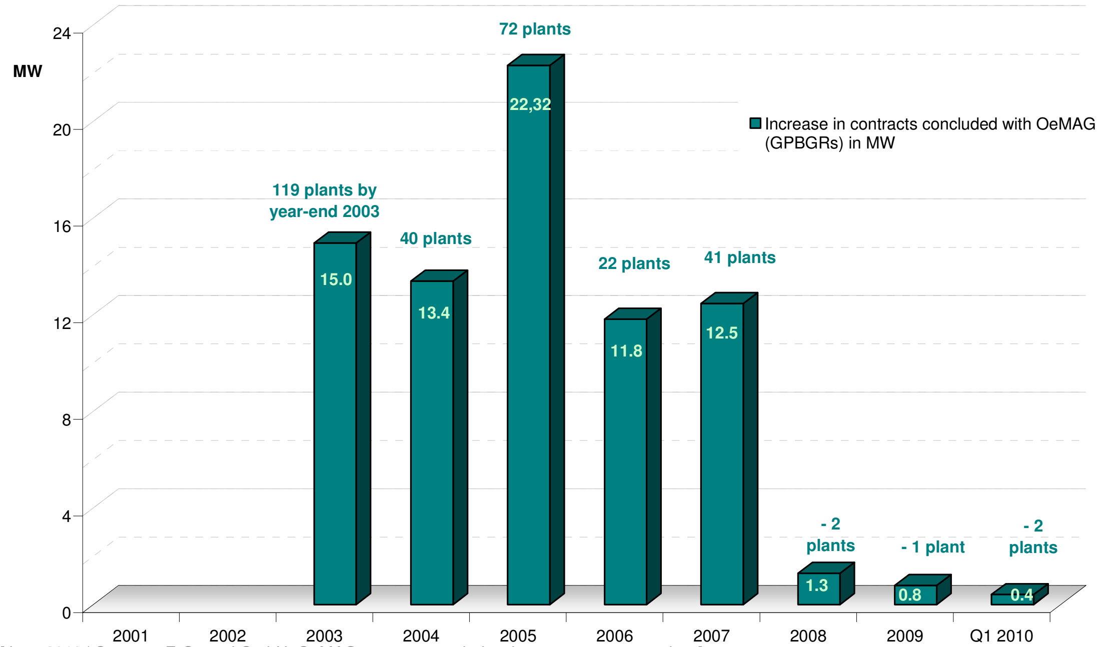



**Figure 57: New contracts concluded with biogas facilities (year of plant construction), in MW**

## Comments on analyses of biogas feedstock energy balances

By the submission date in 2010 E-Control received 228 feedstock energy balances from operators of biogas plants. This represented 79% of all plants under contract to the green power settlement agent as at year-end 2009 and compared with 198 submissions in 2009.
Some of the feedstock energy balances sent to E-Control in 2010 were incomplete or implausible, and the 200 complete and plausible responses were included in the analysis.
In all, these 200 plants used 1.5m t of feedstock, with an energy content of 4.5 PJ (1.2 TWh) in 2009. At an energy yield of 25 MWh per hectare (ha), it would take some 50,850 ha of land to grow the agricultural products required for this amount of feedstock. This is equivalent to the surface area of Lake Constance. At an energy yield of 40 MWh/ha the area needed would be 31,781 ha – roughly the size of Lake Garda. Some 1.2m t of raw materials with an energy content of 3.6 PJ were employed in 2008.

In 2009 a total of 287,753 t of slurry and manure, 885,228 t of other agricultural products, and 362,135 t of other materials such as food waste and biowaste were used as feedstock (see Figure 58).

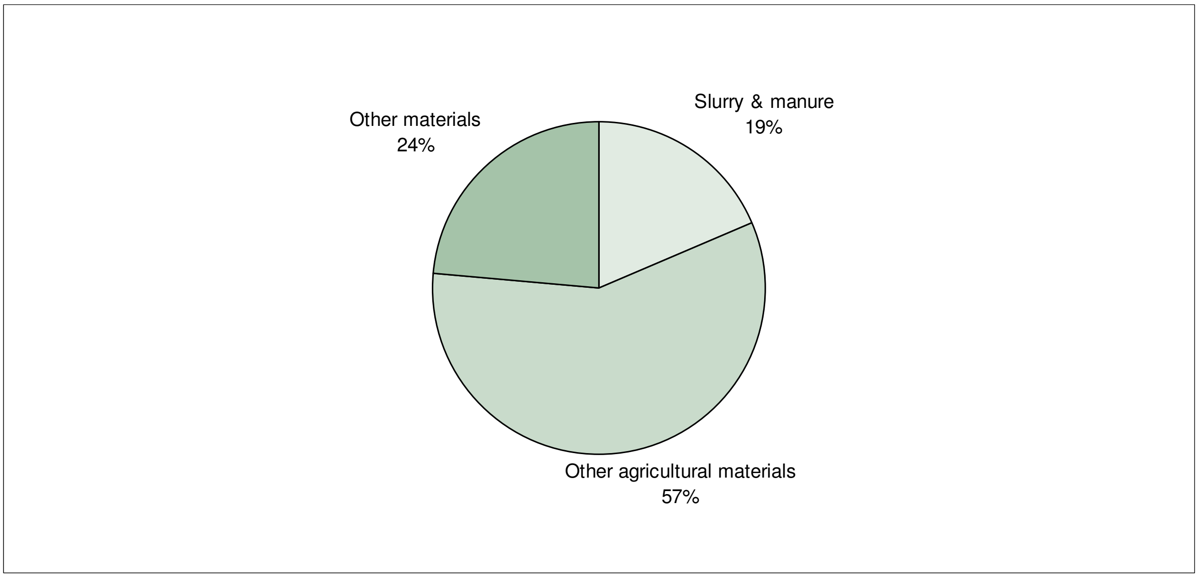



**Figure 58: Percentage breakdown of feedstock used in 2009 (sample of 200 plants)**

Maize silage made up the highest proportion of the other agricultural materials at 45%, followed by grass silage at 7% and whole crop rye silage at 4%.

Pig slurry accounted for the highest share of slurry and manure at 9%, while cattle slurry and cattle manure represented 5% and 3% of the total, respectively.

Biowaste and food waste were the largest constituent of the other materials, at 8%.

Figure 59 gives a detailed breakdown of the energy sources used as feedstock for biogas plants.

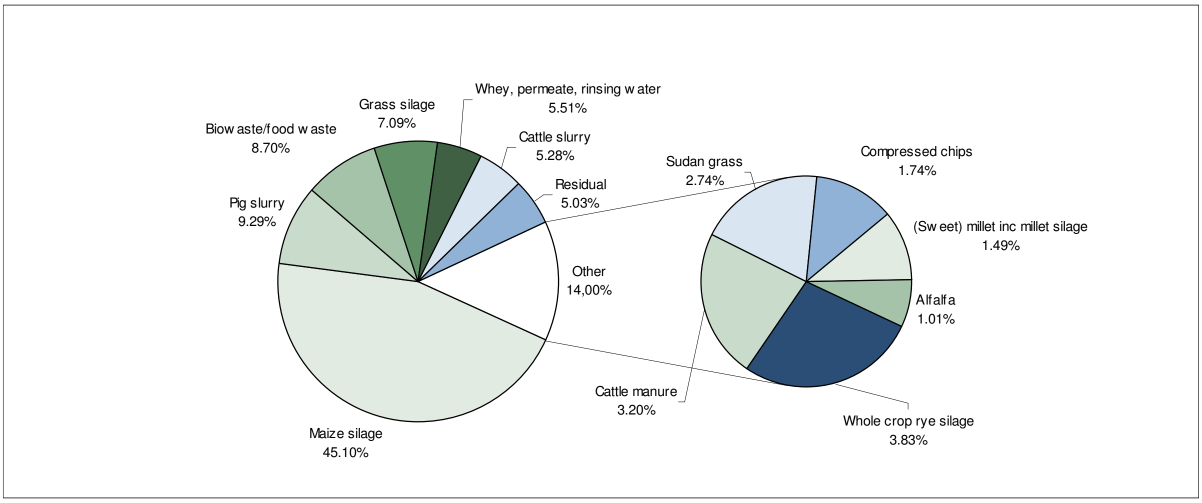



**Figure 59: Percentage breakdown of energy sources used as feedstock for biogas plants by mass (sample of 200 facilities)**

The breakdown in terms of energy content is as follows:

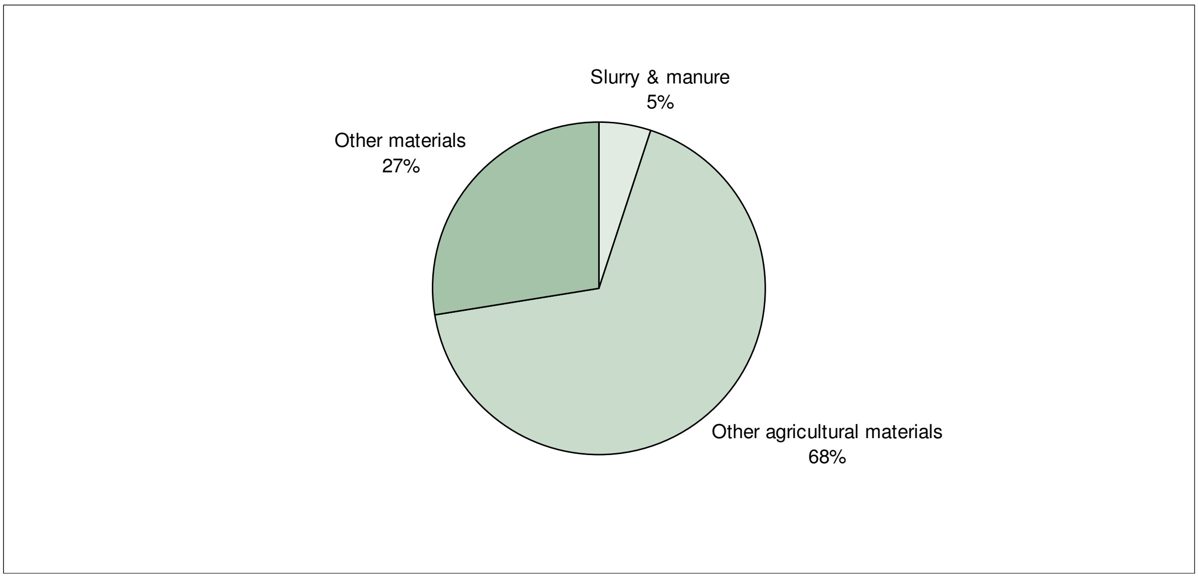



**Figure 60: Percentage breakdown of feedstock by energy content (sample of 200 facilities)**

Due to their low specific energy content, slurry and manure make a significantly lower contribution to electricity generation than their share in terms of mass would suggest. The 45% share of total feedstock mass constituted by maize silage translates into a 60% energy contribution. The chart below analyses the energy input to biogas plants by energy sources.

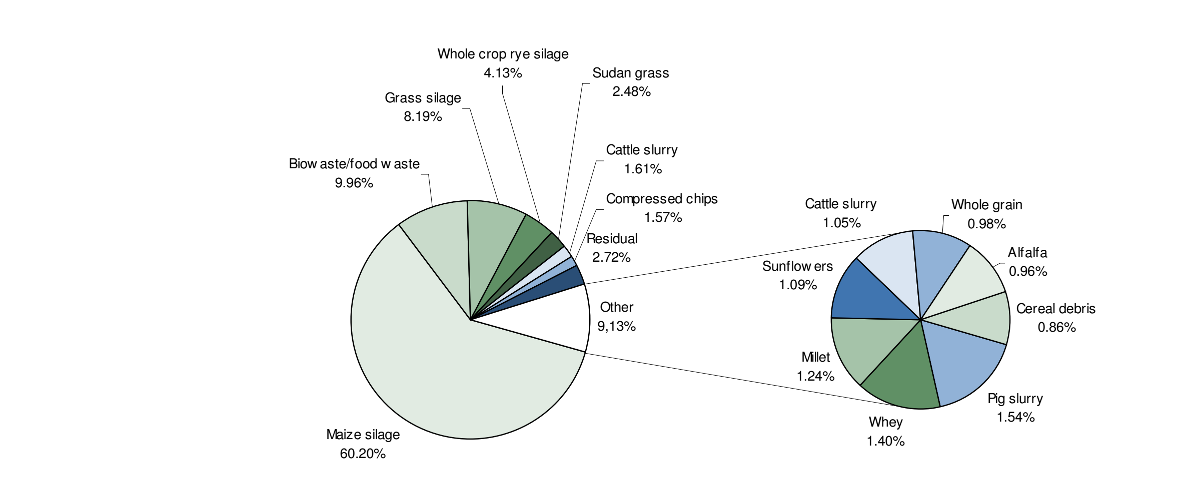



**Figure 61: Energy contributions of energy sources used by biogas plants (sample of 200 facilities)**

Figure 62 also breaks down the energy input by raw materials.

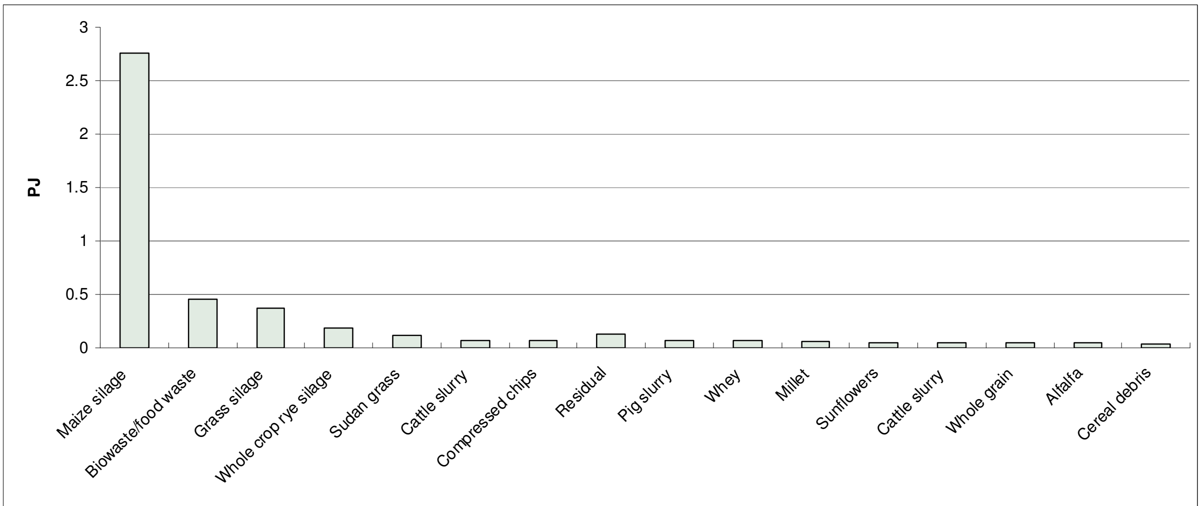



**Figure 62: Breakdown of feedstock by energy content (sample of 200 facilities)**

The plants’ average fuel efficiency is 60%. Figure 63 relates fuel efficiency to plant capacity. The figures in the bars give the number of plants of given sizes.

A total of 1.1 PJ of heat are used. This is equal to 24% of the energy content of the feedstock inputs. Some 51% of the useful heat is recovered for use in district heating.

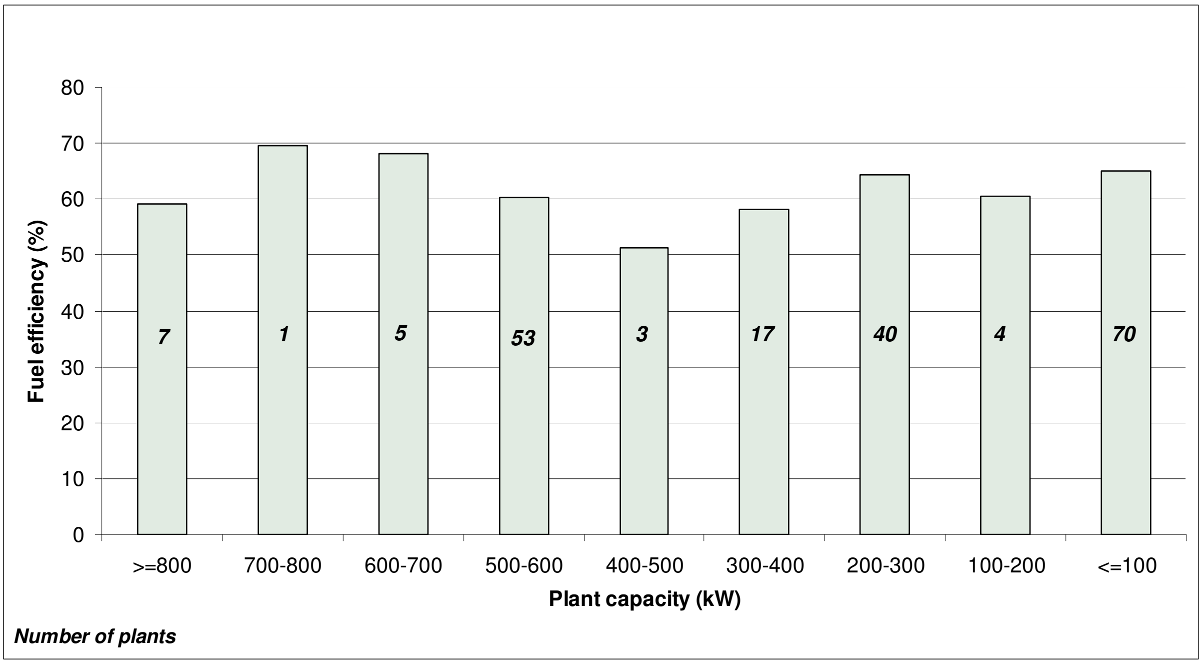



**Figure 63: Fuel efficiency and plant capacity**

Average own use of electricity is 9%. The average electrical efficiency of the biogas plants is about 36%: 18 have efficiencies of less than 30%, 71 efficiencies between 30 and 35% and 87 efficiencies of 35–40%. A further 24 plants achieve efficiencies of over 40% (see Figure 64).

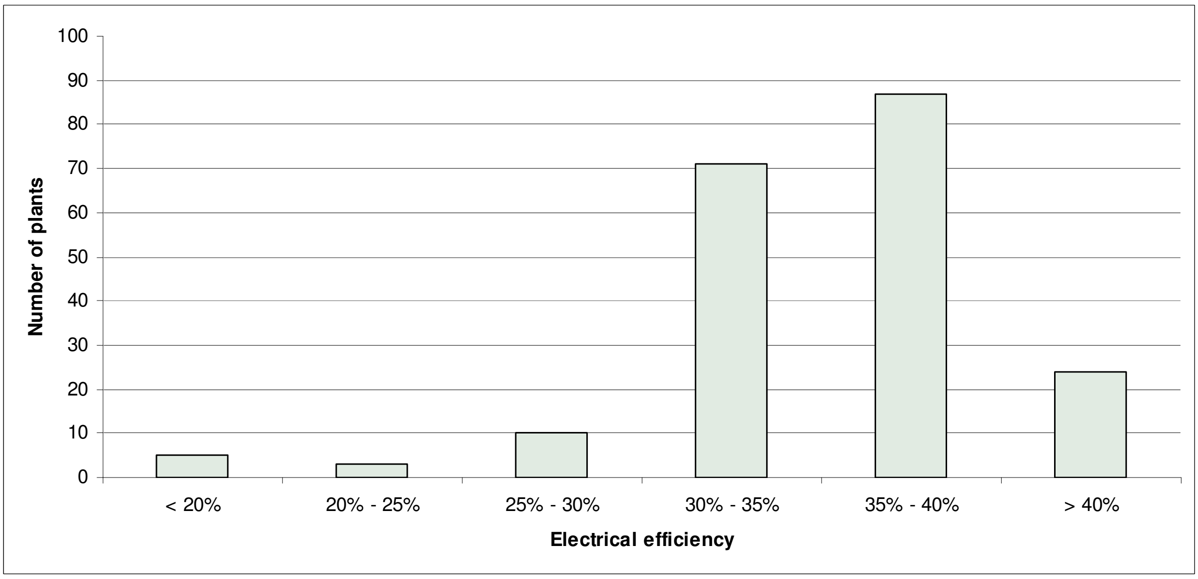



**Figure 64: Analysis of plants by electrical efficiency**

On average the plants operate at 7,444 full-load hours per year.

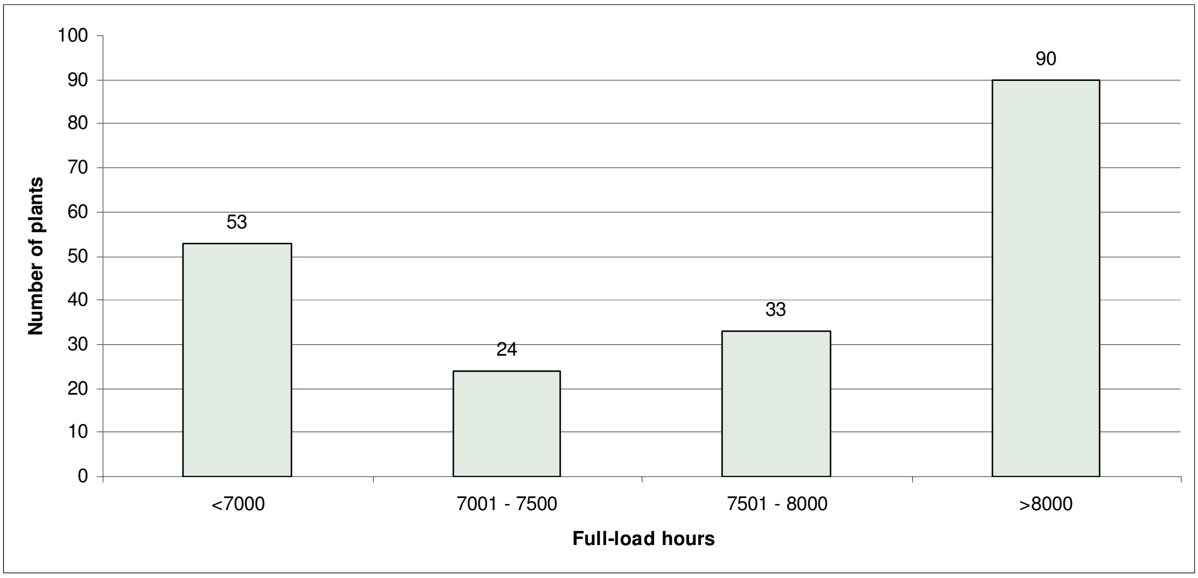
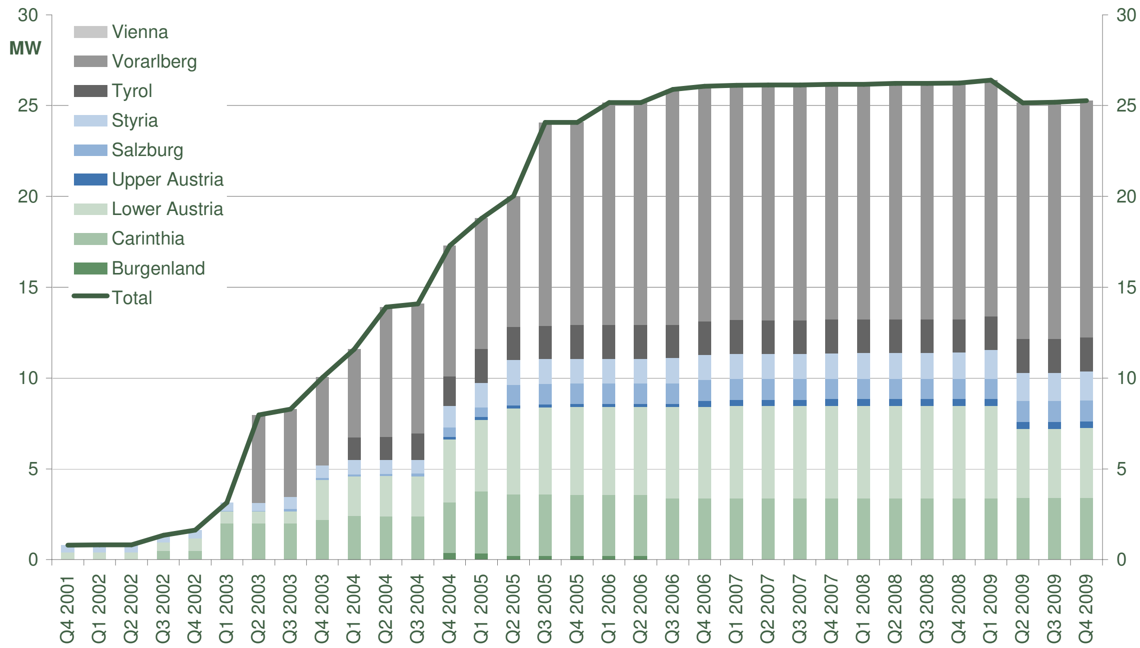



**Figure 65: Analysis of biogas plants by full-load hours**

Almost half of the facilities (90 plants) run at over 8,000 full-load hours/year. It is possible that the 53 facilities that operate at less than 7,000 full-load hours are not being optimally used. Some 20 of these plants have rated capacities of no more than 100 kW, and 40 of them operate at less than 6,500 full-load hours/year.

## 10.5 Liquid biomass

Liquid biomass is the least widely used form of biofuel. At the end of the fourth quarter of 2009, 92 liquid biomass generating stations with a combined capacity of 25.3 MW (see Figure 66 and Table 63) were accredited. Despite the accreditation of four new liquid biomass plants in 2009 (combined capacity of only 230 kW) total capacity declined by 1 MW year on year, as two accreditations (combined capacity of 1,245 kW) were revoked.




[Source: E-Control GmbH]

**Figure 66: Evolution of accredited liquid biomass capacity, Q4 2001 to Q4 2009**

| Accredited liquid biomass plants at year-end 2009 | | |
|---|---|---|
| Province | MW | Number |
| Vorarlberg | 13.04 | 10 |
| Lower Austria | 3.87 | 27 |
| Carinthia | 3.40 | 13 |
| Tyrol | 1.85 | 6 |
| Styria | 1.62 | 20 |
| Salzburg | 1.14 | 12 |
| Other provinces | 0.36 | 4 |
| **Total** | **25.26** | **92** |

[Source: E-Control GmbH]

**Table 63: Accredited liquid biomass plants at year-end 2009**

Average plant size is 275 kW. Some 85% of the facilities (combined capacity of 7 MW or 28% of total approved capacity) have capacities of less than 200 kW, while the seven plants with capacities of over 1 MW (8% of all plants) account for 60% of total capacity (15.2 MW).

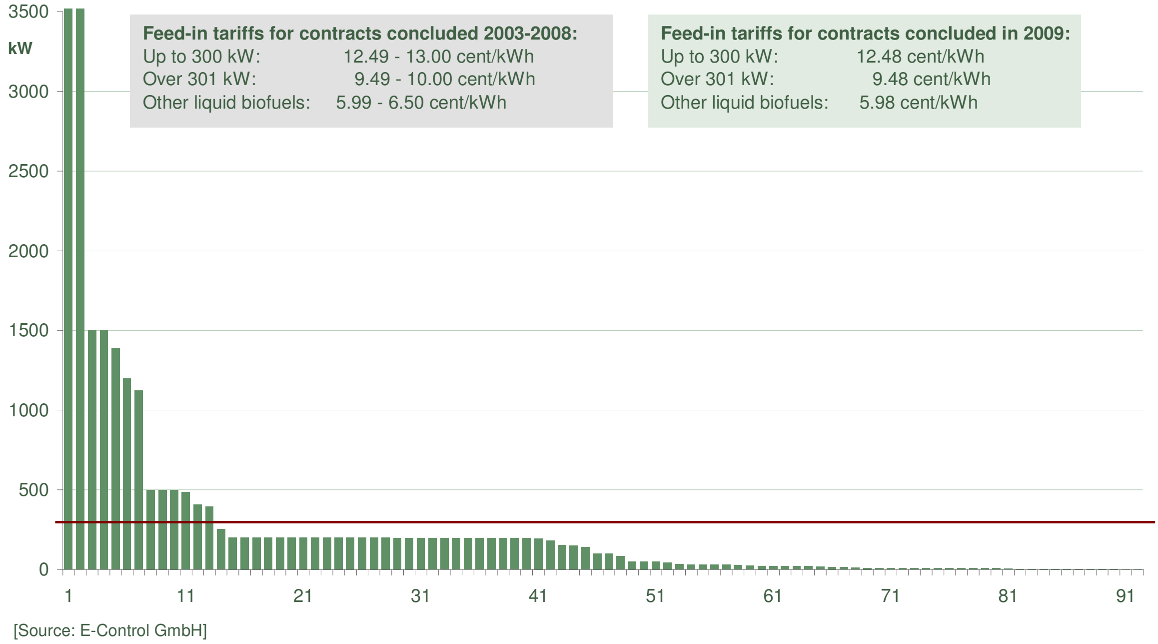
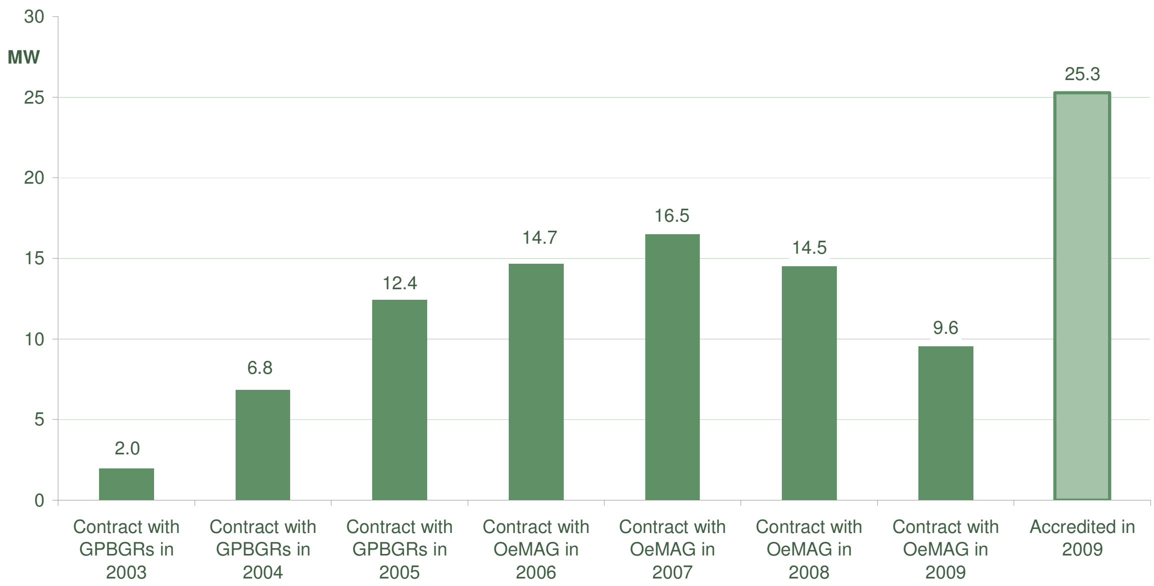



**Figure 67: Size of accredited liquid biomass plants (total: 92 plants; 25.3 MW) at year-end 2009**

Figure 68 below gives an overview of plants that are already in operation and of accredited capacity.




[July 2010 | Sources: E-Control GmbH, green power balancing group representatives, OeMAG]

**Figure 68: Evolution of liquid biogas capacity (supported and in operation vs. accredited), at year-end 2003–2009**

An analysis of information from the OeMAG contract database by provinces, as at year-end 2009, yields the following results:

| Liquid biomass stations and capacity | | | | | |
|---|---|---|---|---|---|
| Province | Under contract to OeMAG at year-end 2009 | | | Accredited plants at year-end 2009 | |
| | Number | Capacity in MW | Energy infeed 2009 in GWh | Number | Capacity in MW |
| Carinthia | 5 | 1.39 | 0.63 | 13 | 3.40 |
| Lower Austria | 20 | 1.69 | 0.80 | 27 | 3.87 |
| Salzburg | 2 | 0.21 | 0.01 | 12 | 1.14 |
| Styria | 9 | 0.35 | 0.10 | 20 | 1.62 |
| Tyrol | 2 | 1.25 | 6.89 | 6 | 1.85 |
| Vorarlberg | 5 | 4.47 | 30.11 | 10 | 13.04 |
| Other provinces | 3 | 0.20 | 0.40 | 4 | 0.36 |
| **Total** | **46** | **9.56** | **38.94** | **92** | **25.26** |

Values may differ from previously published data and other data sources.
[Sources: E-Control GmbH, OeMAG]

**Table 64: Comparison of liquid biomass plants under contract to OeMAG with accredited facilities, by provinces**

## 10.6 Landfill and sewage gas

Last year only one new facility, in Carinthia, was accredited, raising the number of plants to 65 and the total capacity to 29.2 MW (see Figure 69 and Table 65). The dip in the curve in 2007 is explained by the revocation of one accreditation.

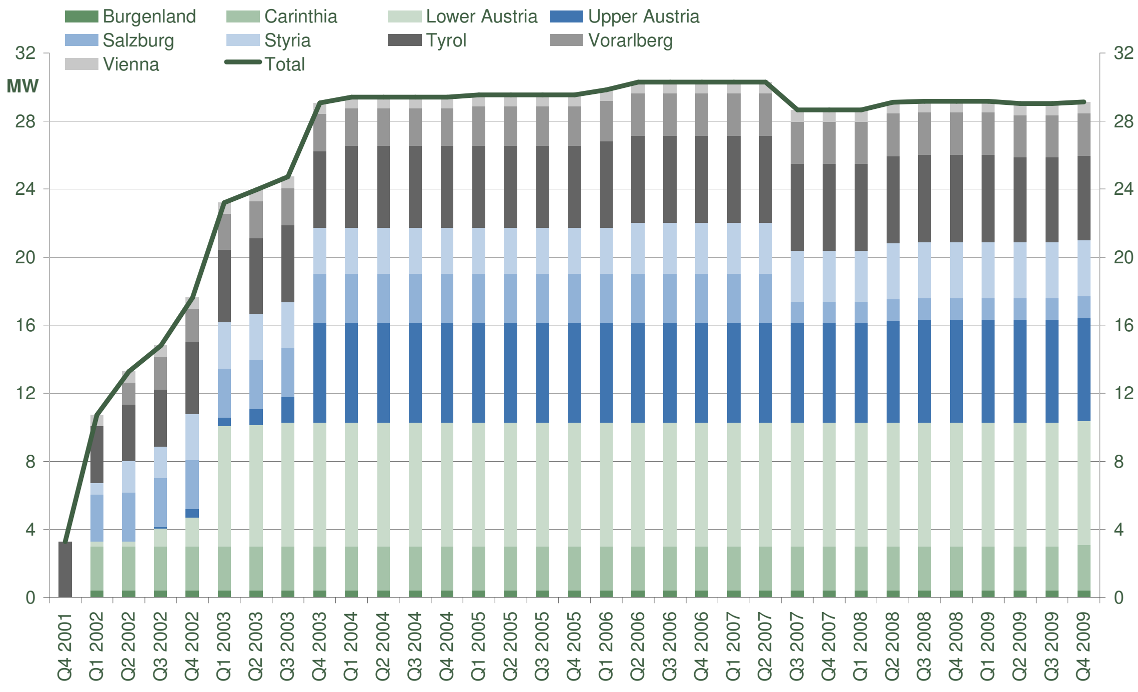


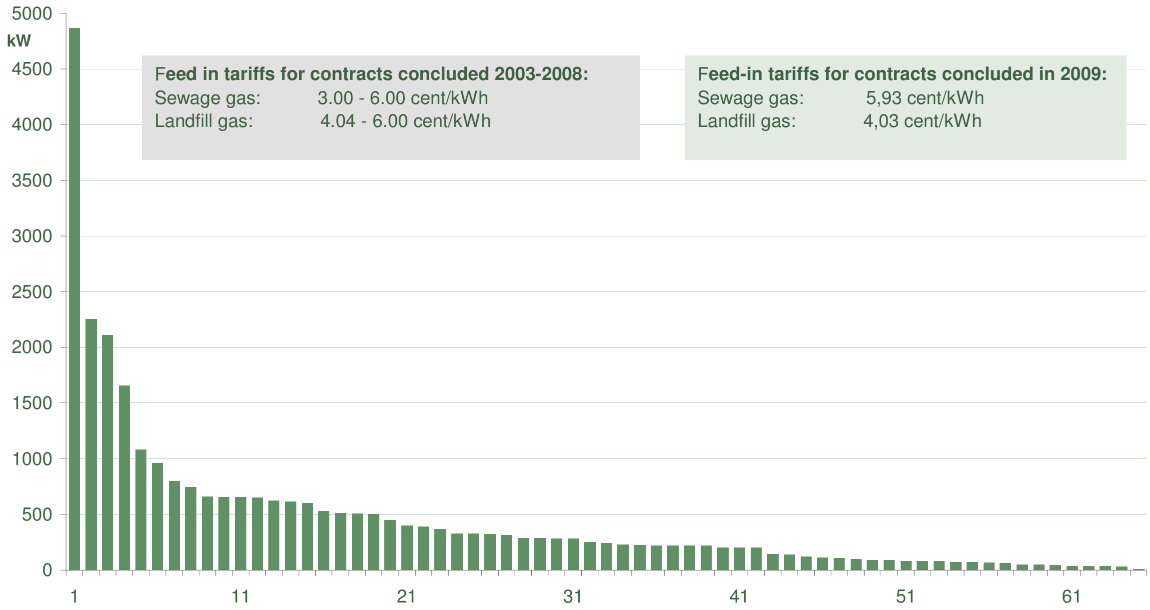

**Figure 69: Evolution of accredited landfill and sewage gas capacity, Q4 2001 to Q4 2009**

| Accredited landfill and sewage gas plants at year-end 2009 | | |
|---|---|---|
| **Province** | **MW** | **Number** |
| Lower Austria | 7.26 | 11 |
| Upper Austria | 6.06 | 9 |
| Tyrol | 4.97 | 13 |
| Styria | 3.32 | 10 |
| Carinthia | 2.70 | 6 |
| Vorarlberg | 2.50 | 9 |
| Other provinces | 2.32 | 7 |
| **Total** | **29.12** | **65** |

[Source: E-Control GmbH]

**Table 65: Accredited landfill and sewage gas plants at year-end 2009**

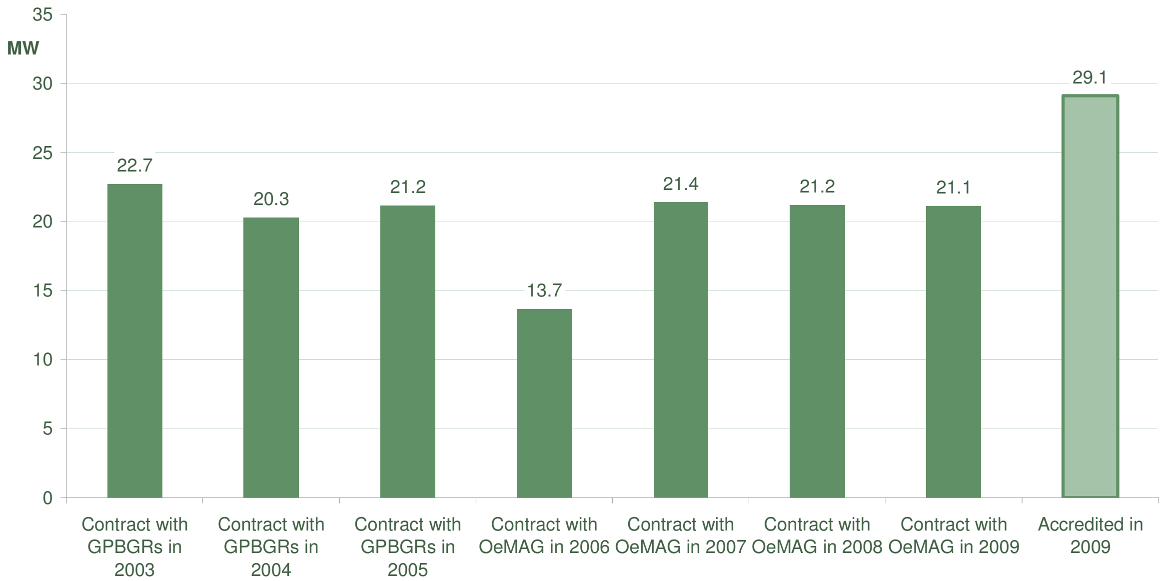
Average plant size is 448 kW. Plants with capacities of no more than 1 MW make up 92% of the total, accounting for 17.2 MW or 59% of the total approved capacity. The five largest plants deliver 41% of total capacity or 12 MW.




[Source: E-Control GmbH]

**Figure 70: Size of accredited landfill and sewage gas plants (total: 65 plants; 29.2 MW) at year-end 2009**

Figure 71 below summarises the capacities of plants in operation and accredited capacity. The decline in the number of supported stations in operation between 2003 and 2004 is probably a reflection of the expiry of support payments. Many of the stations concerned had already been in place for extended periods. There were also numerous withdrawals from contracts with OeMAG in 2006. Similarly to the situation with small hydropower, a considerable proportion of the landfill and sewage gas plant operators left the support scheme because it was possible to command higher prices on the open market. The slight decline in 2008 also reflects high market prices.




[July 2010 | Sources: E-Control GmbH, green power balancing group representatives, OeMAG]

**Figure 71: Evolution of landfill and sewage gas capacity (supported and in operation vs. accredited), at year-end 2003–2009**

An analysis of biogas capacity under contract to OeMAG by provinces at year-end 2009 yields the following results:

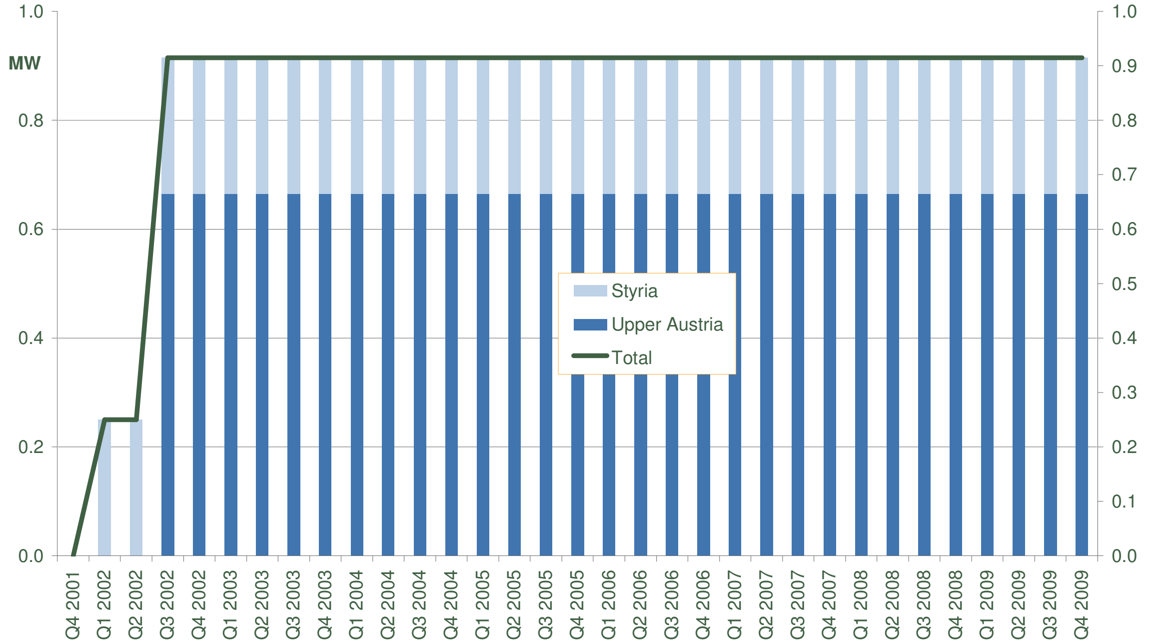
| Landfill and sewage gas stations and capacity | | | | | |
|---|---|---|---|---|---|
| Province | Under contract to OeMAG at year-end 2009 | | | Accredited plants at year-end 2009 | |
| | Number | Capacity in MW | Energy infeed 2009 in GWh | Number | Capacity in MW |
| Carinthia | 3 | 2.14 | 5.03 | 6 | 2.70 |
| Lower Austria | 7 | 1.58 | 4.32 | 11 | 7.26 |
| Upper Austria | 5 | 1.24 | 1.88 | 9 | 6.06 |
| Styria | 7 | 2.25 | 5.55 | 10 | 3.32 |
| Tyrol | 9 | 4.40 | 10.63 | 13 | 4.97 |
| Vorarlberg | 7 | 2.79 | 9.57 | 9 | 2.50 |
| Other provinces | 5 | 6.75 | 7.36 | 7 | 2.32 |
| **Total** | **43** | **21.15** | **44.34** | **65** | **29.12** |

Values may differ from previously published data and other data sources.
[Sources: E-Control GmbH, OeMAG]

**Table 66: Comparison of landfill and sewage gas plants under contract to OeMAG with accredited facilities, by provinces**

## 10.7 Geothermal energy

The picture with regard to geothermal energy has been unchanged since 2002. The two accredited stations, in Styria (Q1 2002) and Upper Austria (Q3 2002), are likely to represent the sole contribution of geothermal energy to attainment of the green power target for some time to come.[60]

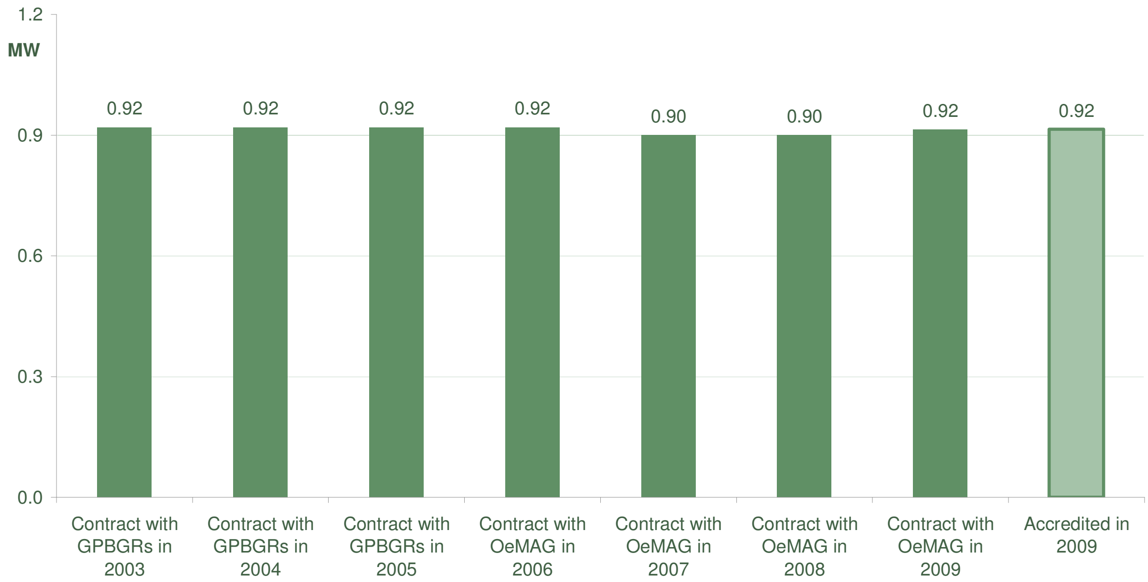



[Source: E-Control GmbH]

**Figure 72: Evolution of accredited geothermal capacity, Q4 2001 to Q4 2009**

In the interests of consistent presentation of data for all renewable technologies, operating and accredited geothermal stations are also compared, in Figure 73.

60 Please note: E-Control's data are not exclusively derived from the analysis of accreditation notices but also drawn from other sources such as the German Geothermal Association (http://www.geothermie.de/gte/gte32-33/geothermische_energienutzung_in_.htm, German only).




[July 2010 | Sources: E-Control GmbH, green power balancing group representatives, OeMAG]

**Figure 73: Evolution of geothermal capacity (supported and in operation vs. accredited), at year-end 2003-2009**

| Geothermal stations and capacity | | | | | |
|---|---|---|---|---|---|
| | Under contract to OeMAG at year-end 2009 | | | Accredited plants at year-end 2009 | |
| | Number | Capacity in MW | Energy infeed 2009 in GWh | Number | Capacity in MW |
| **Total** | **2** | **0.92** | **1.51** | **2** | **0.92** |

Values may differ from previously published data and other data sources.
[Sources: E-Control GmbH, OeMAG]

**Table 67: Comparison of geothermal generating plants under contract to OeMAG with accredited facilities**

## 10.8 Photovoltaics

The history of accreditation notices for PV systems has largely been determined by the following developments:

- Wave of accreditations in late 2002/early 2003, mainly in the Vorarlberg and Salzburg provinces;
- Slowdown from the second quarter of 2003 until the first quarter of 2004;
- Introduction of provincial subsidies (chiefly in Upper Austria), leading to a steady increase in the number of accreditations;
- Further spate of accreditations beginning in summer 2006, and adjustment of existing accreditation notices for lower capacities (less than 5 kW) in accordance with the Green Electricity (Amendment) Act 2006.
- A large number of PV systems were also accredited in 2008, 2009 and 2010. Apart from the support schemes created by the Green Electricity Act, a programme financed by the Climate Change and Energy Fund has been in place during this period.[61] Other incentives have been created by special contracting schemes[62] which are particularly widespread use in Upper Austria.

### 10.8.1 2010 KLI.EN support programme

As part of its 2010 PV promotion programme KLI.EN (the Climate Change and Energy Fund) is providing investment grants of up to € 1,300 per kW (€ 1,700 per kW for building integrated panels) or 30% of the investment costs for small PV systems with a maximum capacity of 5 kW. This programme has a budget of € 35m for 2010.

The fund has published the application figures shown in Table 68 (status as at 11 August 2010). At this point 4,271 applications for grants worth a total of € 25,307,732 had been approved during a first decision-making round by the fund's executive board.[63]

[61] Investment subsidies for PV systems with capacities of up to 5 kW
[62] Elektrizitätswerk Wels AG installs PV systems at private houses and acts as the operator for the duration of eligibility for increased feed-in tariffs under the Green Electricity Act (currently 12–13 years, depending on the contract date).
[63] OTS press release dated 11 August 2010

| Number of complete applications to KLI.EN for PV systems 2010 | |
|---|---|
| Burgenland | 284 |
| Carinthia | 335 |
| Lower Austria | 867 |
| Upper Austria | 1,649 |
| Salzburg | 400 |
| Styria | 2,090 |
| Tyrol | 591 |
| Vorarlberg | 260 |
| Vienna | 51 |
| **Total** | **6,527** |
| [Source: http://www.klimafonds.gv.at, as per 11/8/2010] | |

**Table 68: Applications to KLI.EN for investment grants for PV systems as at 11 August 2010**

There was no information on the capacity of the PV systems at the time. Assuming an average capacity of 3 kW per application, 10,000 applications (provided that all were properly made out and submitted on time, or further applications led to the same overall amount) would result in a total capacity of 30 MW. If all these systems produced at an average of 1,000 full-load hours they would generate 30 GWh of photovoltaic electricity per year.

Comparison with KLI.EN's support for PV in previous years shows rapid growth in the number of applications leading to grants. The budget for the fund's 2009 PV promotion was only half as large, at € 18m. The 2008 programme disbursed € 10.9m for a total of 820 PV systems with a combined capacity of 3.7 MW.

### 10.8.2 Offers by electricity suppliers to accept photovoltaic electricity

Some electricity suppliers offer to pay given prices for PV electricity infed to the public grid. Some of these rates are significantly higher than the market prices for electricity, but contracts are often subject to certain conditions.[64]

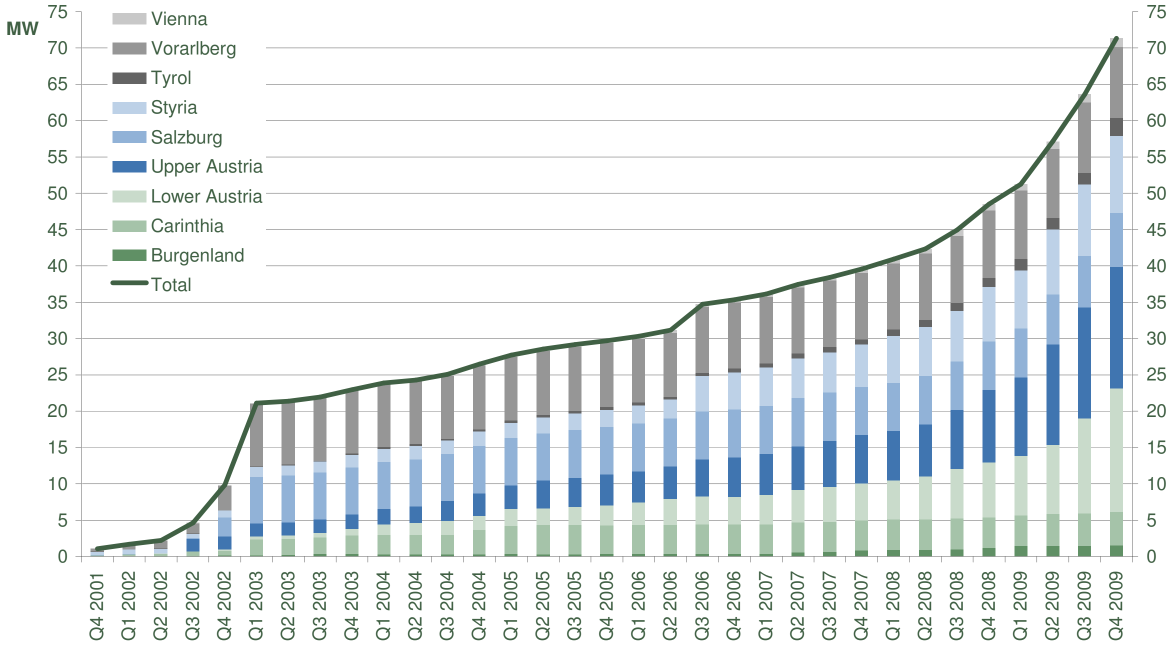
### 10.8.3 Provincial government support for photovoltaics

Apart from the funding extended under the Green Electricity Act and via the Climate Change and Energy Fund, some provincial governments also provide additional – or alternative – subsidies, mostly in the form of investment grants.

[64] Examples of these are capacity limits (only small systems accepted), and restriction to infeed of surplus power to the grid, so as to give priority to own use of autogenerated PV electricity.

## 10.8.4 Accreditation notices and contracts with the green power settlement agent

At year-end 2009 PV accreditations totalled 10,525 systems with a combined capacity of 71.3 MW – up 59% and 47%, respectively, on the 3,893 systems and 22.83 MW recorded a year earlier (Figure 74).




[Source: E-Control GmbH]

**Figure 74: Evolution of accredited PV capacity, Q4 2001 to Q4 2009**

| Accredited PV systems at year-end 2009 | | |
|---|---|---|
| **Province** | **MW** | **Number** |
| Lower Austria | 16.96 | 3,325 |
| Upper Austria | 16.74 | 3,042 |
| Styria | 10.68 | 1,523 |
| Vorarlberg | 9.79 | 1,096 |
| Salzburg | 7.40 | 430 |
| Carinthia | 4.64 | 358 |
| Tyrol | 2.39 | 301 |
| Burgenland | 1.54 | 290 |
| Vienna | 1.15 | 160 |
| **Total** | **71.31** | **10,525** |

[Source: E-Control GmbH]

**Table 69: Accredited PV systems at year-end 2009**

Figure 75 and Table 70 show the increase in accredited capacity between 2008 and 2009, broken down by provinces.

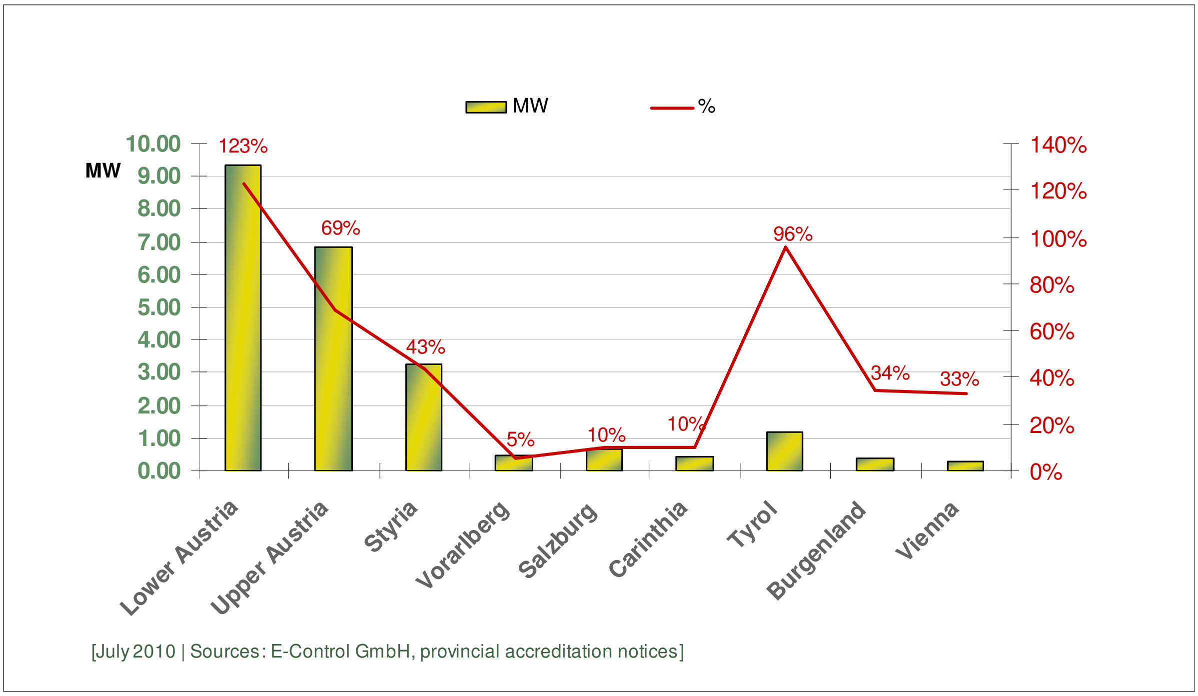



**Figure 75: Growth in accredited PV capacity (in MW and %) in 2009, by provinces**

| Growth in accredited PV capacity in 2009 | | | | |
|---|---|---|---|---|
| | MW | % | Number | % |
| Lower Austria | 9.34 | 123% | 1836 | 123% |
| Upper Austria | 6.83 | 69% | 1035 | 52% |
| Styria | 3.23 | 43% | 561 | 58% |
| Vorarlberg | 0.49 | 5% | 92 | 9% |
| Salzburg | 0.67 | 10% | 84 | 24% |
| Carinthia | 0.41 | 10% | 69 | 24% |
| Tyrol | 1.17 | 96% | 98 | 48% |
| Burgenland | 0.39 | 34% | 75 | 35% |
| Vienna | 0.29 | 33% | 43 | 37% |
| | **22.83** | **47%** | **3893** | **59%** |

[Source: E-Control GmbH]

**Table 70: Growth in accredited PV capacity in 2009**

Average PV system capacity is 6.8 kW, and only 2% of systems have capacities of over 20 kW. The 74% of the approved systems with capacities of no more than 5 kW account for 43% of overall PV capacity (30.6 MW). The 16 largest arrays contribute 11% of the total.

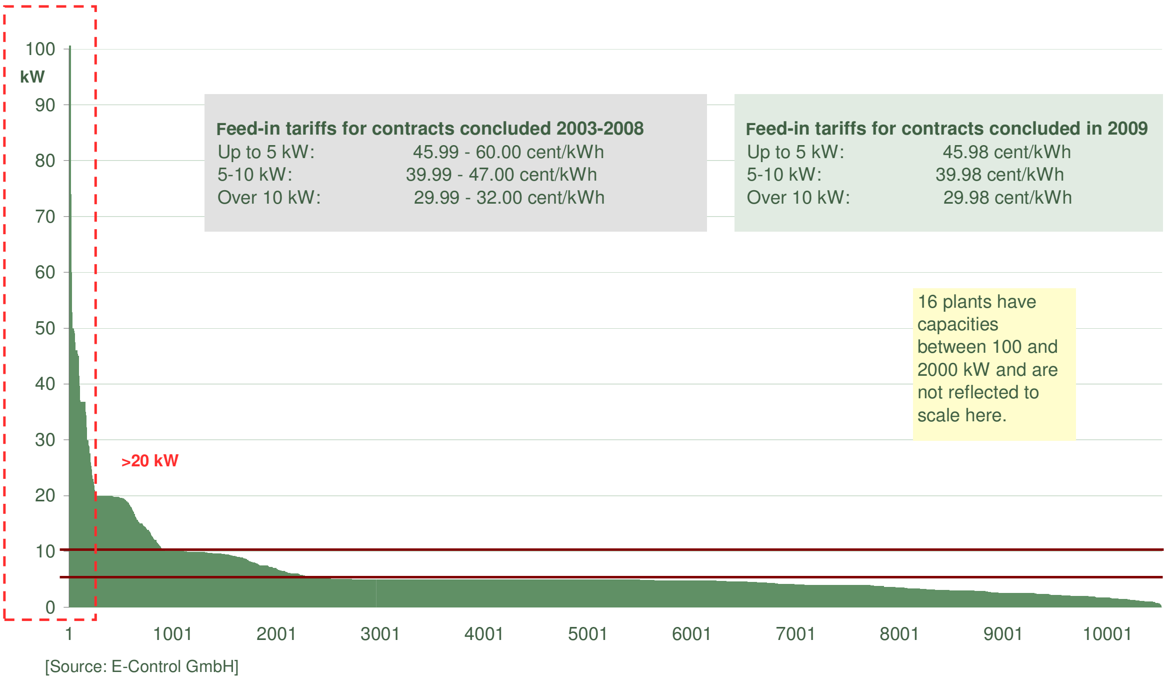



**Figure 76: Size of accredited PV systems (total: 10,525 systems; 71.3 MW) at year-end 2009**

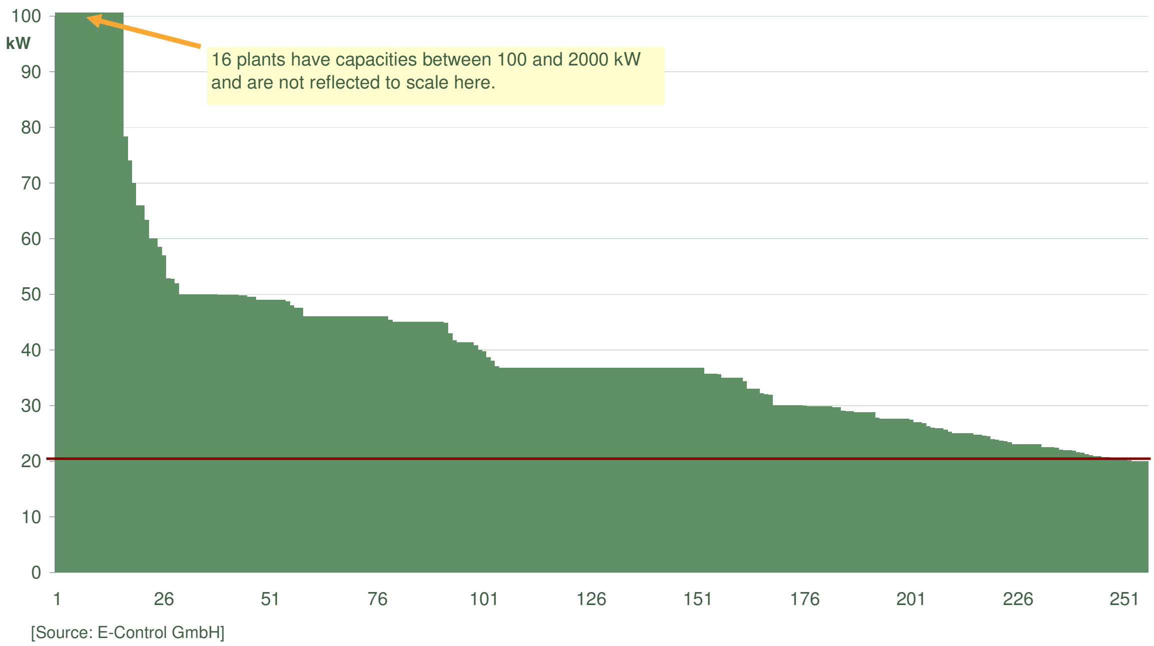



**Figure 77: Accredited PV arrays with capacities of over 20 kW**

The capacity of PV systems under contract to OeMAG rose by 5.1 MW (almost 20%) year on year, from 21.7 MW in 2008 to 26.8 MW in 2009 (Figure 78).

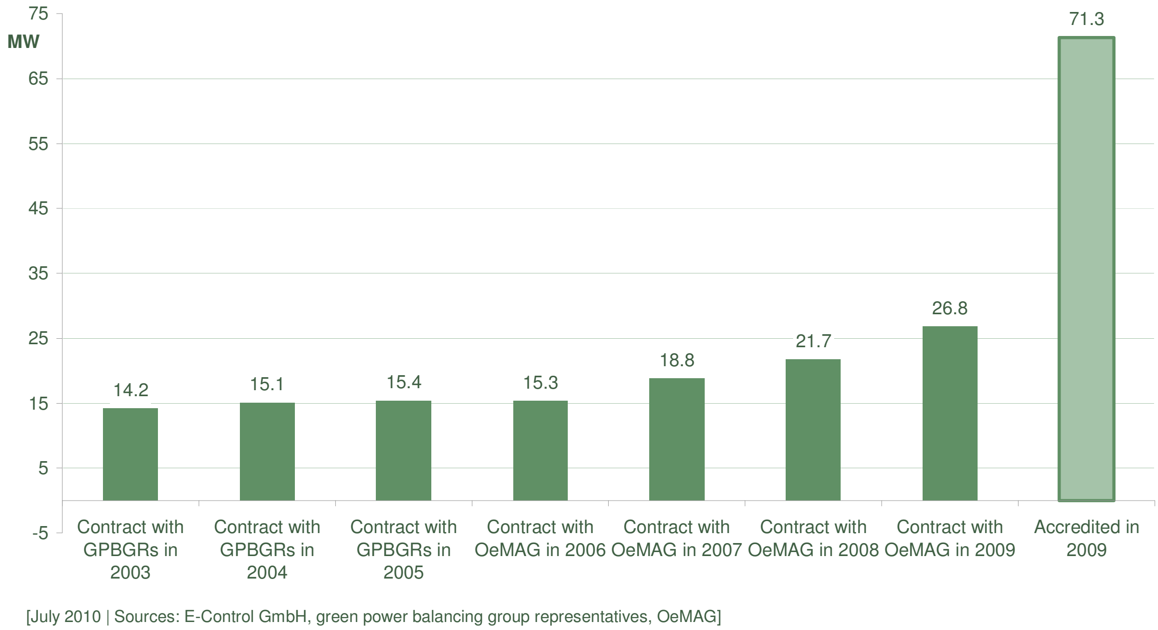



**Figure 78: Evolution of PV capacity (supported and in operation vs. accredited), 2003–2009**

Table 71 below shows the breakdown of PV systems by provinces at year-end 2009.

| PV arrays and capacity | | | | | |
|---|---|---|---|---|---|
| Province | Under contract to OeMAG at year-end 2009 | | | Accredited plants at year-end 2009 | |
| | Number | Capacity in MW | Energy infeed 2009 in GWh | Number | Capacity in MW |
| Burgenland | 195 | 0.94 | 0.80 | 290 | 1.54 |
| Carinthia | 269 | 3.11 | 2.97 | 358 | 4.64 |
| Lower Austria | 776 | 3.50 | 2.47 | 3,325 | 16.96 |
| Upper Austria | 1,121 | 5.86 | 3.46 | 3,042 | 16.74 |
| Salzburg | 192 | 1.49 | 1.41 | 430 | 7.40 |
| Styria | 422 | 2.05 | 1.68 | 1,523 | 10.68 |
| Tyrol | 172 | 0.92 | 0.70 | 301 | 2.39 |
| Vorarlberg | 943 | 8.58 | 7.63 | 1,096 | 9.79 |
| Vienna | 60 | 0.37 | 0.13 | 160 | 1.15 |
| **Total** | **4,150** | **26.81** | **21.26** | **10,525** | **71.31** |

Values may differ from previously published data and other data sources.
[Sources: E-Control GmbH, OeMAG]

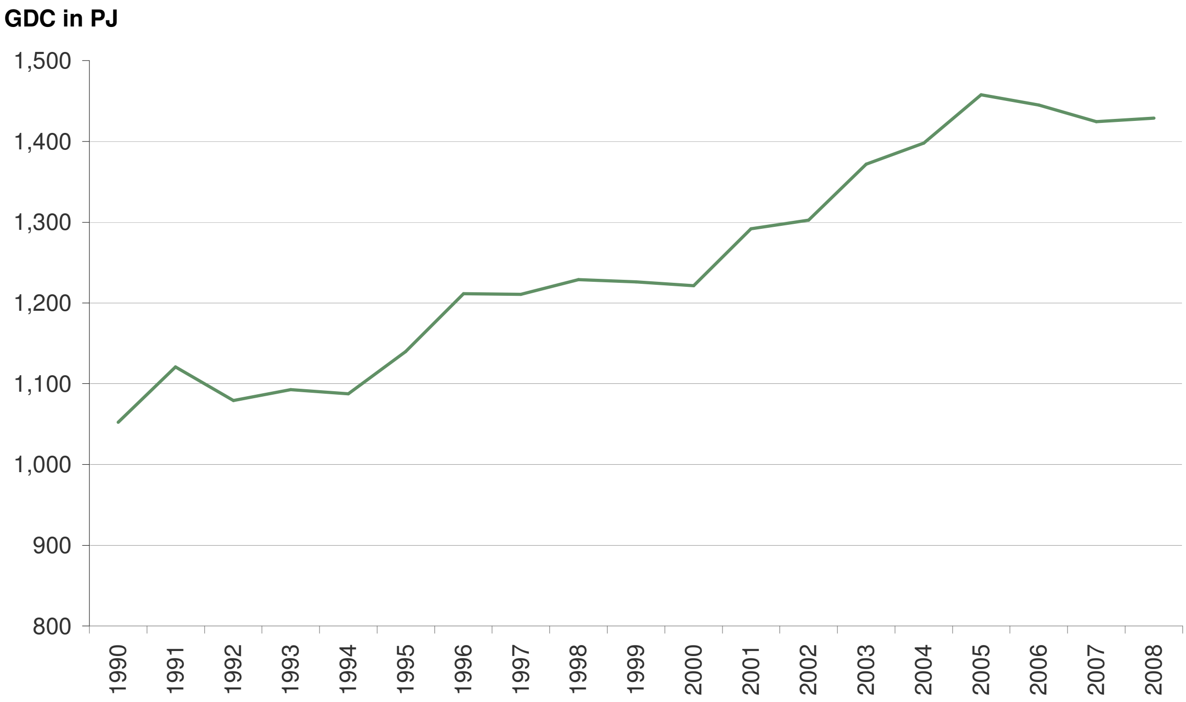
**Table 71: Comparison of photovoltaic systems under contract to OeMAG with accredited facilities, by provinces**

# 11 ANNEX II

# Energy consumption in Austria

## 11.1 Total energy consumption trends

Total energy consumption rose steadily until 2006 before stagnating in 2007 and 2008 – the last two years for which complete statistical data are available (see Figure 79). The brief dip in consumption in 2007 can be traced back to that year's mild winter. This was reflected in a drop in degree days, which were 9% below the long-term trend in 2007.[65] However, the trend reversed completely in 2008, when total heating days exceeded the long-term average by 3%, pushing up energy consumption slightly, by 0.3%. Demand is expected to have fallen sharply in 2009 due to the economic slowdown (further information on energy consumption can be found in the Annex in section 11.5). Gross domestic energy consumption was approximately 1,429 PJ in 2008 – up by 36% on 1990.



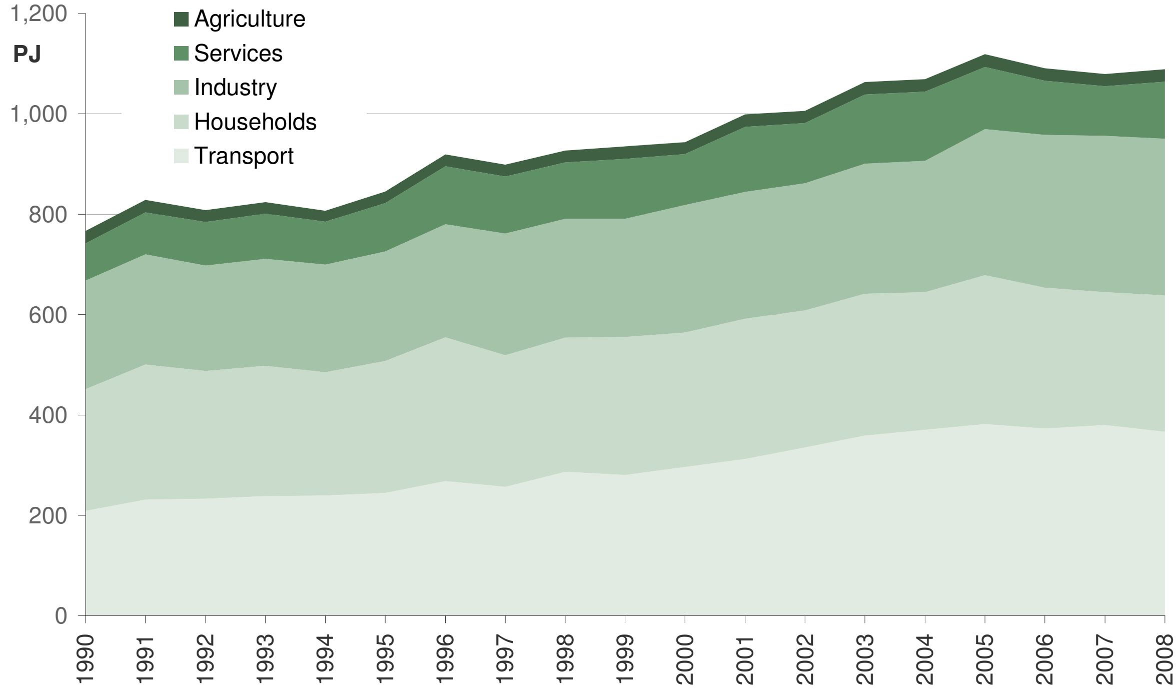

[Source: Statistics Austria]

**Figure 79: Gross domestic energy consumption (in PJ), 1990–2008**

The second key indicator of consumption is total final energy consumption, which is broken down by sectors. Trends in total final energy consumption have mirrored those in gross domestic consumption.

[65] Source: Statistics Austria

Demand has risen over the long term, but has remained flat in recent years. Between 1990 and 2008 demand rose sharply across the board (transport +75.5%; manufacturing industry +44%; services +52.7%; households +12.2%). In 2008 growth continued in those sectors where space heating accounts for a significant proportion of consumption, namely households and services, which used 2.6% and 14.8% more energy, respectively. Consumption by manufacturing industry remained virtually unchanged (+0.2%), while the amount of energy consumed by the transport sector decreased by 3.5% (see Figure 80).




[Source: Statistics Austria]

**Figure 80: Final energy consumption by sectors (in PJ), 1990–2008**

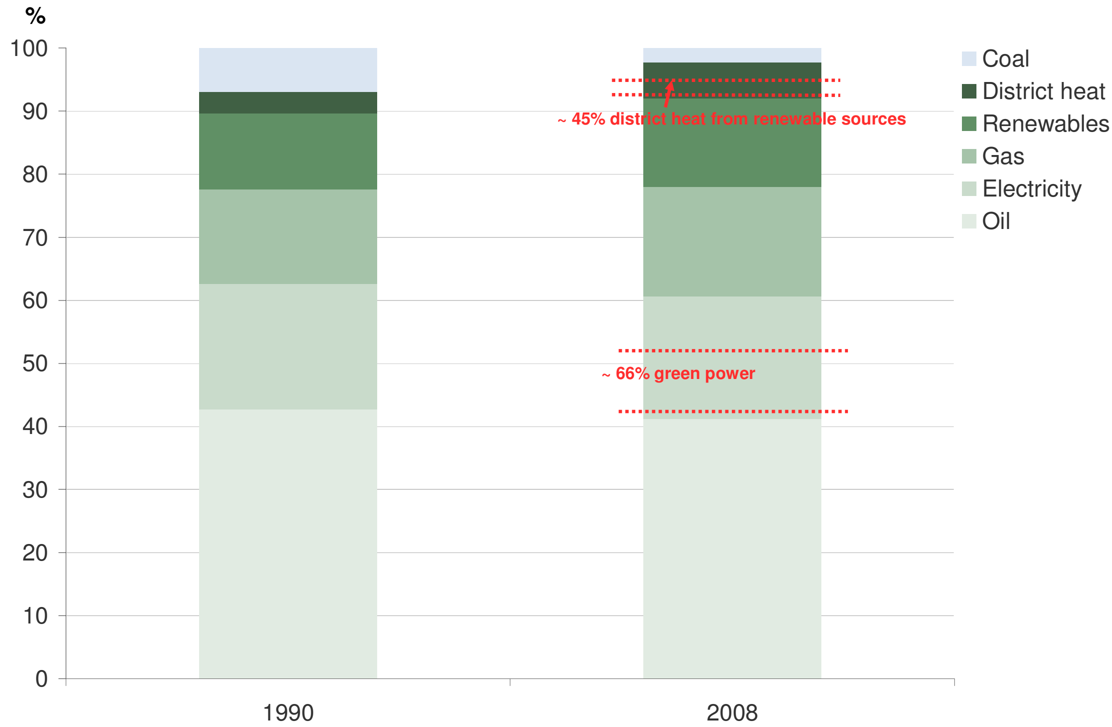
Figure 81 shows the mix of energy sources which make up total final energy consumption. Major changes in the 1990–2008 period were the fall in the contribution of coal from 7% to 2%, and the increase in the share of renewables from 12% to 14%.[66] The proportion of district heating has also drifted up (from 3% to 6%), while the shares of gas, electricity and oil in the energy mix have remained fairly constant.[67] However, it should be noted that fossil fuels (oil, gas and coal) still account for the lion's share of total final energy consumption. Throughout the 1990–2008 period, their total contribution dropped only slightly[68] and ranged between 61 and 65% (Figure 81).[69]

[66] In addition, 65% of the electricity consumed (calculated as the contribution of renewable domestic generation to total consumption incl. own use and losses) is derived from renewable sources (this corresponds to about 15% of final energy consumption). A significant proportion of the country's district heating supplies are also derived from renewables (about 45%) and thus likewise increase the contribution of renewables to final energy consumption (see section 11.5).

[67] This only relates to the shares of the mix – in absolute terms final consumption has risen (with the exception of coal).

[68] There has been a notable shift from coal to gas-fired power generation.

[69] In 2007 fossil fuels' contribution was 61% – the lowest level throughout the period in question. However this, too, was a reflection of the below-average heating season.

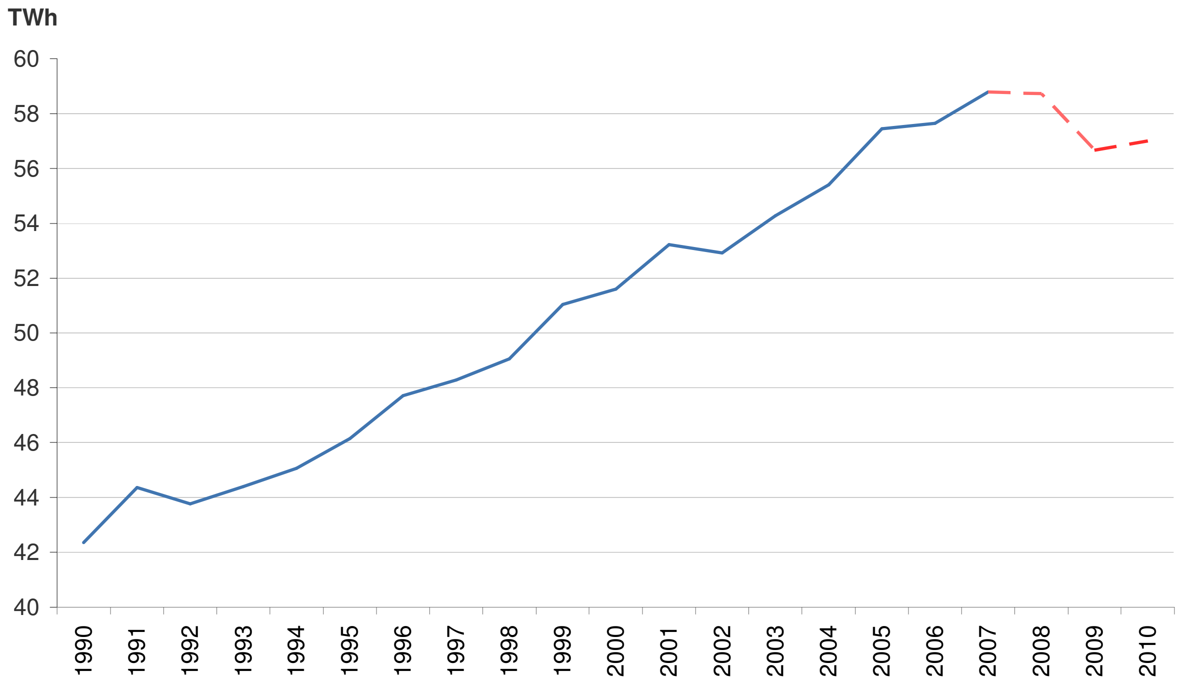



[Sources: Statistics Austria, E-Control GmbH calculations]

**Figure 81: Energy sources as a proportion of total final energy consumption in 1990 and 2008**

## 11.2 Electricity consumption trends

According to Statistics Austria, electricity consumption amounted to around 58.7 TWh, or some 19% of Austria's total final energy consumption in 2008. This represented a 38.7% increase on demand in 1990. Using E-Control data it is possible to forecast electricity consumption in 2009 and 2010.[70] Preliminary statistics point to a 3.5% slide in electricity use in 2009, which is clearly attributable to the economic crisis. However, electricity consumption seems set to rise again this year. It was up by 1.6% year on year over the first four months of 2010 (based on the average monthly change compared with the preceding year) (Figure 82).



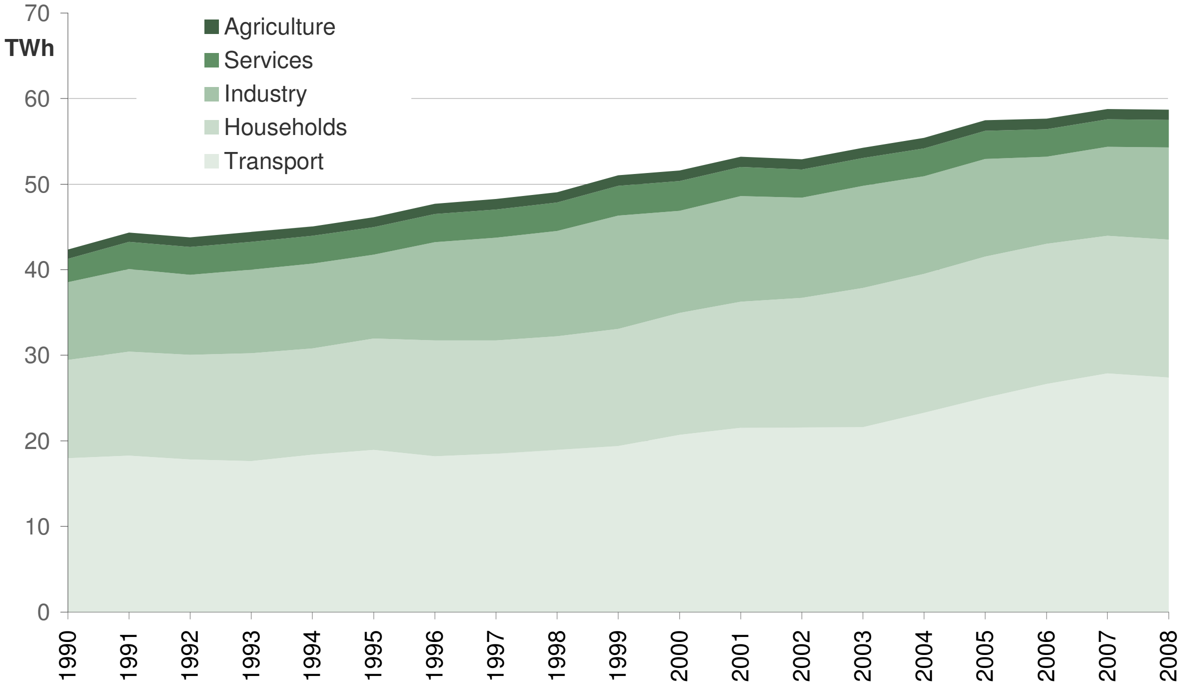

[Sources: Statistics Austria, E-Control calculations]

**Figure 82: Electricity consumption (final energy consumption) in TWh, 1990–2010 (2009 and 2010 estimated)**

In sectoral terms, industry is by far the largest consumer of electricity, accounting for 46.7% of the total, followed by households at 27.4% and services at about 19%. The transport[71] (5.5%) and agricultural (2.1%) sectors consume the smallest amounts of electricity (Figure 83).

[70] There is electricity consumption data for 2009, but this is not broken down according to the Statistics Austria treatment. Because of this assumptions were made for parameters such as transmission losses and own use. The trend for the initial months of 2010 has been extrapolated.

[71] Electricity consumption in the transport sector relates to both road and rail transport.




[Source: Statistics Austria]

**Figure 83: Austrian electricity consumption in TWh by sectors, 1990–2008**

The energy flow chart in Figure 88 gives an overview of electricity consumption (and the structure of generating capacity) in Austria in 2008. In general, it should be noted that the key parameters (structure of generating capacity, imports, system losses and consumption) remained virtually unchanged compared with 2007.

As mentioned above, figures for 2009 can be projected on the basis of E-Control data.[72] These estimates relate (in the terminology of the energy balance) to final energy consumption, system losses and energy sector own use. There is a year-on-year decline in consumption of about 2 TWh or 3.5% in 2009.

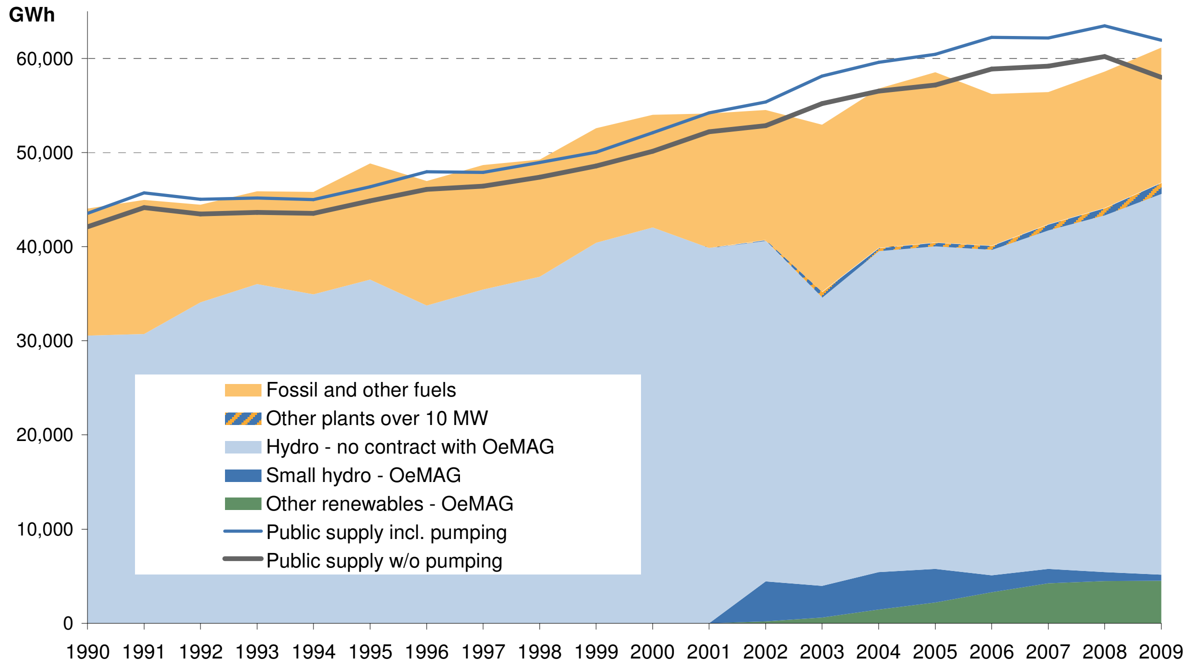
Turning to natural gas trends, recent data shows that consumption is tending to move in step with electricity use. Weather conditions led to a fall in gas consumption in 2007, but 2008 saw a marked rebound (year-on-year increase of 5.6%). The recession also left its mark on gas consumption in 2009, and overall domestic demand slipped by 2.4% compared with the previous year. Consumption bounced back strongly in the first four months of 2010, rising by an average of 14.5% from January to April, not only because of the economic recovery but also as a result of a long and cold winter.

[72] In contrast to the figures from Statistics Austria, E-Control's data cannot be broken down by sector or directly related to total final energy consumption.

## 11.3 Renewable electricity generation, 1990–2009

Austria has recorded increases in electricity consumption[73] and generation. In 1990, 43.5 TWh of electricity (including pumped storage) was withdrawn from the public grid, compared with output of 44.1 TWh; renewables accounted for 70% of consumption.

By 2009 consumption had climbed by 42% to reach 61.9 TWh, with 73.7% coming from renewable energy sources.[74] In the same period renewable power generation surged by 49.5%, as shown in Figure 84.




[Source: E-Control GmbH]

**Figure 84: Electricity generation and consumption from the public grid, 1990–2009 (2009 preliminary)**

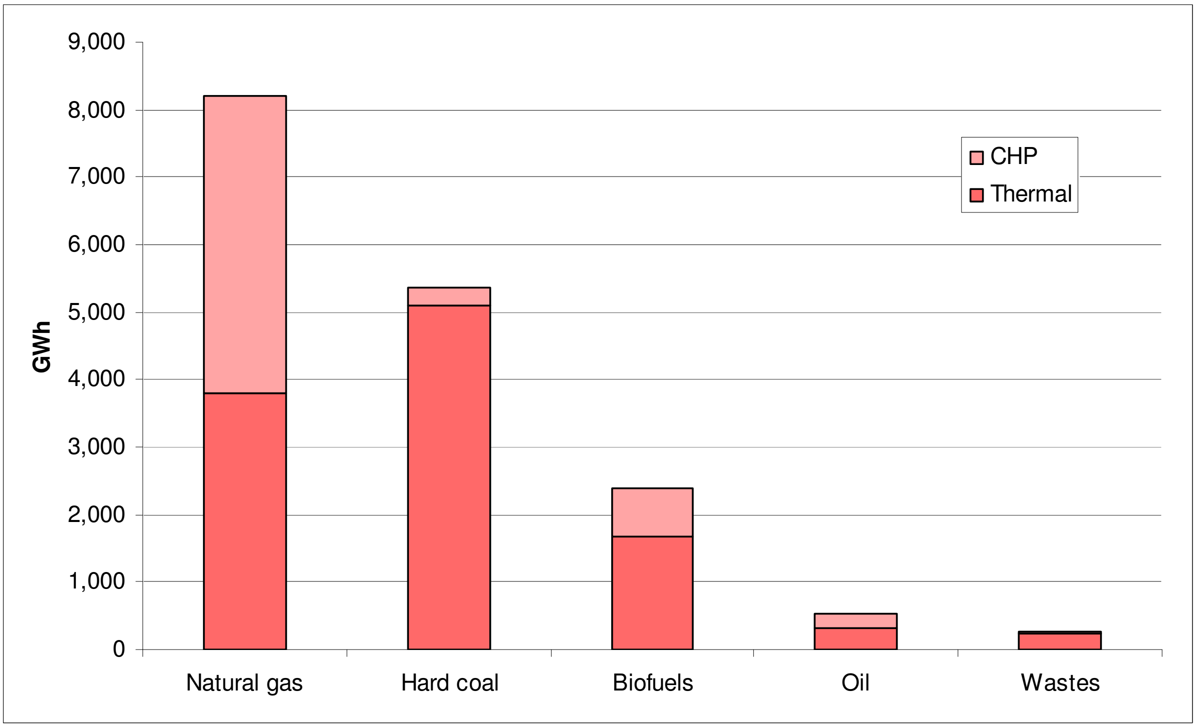
[73] The electricity consumption data are based on statistics compiled by E-Control. Electricity consumption is calculated as follows: gross electricity output + physical imports – physical exports. Pumped storage is included.
[74] The figures for 2009 may change following the second clearing process and the subsequent final settlement. Some figures may differ from previously published values as a result of *ex post* adjustments.

## 11.4 Overview of thermal generating capacity in Austria

Every year up to 30% of the electricity supplied from Austria's public grid is generated at thermal power stations and CHP plants. These use the following types of input energy source:

- Natural gas;
- Hard coal;
- Oil;
- Combustible waste;
- Biogenic fuels.

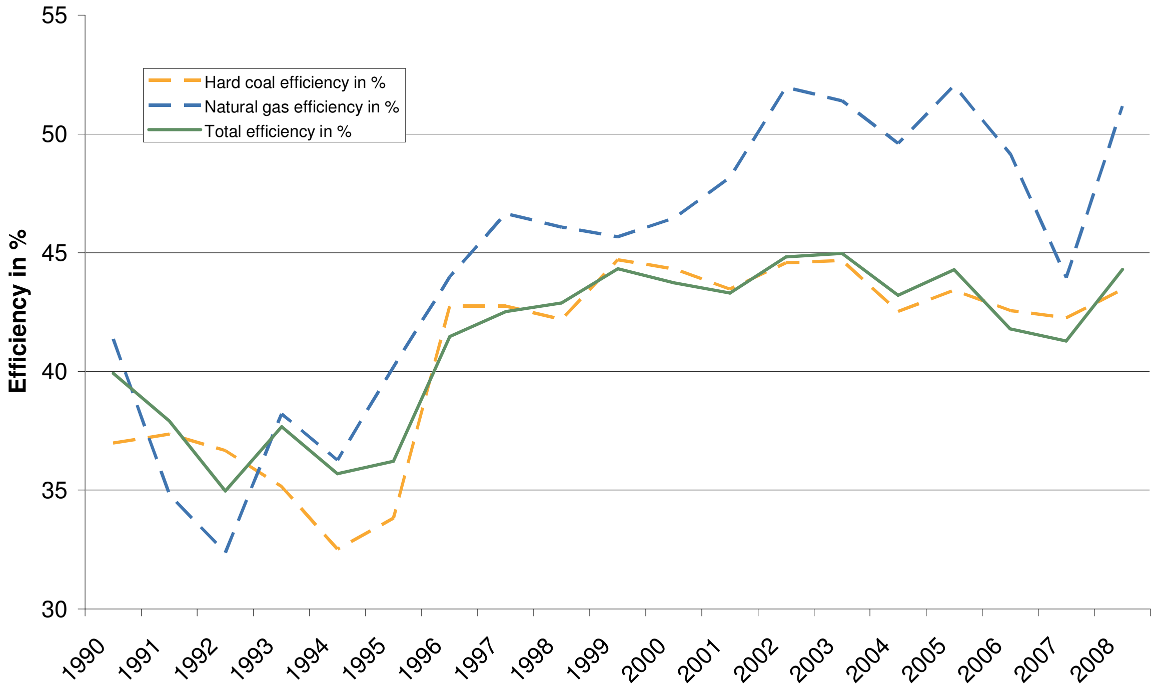
The quantities of electricity generated from each of these sources are shown in Figure 85 below. This breaks output down into conventional power stations and CHP plants. In 2008 some 8,200 GWh of electricity was produced from natural gas and around 5,400 GWh from hard coal; the remaining energy sources all accounted for smaller shares of output.




Source: Statistics Austria

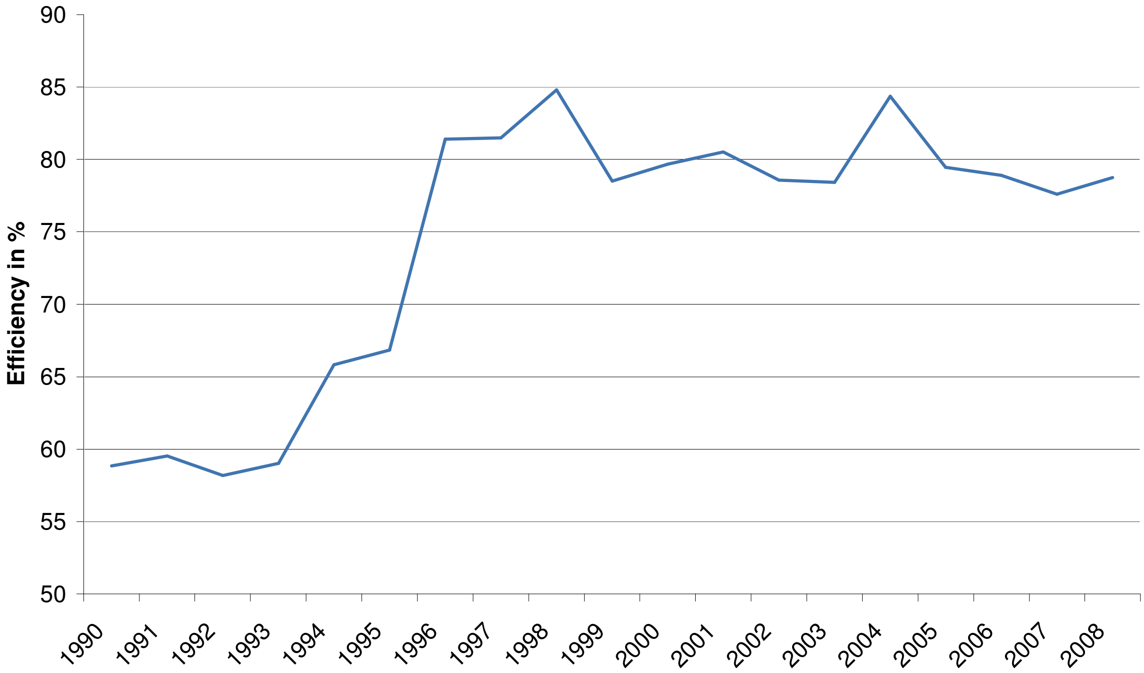
**Figure 85: Electricity output derived from the various primary energy sources (in GWh of electricity), 2008**

Figure 85 also clearly demonstrates that thermal power stations account for much more output (around 11.1 TWh) than CHP plants (5.6 TWh). It should be noted that there are limits to the use of CHP technologies. In addition to adequate infrastructure they also require sufficient demand for the waste heat they recover, either for household space heating or process heat for industry. In the interests of resource conservation and energy efficiency, however, initiatives to develop CHP capacity should be supported in order to capitalise fully on their technical and economic potential. The benefits of such a policy are underlined by the following two charts, which compare the efficiency of power stations (Figure 86) and CHP plants (Figure 87). The efficiency is given by the ratio of the primary energy inputs to the output of electricity (and in the case of CHP plants, heat). Figure 86 shows the total efficiency of all thermal generating stations and a breakdown by the most widely used primary energy sources, hard coal and natural gas. Over the past decade power station efficiency has ranged from 41–45%, compared with 78–85% for CHP plants. This highlights the superior efficiency of CHP generation, and the logic behind supporting and expanding CHP generating capacity. Table 72 summarises the total quantities of electricity and heat generated at Austrian thermal power plants in 2008, and the efficiency of the technologies.



[Sources: Statistics Austria, E-Control calculations]

**Figure 86: Efficiency of Austrian thermal generating stations, 1990–2008**




[Sources: Statistics Austria, E-Control calculations]

**Figure 87: Efficiency of Austrian CHP plants, 1990–2008**

| | Thermal generating stations | CHP plants |
|---|---|---|
| Electricity | 11,135 GWh | 5,600 GWh |
| Heat | - | 10,748 GWh |
| **Efficiency (%)** | **44.3** | **78.8** |

[Sources: Statistics Austria, E-Control calculations]

**Table 72: Total output (GWh) and efficiency of Austrian thermal generating stations and CHP plants, 2008**

## 11.5 Summary of Austrian electricity flows

The information on electricity consumption and generation provided in the preceding chapters is summarised in the energy flow chart below. It depicts the entire supply chain from the primary energy sources and their conversion into electricity through to consumption by the various sectors of the economy.

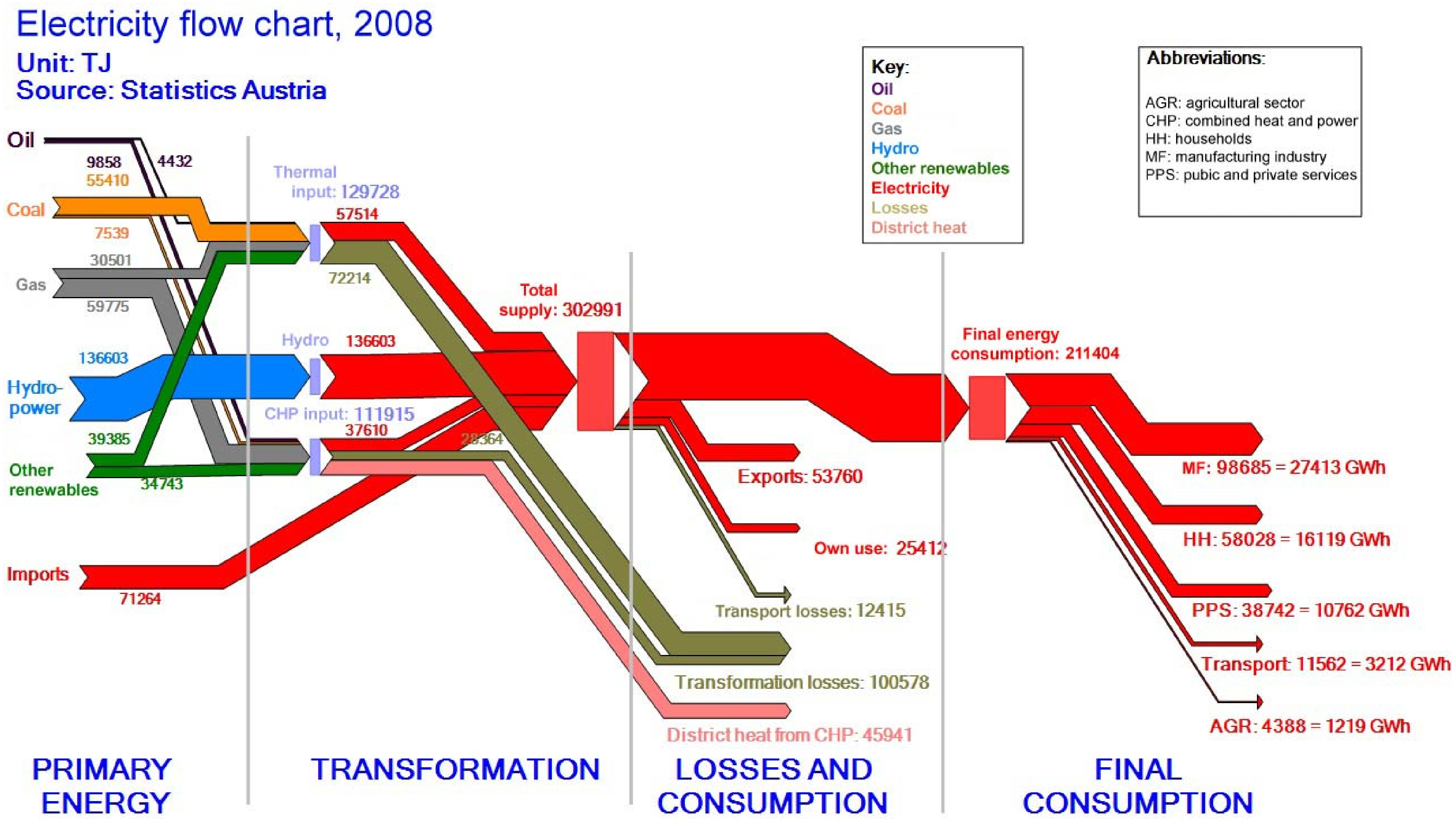



**Figure 88: Electricity flow chart, 2008**

## 11.6 Renewable electricity generation in the EU member states

| Country | Total generation | % | Gross electricity generation from renewable energy sources in the EU-27 in 2007, in GWh and % | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | % | Hydro | % | Wind | % | Biomass | % | PV | % | Geothermal | % |
| BE | 88,800 | 100% | 3,993 | 4.5% | 389 | 0.4% | 491 | 0.6% | 3,107 | 3.5% | 6 | 0.01% | | |
| BG | 43,300 | 100% | 2,921 | 6.7% | 2,874 | 6.6% | 47 | 0.1% | | | | | | |
| CZ | 88,200 | 100% | 3,419 | 3.9% | 2,089 | 2.4% | 125 | 0.1% | 1,203 | 1.4% | 2 | 0.00% | | |
| DK | 39,200 | 100% | 11,063 | 28.2% | 28 | 0.1% | 7,173 | 18.3% | 3,860 | 9.8% | 2 | 0.01% | | |
| DE | 637,100 | 100% | 93,770 | 14.7% | 20,904 | 3.3% | 39,713 | 6.2% | 30,078 | 4.7% | 3,075 | 0.48% | | |
| EE | 12,200 | 100% | 148 | 1.2% | 21 | 0.2% | 91 | 0.7% | 36 | 0.3% | | | | |
| IE | 28,200 | 100% | 2,757 | 9.8% | 667 | 2.4% | 1,958 | 6.9% | 132 | 0.5% | | | | |
| EL | 63,500 | 100% | 4,594 | 7.2% | 2,591 | 4.1% | 1,818 | 2.9% | 184 | 0.3% | 1 | 0.00% | | |
| ES | 303,300 | 100% | 59,416 | 19.6% | 27,763 | 9.2% | 27,509 | 9.1% | 3,635 | 1.2% | 509 | 0.17% | | |
| FR | 569,800 | 100% | 68,289 | 12.0% | 58,706 | 10.3% | 4,052 | 0.7% | 5,514 | 1.0% | 17 | 0.00% | | |
| IT | 313,900 | 100% | 49,228 | 15.7% | 32,816 | 10.5% | 4,034 | 1.3% | 6,770 | 2.2% | 39 | 0.01% | 5,569 | 1.8% |
| CY | 4,900 | 100% | 2 | 0.0% | | | | | | | 2 | 0.04% | | |
| LV | 4,800 | 100% | 2,830 | 58.9% | 2,733 | 56.9% | 53 | 1.1% | 43 | 0.9% | | | | |
| LT | 14,000 | 100% | 581 | 4.2% | 421 | 3.0% | 106 | 0.8% | 54 | 0.4% | | | | |
| LU | 4,000 | 100% | 295 | 7.4% | 107 | 2.7% | 64 | 1.6% | 103 | 2.6% | 21 | 0.53% | | |
| HU | 40,000 | 100% | 2,023 | 5.1% | 210 | 0.5% | 110 | 0.3% | 1,703 | 4.3% | | | | |
| MT | 2,300 | 100% | | | | | | | | | | | | |
| NL | 103,200 | 100% | 9,146 | 8.9% | 107 | 0.1% | 3,438 | 3.3% | 5,565 | 5.4% | 36 | 0.03% | | |
| **AT** | **63,400** | **100%** | **41,866** | 66.0% | **35,993** | 56.8% | **2,015** | 3.2% | **3,837** | 6.1% | **17** | 0.03% | **3** | 0.005% |
| PL | 159,300 | 100% | 5,430 | 3.4% | 2,352 | 1.5% | 522 | 0.3% | 2,556 | 1.6% | | | | |
| PT | 47,300 | 100% | 16,501 | 34.9% | 10,092 | 21.3% | 4,037 | 8.5% | 2,147 | 4.5% | 24 | 0.05% | 201 | 0.4% |
| RO | 61,700 | 100% | 16,005 | 25.9% | 15,966 | 25.9% | 3 | 0.0% | 36 | 0.1% | | | | |
| SI | 15,000 | 100% | 3,377 | 22.5% | 3,266 | 21.8% | | | 111 | 0.7% | | | | |
| SK | 28,100 | 100% | 4,956 | 17.6% | 4,451 | 15.8% | 8 | 0.0% | 497 | 1.8% | | | | |
| FI | 81,200 | 100% | 24,429 | 30.1% | 14,177 | 17.5% | 188 | 0.2% | 10,060 | 12.4% | 4 | 0.00% | | |
| SE | 148,800 | 100% | 78,169 | 52.5% | 66,160 | 44.5% | 1,430 | 1.0% | 10,578 | 7.1% | | | | |
| UK | 396,100 | 100% | 20,373 | 5.1% | 5,089 | 1.3% | 5,274 | 1.3% | 9,999 | 2.5% | 11 | 0.00% | | |
| **EU-27 total** | **3,361,600** | **100%** | **525,583** | **15.6%** | **309,972** | **9.2%** | **104,259** | **3.1%** | **101,808** | **3.0%** | **3,766** | **0.11%** | **5,773** | **0.2%** |
| [Source: European Commission "Statistical Pocketbook 2010", published in June 2010] | | | | | | | | | | | | | | |

**Table 73: Renewable electricity generation in the EU-27**