

2004 RES-E EU FRAMEWORKS & PRICES (€/MWh)

Country		Small Hydro	Wind	Biomass	Solar PV	Others
Austria ¹	Old plants ²	Feed-in volume up to 1.000 MWh: 56,80 € 5.000 MWh: 43,60 € 15.000 MWh: 36,30 € 25.000 MWh: 32,80 € 50.000 MWh: 31,50 €	From 73.5 €/MWh to 109 €/MWh (depending on the region and the investment costs)	From 47.7 €/MWh to 174.5 €/MWh (depending on power and region) ³	From 358 €/MWh to 726 €/MWh (depending on the region)	
	Revital ized plants ⁴	Feed-in volume up to 1.000 MWh: 59,60 € 5.000 MWh: 45,80 € 15.000 MWh: 38,10 € 25.000 MWh: 34,40 € 50.000 MWh: 33,10 €				

¹ The Green Electricity Act is currently under discussion. Therefore changes are expected for 2005. The original Green certificate system has been replaced by a feed in system by 01.01.2003.

² This is concerning plants which got all planning permissions before January 1st 2003, which includes all currently operating plants. They are entitled to receive such **guaranteed feed-in tariffs for the first 10 years of plant operation**.

³ From 82.8 €/MWh to 174.5 €/MWh (<1 MW); From 82, 8 €/MWh to 159.8 €/MWh (<3 MW); From 63.6 €/MWh to 159.8 €/MWh (<10 MW) and From 47.7 €/MWh to 159. 8 €/MWh (>10 MW) (depending on the regions).

⁴ Tariff for revitalized old plants with an increased yearly working capacity by 15 %. If the increase of yearly working capacity exceeds 50 % the tariff for new plants can be claimed.

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	New olants ⁵	Feed-in volume up to 1.000 MWh: 62,50 € 5.000 MWh: 50,10 € 15.000 MWh: 41,70 € 25.000 MWh: 39,40 € 50.000 MWh: 37,80 €	78 €/MWh	Solid Biomass 160 €/MWh (< 2 MW) 150 €/MWh (>2 < 5 MW) 130 €/MWh (>5 < 10 MW) 102 €/MWh (> 10 MW) Liquid Biomass 130 €/MWh (< 200 kW) 100 €/MWh (> 200 kW) Biogas 165 €/MWh (< 100 kW) 145 €/MWh (>100 < 500 kW) 145 €/MWh (>500 kW < 1 MW) 103 €/MWh (> 1 MW) Landfill gas 60 €/MWh (< 1 MW) 30 €/MWh (> 1 MW)	600 €/kWh (< 20 kWp) 470 €/kWh (> 20 kWp)	<u>Geothermal</u> 70 €/kWh
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⁵ Plants which get all planning permissions between January 1st 2003 and December 31st 2004 and start generating electricity by the end of 2006 are entitled to receive such **feed-in guaranteed tariffs for the first 13 years of plant operation**.



Country		Small Hydro	Wind	Biomass	Solar PV	Others
Belgium ⁶	Wallonia ⁷	117 €/MWh =27 €/MWh (market price) + 90 €/MWh (market price Green Certificate)	102€/MWh = 12 €/MWh (market price) + 99 €/MWh (market price Green Certificate)	110 €/MWh = 20 € /MWh (market price) + 90€ for one Green Certificate ⁸	150 €/MWh ⁹ (minimum price Green Certificate)	90€/MWh (market price Green Certificate)

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⁶ Renewable energy is a competence of the regions in Belgium which have passed a system of quota with tradable green certificates). In the Flemish region there is a 3% quota in 2004 and 5% in 2010 (excl. MSW); Brussels region has no support scheme yet. The considered market price was the average price in 2001 in case of not 100% disponibility of the plant. In case of 100% disponibility the average market price reached 39.1 €/MWh.

⁷ In Wallonia the green certificate system began to work on October 1st 2002. This scheme has placed an obligation on all suppliers (retailers) to source a percentage of their total sales of electricity from whatever eligible green sources (renewables or quality cogeneration). The quota for the first obligation period ending on 30 September 2003 has been set at 3%. This percentage will grow every year till 2007 −4% for the second period, 5% de the next one, 6% the next one and 7% the last year—. Green generators get a green certificate per each 456 kg of CO2 avoided emissions what means 1 MWh for wind, small hydro, biomass or solar PV but 3, 3 MWh for a natural gas co generator and 6, 2 MWh for a fuel oil co generator. Green certificates are valid during five years. Those suppliers which fail to reach the target will have to pay a fine per green certificate missing of 75 € in the first half year and of 100 € afterwards. The amount of the fine indicates the theoretical ceiling price of the certificates. The money coming from the fines will go to a public Fund to promote renewables. However, green generators will be entitled to sell their certificates to the Energy authority at minimum price of 65 € per certificate.

The amount for green certificates for biomass for 1 MWh may vary depending the amount of CO2 avoided

⁹ This price is the same as householders pay at present for their electricity. In fact producers substrate their production from their consumption. If they produce 250 kWh with PV and the household consumption is 1000 kWh, the owner will pay only a 750 kWh bill.

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Flanders ¹⁰	135 €/MWh= 27 €/MWh (market price) + 108 €/MWh (market price Green Certificate) 120 €/MWh= 12 €/MWh (market price) + 108 €/MWh (market price Green Certificate)	128 €/MWh = 20 € /MWh (market price) + 108 € for one Green Certificate ¹¹	450 €/MWh (minimum price Green Certificate)	108 €/MWh (market price Green Certificate)
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¹⁰ In Flanders, the green certificate system began to work on January 1st 2002. The scheme has placed an obligation on all suppliers (retailers) to source a percentage of their total sales of electricity from whatever eligible green sources (renewables). The quota for the first obligation period ending in 2004 has been set at 3%. This percentage will grow to 6% in 2010. Those suppliers which fail to reach the target have to pay currently a fine of 75 € per green certificate missing. As the amount of the fine is expected to rise to 100 € and eventually to 125 €.

The amount for green certificates for biomass for 1 MWh may vary depending the amount of CO2 avoided



Country	Small Hydro	Wind	Biomass	Solar PV	Others
Denmark		New wind mills: 57.6 €/MWh ¹² Wind mills >10 years: 30 – 45€/MWh	Farm biogas 80 €/MWh (10 years)	Net metering	

¹² Danish wind rates are in a transition period. The old fixed price system is expected to be replaced by a green certificate system according to which future wind turbine owners will be paid the market price (at present 21 €/MWh) plus a Green Certificate (with a floor price of 12 €/MWH and a maximum price 36 €/MWh).



Country	Small Hydro	Wind	Biomass	Solar PV	Others
Finland	39.45 €/MWh ¹³	48.4 €/MWh ¹⁴	31 €/MWh (tax relief)		

¹³ The income a small hydro electricity producer can expect to get consists of three parts;

negotiated price from the buyer, which usually keeps around nordpool spot price, now about 28.0 €
 the influence of government investment subsidy which makes about 8.0 € and

the tax reduction of 3.45 €/MWh.

¹⁴ The income a wind power electricity producer can expect to get consists of three parts;

negotiated price from the buyer, which usually keeps around nordpool spot price, now about 28.0 €

the influence of government investment subsidy (30-40%) which makes about 13.4 € and

the tax reduction of 6.9 €/MWh.



Country	Small Hydro	Wind	Biomass	Solar PV	Others
France	Operating before 2001 71.65 €/MWh ¹⁵ (winter) 28.81 €/MWh (summer)	For plants $<$ 12MW: From 6/2001 onwards ¹⁶ First five years 83.5 \in /MWh Next ten years ¹⁷ 83.5 \in /MWh (2000 h/y) 59.3 \in /MWh (2600 h/y) 30.4 \in /MWh (3600 h/y) Between=linear interpolation	Landfill biogas only ¹⁸ 57.2 €/MWh (< 2 MW) 45 €/MWh (> 6 MW) Between=linear interpolation	2004 145,29 €/MWh (General) 290,58 €/MWh (Corsica	
	Commissioned after 2001 if < 500 kVA 84.2 ϵ /MWh ¹⁹ (winter)	For plants > 12 MW: Tender procedure applicable		& Overseas)	
	44.5 €/MWh (summer) <u>if > 500 kVA</u> 75.8 €/MWh ²⁰ (winter) 40.1 €/MWh (summer)				

^{15 +} bonus for regularity of 7.5 €/MWh.

16 Prices since the total installed power is under 1500 MW, 10% decrease beyond. Prices for Corsica are 10% higher

17 Price for other h/y is calculated by linear interpolation.

18 Not yet determined for other sources.

19 + bonus for regularity of 7.5 €/MWh

20 + bonus for regularity of 7 €/MWh

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Country	Small Hydro	Wind	Biomass	Solar PV	Geothermal
Germany ²¹	For installations in service before 31.7.2004 ²² : 76.7 € MWh (<500 kW) 66.5 € MWh (between 500 kW and 5 MW For installations in service after 31.7.2004: 96.7 €/MWh (< 500 kW) 66.,5 €/MWh (between 500 kW and	87 €/MWh (First 5 years) 55 €/MWh (From year 6 to 20 ²³) Offshore 91 €/MWh (61.9 €/MWh after 12 years) Degression rate ²⁴ : 2 %	General Biomass 115 €/MWh (<150 kW) 99 €/MWh (<500 kW) 89 €/MWh (< 5 MW) 84 €/MWh (< 20 MW) Landfill & Sewage Biogas 76,7 €/MWh (< 500 kW) 66,5 €/MWh (< 5 MW) Raw material bonus 20-60 €/MWh Cogeneration & Innovation	Photovoltaics 574 € /MWh	Geothermal 150 €/MWh (< 5 MW) 140 €/MWh (< 10MW) 89.5 €/MWh (< 20 MW) 71.6 €/MWh (> 20 MW) Degression rate ²² : 1 %
İ	5 MW)		bonus	/ Degression rate ²² open-space	

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20 €/MWh

Degresssion rate²²: 1,5 %

installations: 6,5 %

²¹ These *fixed prices* apply for plants commissioned during the year 2004 and for a runtime of 20 years, except for hydropower whose running time is 30 years.

²² Installations in service before 31.7.2004 may also profit from the higher price of 96.7 €/MWh if they have introduced after the 31.7.2004 an ecological (respectively technical) improvement of their installation. For this purpose there may come a guideline for these improvements, to be issued by the German Ministry. If these guidelines would not be issued, the installation owner will have to introduce the ecological /technical improvement and the demand for a higher price to the respective authorisation administration for his concrete installation in his region.

During a period of five years, the EEG tariff for wind energy is kept at a uniform level of 8.7 cents/kWh for all sites. After this time the extension of the higher tariff depends on the site quality. The better the site quality, the sooner the tariff will be reduced to 5.5 cents/kWh in the subsequent years

²⁴ Degression rate means, that the remuneration rates for new plants decrease yearly.



Country	Small Hydro	Wind	Biomass	Solar PV	Others
Great Britain ²⁵ (2003 data)	28 €/MWh (market price) + 70 €/MWh (Green Certificate) ²⁶	28 €/MWh (market price) + 70 €/MWh (Green Certificate) ²⁷	28 €/MWh (market price) + 70 €/MWh (Green Certificate)	28 €/MWh (market price) + 70 €/MWh (Green Certificate)	28 €/MWh (market price) + 70 €/MWh (Green Certificate)

Last data update for Great Britain: 2003

²⁵ Following powers given to the Government through the *Utilities Act 2000* and developed through the *Renewables Obligation Order*, on 1 April 2002 the *Renewables Obligation* came into force in England and Wales. This scheme has placed an obligation on all suppliers (retailers) to source a percentage of their total sales of electricity from whatever eligible renewable sources. The Obligation has been set at 3% in the first obligation period—ending on 31 March 2003—rising to 4.3% in the following one year period, to 4.9% in the next until reaching 10.4% of sales in the year ending 31 March 2011. It will then remain constant until 31 March 2027, but may well be increased to meet more ambitious targets beyond 2011. Compliance with the Obligation will be demonstrated by presenting *Renewables Obligation Certificates (ROC)* to the regulator (Ofgem) at the end of each period. One *ROC* is issued by Ofgem for each MWh of eligible renewable electricity generated within the UK, its territorial waters and continental shelf, from RES stations built or refurbished after 1 January 1990, and physically supplied to customers in Great Britain. Suppliers can fulfill their obligation by purchasing ROCs with the power from an accredited generator, by buying ROCs on the market separately from the power or by paying to Ofgem a *buyout price*—set at 44,64 €/MWh (30,51 £/ MWh) until 2004 and thereafter adjusted by Ofgem in line with the retail price index—. This *buyout price* indicates the maximum theoretical price of ROCs. The *buyout* funds will be returned by Ofgem to suppliers who had fulfilled 100% of their obligation with ROCs in proportion to the number of ROCs that each of them had presented. Suppliers are able to bank ROCs for use only in the period after they are issued although limiting up to 25% of the supplier's obligation what can be met by ROCs awarded in the previous period.

²⁶ Stations over 20 MW are only eligible if commissioned after the date of approval of the Obligation (31 March 2002). All existing hydropower stations under 20 MW built or refurbished after 1 January 1990 are eligible. All stations with a declared net capacity 1.25 MW or less are eligible regardless of their date of built or refurbishment.

²⁷ Offshore wind projects are eligible to capital grants up to 40% of their costs with a maximum of 15 M€ plus additional grants from other Public Funds.

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Country	Small hydro	Wind	Biomass	Solar PV	Others
Greece ²⁸	66,1 €/MWh + (1,19 €/kW/month) =Interconnected system	66,1 €/MWh + (0,85 €/kW/month) = Interconnected system	66,1 €/MWh + (1,53 €/kW/month) =Interconnected system	66,1 €/MWh + (0,85 €/kW/month) =Interconnected system	
	81,7 €/MWh = non-interconnected islands	81,7 €/MWh = non-interconnected islands	81,7 €/MWh = non- interconnected islands	81,7 €/MWh = non- interconnected islands	

²³ Greece follows the *REFIT model*: the Transmission System Operator (TSO) is obligated to grant priority access to RES plants up to 50 MW (up to 10 MW for small hydro plants) and to sign a 10-year contract (PPA) with the RES producers for the purchase of their electricity (with a contract renewal option). Output is sold to the TSO at a predetermined buy-back rate, which is a fixed percentage (90% if independent producers) of the consumer electricity price. Moreover, all kinds of RES investments are entitled to apply for a 40% public subsidy on their total cost <u>plus</u> a 40% subsidy on the interest on loans obtained. Alternatively, the latter subsidy can be combined with a 100% tax rebate on the investment cost. Alternative subsidies up to 50% of the investment cost, depending on RES type, can be obtained under the CSF III / OPC Programme (following rounds of competitive calls/evaluations).

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Country	Small Hydro	Wind	Biomass	Solar PV	Others
Ireland 29	64.1 €/MWh (weighted average price)	Small Wind (< 3 MW) 52.97 €/MWh (cap price)=18% Less than cap price=72% (down to 47.23 €/MWh) Large Wind (> 3 MW) 48,12 €/MWh (cap price)=5% Less than cap price=95%(down to 45.47 €/MWh)	59.16 €/MWh (cap price)=12% Less than cap price=88%(down to 37.65 €/MWh)	Neither legal framework nor set price for PV electricity producers.	

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²⁹ Prices for new plants under Alternative Energy Requirement V (AER V 2002). Since 1994, the development of electricity generating capacity from renewable energy has been encouraged through a series of Government supported **Alternative Energy Requirement (AER)** competitions. The AER involves a series of **tendering competitions**, in which prospective generators are invited to compete, based on price per unit of electricity, for contracts to sell electricity at a guaranteed price for up to 15 years. Successful applicants are those who offer to sell the electricity at the lowest price at or below the cap price previously notified and published in the terms and conditions of the competition.

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Country	Small Hydro	Wind	Biomass	Solar PV	Others
Italy ³⁰	37 €/MWh (spot electricity price) + 82.4 €/MWh (Cap price green Certificate) ³¹	37 €/MWh (spot electricity price) + 82.4 €/MWh (Cap price green Certificate) ³²	37 €/MWh (spot electricity price) + 82.4 €/MWh (Cap price green Certificate)	Net metering + 75% grant support ³³ 34	37 €/MWh (spot electricity price) + 82.4 €/MWh (Cap price green Certificate)

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³⁰ Italy follows the quota plus tradable green certificates model. The quota imposed on suppliers and importers of electricity during the year 2002 was 2%. This quota should be increased by 0.3% every year starting from 2005. Cap price for green certificates is fixed every year by the Grid Authority. Green Certificates are issued only for the first eight years. From then on producers will be receiving only the spot market price.

³¹ Small hydro refers to run-of-river hydro power plants which do not exceed the capacity of 3 MW. Small Hydro power plants entered in force before 1st April 1999 deliver the electricity to the Transmission System Operator Gestore della Rete di Trasmissione Nazionale (GRTN), according to a prices defined by the AEEG (Delibera n.62/02, see www.autorita.energia.it). This pricing scheme sets decreasing prices for each GWh yearly produced.

Small Hydro power plants entered in force after 1st April 1999 could deliver the electricity to the Transmission System Operator at the marginal price Ct (which represents the electricity cost produced with reference to the national mix of fossil fuel) defined by the AEEG every three months (average value 2004 = 3.758 €cent / kWh). In addition they receive the income for selling green certificates (GC) (official value GC 2003 = 8.240 €cent / kWh in the GC-exchange; average value = maximal value discounted of 3-5%, depending on market transaction costs in bilateral contracts - expected value CG 2004 = not available).

Power plants (> 20KW) entered in force before 1st April 1999 could deliver the electricity to the Transmission System Operator at the marginal price Ct (which represents the electricity cost produced with reference to the national mix of fossil fuel) defined by the AEEG every three months (average value 2003 = 3,758 \(\) \(\) cent / kWh). Alternatively they could sell electricity to electricity traders by means of bilateral contracts (average value within bilateral contractors 2004 = 5, 0 - 5, 5 €cent / kWh). Additionally, power plants entered in force after 1st April 1999 receive the income for selling green certificates (GC) (official value GC 2003 = 8,240 €cent / kWh in the GC-exchange; average value = maximal value discounted of 3-5%, depending on market transaction costs in bilateral contracts – expected value CG 2004 = not available).

³³ Major PV plants (> 20 kW) will be able to benefit from Green certificates since they require a minimum electricity production required to get One certificate is 51,000 kWh.

³⁴ PV plants **not exceeding** 20 kW adopt net-metering scheme, whereas a regional contribute up to 75% of the investment costs could be delivered by grants support. The forthcoming scheme will foresee the adoption of a feed-in tariff system





Country	Small Hydro	Wind	Biomass	Solar PV	Others
Netherl ands ³⁵	68 €/MWh	Onshore 49 €/MWh ³⁶ Offshore 68 €/MWh	<u>Stand-alone</u> 68 €/MWh (< 50 MW) <u>Others</u> 48 €/MWh	68 €/MWh	<u>Tidal & wave</u> 68 €/MWh

³⁵ The Netherlands feed-in tariffs quoted are expected as from 1 April 2003. The tariffs will be guaranteed for ten years for new generating plants, and for ten years subtracted with their age for older installations.

36 Feed-in tariff up to 18,000 fully rated hours.

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Country	Small Hydro	Wind	Biomass	Solar PV	Others
Portugal ³⁷	76.74 €/MWh ³⁸	Up to 2000 h Up to 2200 h Up to 2200 h Up to 2400 h Up to 2600 h Up to 3500 h 86.07 € /MWh 85.16 € /MWh 81.39 €/MWh 73.17 €/MWh	72.77 €/MWh	For the first 50 MW installed in Portugal: Up to 5 kW 449.50 €/MWh > 5 kW 260.24 €/MWh After the level of 50 MW will be reached: 67.50 €/MWh	WAVE energy For the first 20 MW installed in Portugal: 255.18 €/MWh After the level of 20 MW will be reached: 69.39 €/MWh

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³⁷ Portuguese *fixed prices* are updated monthly according to inflation.

³⁸ This is applicable for up to 10 MW

³⁹ Between those limits linear interpolation is used. The average value for a wind farm in Portugal is 2300 h and the price is in average 84.28 € /MWH. All above values are net of the municipality tax of 2.5 %



Country	Small Hydro	Wind	Biomass	Solar PV	Others
Spain ⁴⁰	From 74.04 €/MWh to 60.17 €/MWh ⁴¹ (according to the payment option chosen and date of commissioning)	From 75.29 €/MWh to 63.77 €/MWh (according to the payment option chosen and date of commissioning)	Energy crops & farm, forestry and garden residues From 72.78 €/MWh 67.03 €/MWh Biogas & Biofuels From 71.16 €/MWh to 64.20 €/MWh Industrial residues (farm & forestry industries) From 63.95 €/MWh (according to the payment option chosen and date of commissioning in all cases)	Solar PV 414 €/MWh (< 100 kW) 216 €/MWh (> 100 kW) Solar Thermal Electric 216 €/MWh	

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⁴⁰ The Spanish support system provides for two payment options: selling electricity to the distribution company (option 1) and selling electricity freely in the market (option 2). The remuneration received for option 1 encompasses a regulated or fixed tariff per kWh applied to the total output of the installation, a reactive power service supplement and a supplement for continuity of the supply against voltage dips. The remuneration for option 2 consists of the hourly price per kWh set in the electricity pool or the respective price according to the agreement with the purchaser, plus a premium per kWh, an incentive per kWh for participating in the market and a capacity payment. Wind farms which fulfil certain conditions receive also a supplement for continuity of the supply against voltage dips. For more detailed information on the different options please see the APPA report on "THE NEW PAYMENT MECHANISM OF RES-E IN SPAIN", May 2004.



Country	Small Hydro	Wind	Biomass	Solar PV	Others
Sweden 42	30 €/MWh (electricity market price) + 23 €/MWh (certificate market price) (only for power plants < 1500 kW)	30 €/MWh (electricity market price) + 23 €/MWh (certificate market price) + 13 €/MWh	30 €/MWh (electricity market price) + 23 €/MWh (certificate market price)	30 €/MWh (electricity market price) + 23 €/MWh (certificate market price)	30 €/MWh (electricity market price) + 23 €/MWh (certificate market price

⁴² Sweden introduced a national certificate scheme on May 1, 2003. Electricity production from photovoltaic, wind power, biomass, geothermal energy, wave energy and small-scale hydro (under 1.5 MW, some exceptions exist) are eligible for electricity certificates. For each MWh electricity produced from these sources a certificate is issued. The system is a quota-based system, meaning that a quota obligation is placed on all electricity consumers. The quota obligation, ranging from 7.4% in 2003 to 16.9% in 2010, obliges consumers to have this percentage of their electricity consumption as "renewable" through certificates. In practice, the quota will be handled by the electricity distributing companies. The certificate price will be set on the market. However, there is a minimum price and a penalty level. The minimum price is the buy-out price at which the government promises to buy the certificates from the producers. This starts at about 6.6 €/MWh in 2003 and is lowered year by year. There is also a penalty level for the electricity consumer that does not show enough certificates. The penalty level, in the latest proposal, is at € 19.2 €/MWh in 2003 and 26.3 €/MWh in 2004.