

Renewable electricity policies in Europe

Country fact sheets 2003

H.J. de Vries
C.J. Roos
L.W.M. Beurskens
A.L. Kooijman - van Dijk
M.A. Uyterlinde

Preface

This report gives an overview of current policies in Europe, with regard to the promotion of electricity production from renewable energy sources. The project is registered at ECN under project number 7.7449.02.03. For further information, questions and comments on this report, please contact Hage J. de Vries at the following address:

Energy research Centre of the Netherlands
ECN Policy Studies
P.O. Box 37154
1030 AD Amsterdam
The Netherlands
Tel: +31 224 56 4851
Fax: +31 20 4922812
E-mail: devries@ecn.nl

Abstract

In the EU Directive on the promotion of electricity produced from renewable energy sources, indicative targets for the contribution of electricity from renewable energy sources to gross electricity consumption in 2010 are set. For many EU Member States these targets require a substantial growth of the share of renewable energy sources in the national energy mix. To encourage investments in the production of electricity from renewable energy sources, several policy instruments can be used. The Directive does not indicate which (set of) policy instrument(s) would be favourable. As a result Member States continue to develop their own national mix of policy instruments to stimulate renewable electricity.

A comprehensive overview of the different policy instruments used in the Member States (and Norway) is hard to find. This report provides a clear and systematic overview of policy instruments used in the Member States of the EU and Norway for the promotion of electricity from renewable energy sources. Norway is a special case, since 99.2% of the electricity production is already produced from renewable energy sources. This report is a reference book, which describes the proportion of renewable energy sources in the present fuel mix and the development of renewable energy sources for every country in the European Union. For each Member State the national renewable electricity targets are given, and an overview of the policy instruments that are in place to promote the use of renewable energy in order to achieve the targets.

The sources on which this report is based vary between Member States. Many of the descriptions of the policy instruments are based on policy documents and laws, others on secondary sources.

CONTENTS

LIST OF TABLES	6
LIST OF FIGURES	6
SUMMARY	9
1. INTRODUCTION	11
1.1 Investment subsidies	12
1.2 Fiscal measures	12
1.3 Feed-in tariffs	12
1.4 Quota obligations/green certificates	12
1.5 Bidding systems	12
1.6 Reading guide	13
2. AUSTRIA	14
2.1 Renewable energy in Austria	14
2.2 Targets and objectives	15
2.3 Policy instruments	15
2.3.1 Policy Instruments at National Level	16
2.3.2 Policy Instruments at Province level	18
2.4 Country context	18
2.4.1 Institutional framework	18
2.4.2 Electricity sector	19
3. BELGIUM	21
3.1 Renewable energy in Belgium	21
3.2 Targets and objectives	22
3.3 Policy instruments	22
3.4 Country context	24
3.4.1 Institutional framework	24
3.4.2 Electricity sector	25
4. DENMARK	26
4.1 Renewable energy in Denmark	26
4.2 Targets and objectives	27
4.3 Policy instruments	27
4.4 Country context	30
4.4.1 Institutional framework	30
4.4.2 Electricity sector	30
5. FINLAND	32
5.1 Renewable energy in Finland	32
5.2 Targets and objectives	33
5.3 Policy instruments	33
5.4 Country Context	34
5.4.1 Institutional framework	34
5.4.2 Electricity sector	34
6. FRANCE	36
6.1 Renewable energy in France	36
6.2 Targets and objectives	37
6.3 Policy instruments	37
6.4 Country context	40
6.4.1 Institutional framework	40
6.4.2 The electricity sector	40

7.	GERMANY	42
	7.1 Renewable energy in Germany	42
	7.2 Targets and objectives	43
	7.3 Policy instruments	43
	7.3.1 Policies instruments at a national level	43
	7.3.2 Policy instruments at a State level	46
	7.4 Country context	47
	7.4.1 Institutional framework	47
	7.4.2 Electricity sector	48
8.	GREECE	49
	8.1 Renewable energy in Greece	49
	8.2 Targets and objectives	50
	8.3 Policy instruments	50
	8.4 Country context	53
	8.4.1 Institutional Framework	53
	8.4.2 Electricity market	54
9.	IRELAND	56
	9.1 Renewable energy in Ireland	56
	9.2 Targets and objectives	57
	9.3 Policy instruments	57
	9.4 Country Context	62
	9.4.1 Institutional framework	63
	9.4.2 Electricity market	63
10.	ITALY	65
	10.1 Renewable energy in Italy	65
	10.2 Targets and objectives	66
	10.3 Policy instruments	66
	10.4 Country Context	69
	10.4.1 Institutional framework	69
	10.4.2 Electricity market	70
11.	LUXEMBOURG	71
	11.1 Renewable energy in Luxembourg	71
	11.2 Targets and objectives	72
	11.3 Policy instruments	72
	11.4 Country context	75
	11.4.1 Institutional framework	75
	11.4.2 Electricity sector	75
12.	THE NETHERLANDS	76
	12.1 Renewable energy in The Netherlands	76
	12.2 Targets and objectives	77
	12.3 Policy instruments	77
	12.4 Country context	81
	12.4.1 Institutional framework	81
	12.4.2 Electricity sector	82
13.	NORWAY	83
	13.1 Renewable energy in Norway	83
	13.2 Targets and objectives	84
	13.3 Policy instruments	84
	13.4 Country context	84
	13.4.1 Institutional framework	84
	13.4.2 Electricity sector	85

14. PORTUGAL	86
14.1 Renewable energy in Portugal	86
14.2 Targets and objectives	87
14.3 Policy instruments	87
14.4 Country Context	89
14.4.1 Institutional framework	89
14.4.2 Electricity sector	90
15. SPAIN	92
15.1 Renewable energy in Spain	92
15.2 Targets and objectives	93
15.3 Policy instruments	93
15.4 Country context	95
15.4.1 Institutional framework	95
15.4.2 Electricity sector	96
16. SWEDEN	97
16.1 Renewable energy in Sweden	97
16.2 Targets and objectives	98
16.3 Policy instruments	98
16.4 Country context	101
16.4.1 Institutional framework	101
16.4.2 Electricity sector	101
17. UNITED KINGDOM	103
17.1 Renewable energy in the United Kingdom	103
17.2 Targets and objectives	104
17.3 Policy instruments	104
17.4 Country Context	106
17.4.1 Institutional framework	106
17.4.2 Electricity sector	106
REFERENCES	108
APPENDIX A FEED-IN TARIFFS AUSTRIAN PROVINCES	117

LIST OF TABLES

Table S.1	<i>Policy instruments per used in the EU Member States and Norway</i>	9
Table 2.1	<i>Installed capacity in Austria in 1999</i>	14
Table 2.2	<i>Renewable electricity targets for Austria in 2010</i>	15
Table 2.3	<i>Ökostromgesetz targets for 2003, 2005, and 2007</i>	15
Table 3.1	<i>Installed capacity in Belgium in 1999</i>	21
Table 3.2	<i>Share of RES-E in 2000 and targets 2010 (indicative EU targets)</i>	22
Table 3.3	<i>Regional RES-E targets for 2004 and 2010</i>	22
Table 4.1	<i>Installed capacity in Denmark in 1999</i>	27
Table 4.2	<i>Share of RES-E in 2000 and targets 2010 (EU indicative target)</i>	27
Table 5.1	<i>Installed capacity in Finland in 1999</i>	32
Table 6.1	<i>Installed capacity in France in 1999</i>	36
Table 6.2	<i>Feed-in tariffs France</i>	39
Table 7.1	<i>Installed capacity in Germany in 1999</i>	42
Table 7.2	<i>Share of RES in 2000 and targets 2010</i>	43
Table 7.3	<i>Feed-in tariffs for electricity under the Strom-Einspeisungs-Gesetz</i>	44
Table 7.4	<i>Feed-in tariffs for electricity under the EEG</i>	45
Table 8.1	<i>Installed capacity in Greece in 1999</i>	49
Table 8.2	<i>Feed-in tariffs in Greece in 2001</i>	53
Table 9.1	<i>Installed capacity in Ireland in 1999</i>	56
Table 9.2	<i>AER bidding rounds</i>	61
Table 10.1	<i>Installed capacity in Italy in 1999</i>	65
Table 10.2	<i>Development targets in the Italian white paper for the valorisation of renewable energy sources (1999)</i>	66
Table 10.3	<i>Share of RES in 2000 and 2010 (targets)</i>	66
Table 11.1	<i>Installed capacity in Luxembourg in 1999</i>	71
Table 11.2	<i>Share of RES in 1997 and 2010 (EU indicative targets)</i>	72
Table 12.1	<i>Installed capacity in The Netherlands in 1999</i>	76
Table 12.2	<i>Share of RE and RE-E in 2000 and targets 2010</i>	77
Table 12.3	<i>Regulatory energy tax (REB) for electricity per user category</i>	79
Table 13.1	<i>Installed capacity in Norway in 1999</i>	83
Table 13.2	<i>Increase of the share of RES in 2010</i>	84
Table 14.1	<i>Installed capacity in Portugal in 1999</i>	86
Table 14.2	<i>Share of RES in 1997 and 2010 (EU indicative targets)</i>	87
Table 15.1	<i>Installed capacity in Spain in 1999</i>	92
Table 15.2	<i>Share of RES in 2000 and EU indicative targets 2010</i>	93
Table 15.3	<i>Premiums and fixed prices in 2003 for RE under Royal Decree 2818/1998</i>	94
Table 16.1	<i>Installed capacity in Sweden in 1999</i>	97
Table 17.1	<i>Installed capacity in the United Kingdom in 1999</i>	103
Table 17.2	<i>share of RES in 2000 and 2010 (targets)</i>	104

LIST OF FIGURES

Figure 1.1	<i>Categorisation of policy instruments</i>	11
Figure 2.1	<i>Gross electricity production in 1999 in Austria</i>	14
Figure 3.1	<i>Gross electricity production in 1999 in Belgium</i>	21
Figure 4.1	<i>Gross electricity production in 1999 in Denmark</i>	26
Figure 5.1	<i>Gross electricity production in 1999 in Finland</i>	32
Figure 6.1	<i>Gross electricity production in 1999 in France</i>	36

Figure 7.1	<i>Gross electricity production in 1999 in Germany</i>	42
Figure 8.1	<i>Gross electricity production in 1999 in Greece</i>	49
Figure 9.1	<i>Gross electricity production in 1999 in Ireland</i>	56
Figure 10.1	<i>Gross electricity production in 1999 in Italy</i>	65
Figure 11.1	<i>Gross electricity production in 1999 in Luxembourg</i>	71
Figure 12.1	<i>Gross electricity production in 1999 in The Netherlands</i>	76
Figure 13.1	<i>Gross electricity production in 1999 in Norway</i>	83
Figure 14.1	<i>Gross electricity production in 1999 in Portugal</i>	86
Figure 15.1	<i>Gross electricity production in 1999 in Spain</i>	92
Figure 16.1	<i>Gross electricity production in 1999 in Sweden</i>	97
Figure 17.1	<i>Gross electricity production in 1999 in the United Kingdom</i>	103

SUMMARY

This report gives an overview of the policy instruments in the EU Member States and Norway, which are used to increase the contribution of electricity from renewable energy sources to the national energy mix. In the report a categorisation of the policy instruments is used. Difference is made between investment subsidies, fiscal measures, feed-in tariffs, and quota obligations/green certificates and bidding systems (tendering systems). In Table S.1 an overview of the different policy instruments in the EU member states and Norway is given.

Table S.1 *Policy instruments per used in the EU Member States and Norway*

Country/Policy instrument	Investment subsidies	Fiscal measures	Feed-in tariffs	Quota obligations/ Green certificates	Bidding systems
Austria	×	×	×	× (2002, hydro)	
Belgium	×	×	×	×	
Denmark	×	×	×		
Finland	×		×		
France	×		×		× (wind)
Germany	×		×		
Greece	×		×		
Ireland		×			×
Italy	×		×	×	
Luxembourg	×	×	×		
The Netherlands	×	×	×		
Norway	×	×			
Portugal	×	×	×		
Spain	×		×		
Sweden	×	×		×	
United Kingdom	×	×		×	

A more detailed overview of the policy instruments is presented for all above-mentioned countries. This report serves as an easy to use reference guide to renewable electricity policies in the Europe Union.

Per country an overview is given of the fuel mix in 1999, and the installed capacity from renewable energy sources in 1990, 1995 and 1999. The data used for the graphs and tables are Eurostat data. 1999 data is used because that data is complete and comparable to other years. In 2000 the Eurostat database changed some of its records and, as a result, is not easily comparable to previous years¹. The aim of the fuel mix and installed capacity overview is to place renewable electricity production in the perspective of total electricity production in a country.

Then the targets and objectives are given. In many countries the EU renewable Directive targets are the main targets, but some countries have set other, more ambitious targets. Presenting the targets gives an idea of the urge to promote renewable electricity production.

The policy instruments are given next. The categorisation as described in this chapter is used.

Finally the country context is given. The institutional framework in which the policy instruments are created, implemented and regulated is given. The electricity sector and its main actors are described as well.

¹ Especially biomass categories differ from previous years.

1. INTRODUCTION

In the EU Directive on the promotion of electricity produced from renewable energy sources², indicative targets for the contribution of electricity from renewable energy sources to gross electricity consumption in 2010 are set. For many EU Member States these targets require a substantial growth of the share of renewable energy sources in the national energy mix. To encourage investments in the production of electricity from renewable energy sources, several policy instruments can be used. The Directive does not indicate which (set of) policy instrument(s) would be favourable. As a result Member States continue to develop their own national mix of policy instruments to stimulate renewable electricity.

A comprehensive overview of the different policy instruments used in the Member States (and Norway) is hard to find. This report provides a clear and systematic overview of policy instruments used in the Member States of the EU and Norway for the promotion of electricity from renewable energy sources. Norway is a special case, since 99.2% of the electricity production is already produced from renewable energy sources. This report is a reference book, which describes the proportion of renewable energy sources in the present fuel mix and the development of renewable energy sources for every country in the European Union. For each Member State the national renewable electricity targets are given, and an overview of the policy instruments that are in place to promote the use of renewable energy in order to achieve the targets.

The policy instruments that are in place in the different Member States are all based on two main principles. The instruments either affects the *supply* or the *demand* of renewable electricity, and the focus either on the *production* of electricity or on the installed *capacity* of renewable electricity plants. (See Figure 1.1)

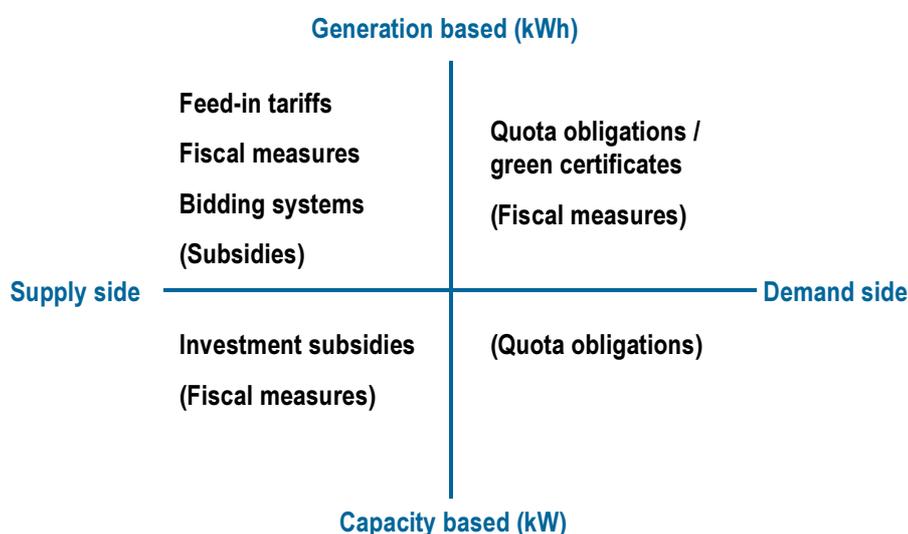


Figure 1.1 *Categorisation of policy instruments*

Within this categorisation, there are basically three main instruments to promote renewable electricity. These instruments are feed-in tariffs, quota obligations in combination with a green certificate system, and tendering/bidding schemes. Besides the three main instruments there are complementary mechanisms possible, like investment subsidies and fiscal measures. This categorisation is used throughout the report.

² Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market

1.1 Investment subsidies

Investment subsidies can help to overcome the barrier of a high initial investment. This type of subsidy is commonly used to stimulate investments in less economical renewable energy technologies. Investment subsidies are usually 20-50% of eligible investment costs, but in some cases subsidy is given over the total eligible investment sum, however within the limitations of the Community guidelines on State aid for environmental protection. In this report loans with a low interest rate are also considered to be investment subsidies.

1.2 Fiscal measures

Some EU countries support renewable electricity by means of the fiscal system. These schemes may take different forms, which range from rebates on general energy taxes, rebates from special emission taxes, proposals for lower VAT rates, tax exemption for green funds, to fiscal attractive depreciation schemes, which must be in line with the Community guidelines on State aid for environmental protection

1.3 Feed-in tariffs

Feed-in tariffs are a commonly used policy instrument for the promotion of renewable electricity production. The term feed-in tariff is used both for a regulatory, minimum guaranteed price per unit of produced electricity to be paid to the producer, as well as for a premium in addition to market electricity prices. Regulatory measures are usually applied to impose an obligation on electricity utilities to pay the (independent) power producer a price as specified by the government. The tariff may be supplemented with subsidies from the state. The level of the tariff is commonly set for a number of years to give investors security on income for a substantial part of the project lifetime. Many different adaptations of the instrument are applied.

A feed-in tariff can be based on the avoided cost of the utility that has the purchase obligation, or on the end price to the consumer. However, the level of the tariff need not have any direct relation with either cost or price, but can be chosen at a level to motivate investors for green power production.

1.4 Quota obligations/green certificates

Quota obligations are used to impose a minimum production or consumption of electricity from renewable energy sources. The government sets the framework within which the market has to produce, sell, or distribute a certain amount of energy from renewable sources. The obligation is imposed on consumption (often through distribution companies) or production. Governments may choose to establish 'technology bands' in order to protect technologies from strong competition by lower cost options. The quota can usually be traded between companies to avoid market distortions. A tradable green certificate is needed for this system. These green certificates provide an accounting system to register production, authenticate the source of electricity, and to verify whether demand has been met.

1.5 Bidding systems

Bidding procedures can be used to select beneficiaries for investment support or production support (such as through feed-in-tariffs), or for other limited rights- such as sites for wind energy. Potential investors or producers have to compete through a competitive bidding system. The criteria for the evaluation of the bids are set before each bidding round. The government decides on the desired level of electricity from each of the renewable sources, their growth rate over time, and the level of long-term price security offered to producers over time. The bidding

is accompanied by an obligation on the part of electricity providers to purchase a certain amount of electricity from renewable sources at a premium price. The difference between the premium and market price is reimbursed to the electricity provider, and is financed through a non-discriminatory levy on all domestic electricity consumption. In each bidding round the most cost-effective offers will be selected to receive the subsidy. The mechanism therefore leads to the lowest cost options.

In order to maintain a differentiation in renewable energy sources, the bidding may be differentiated in bands of different technologies and energy sources. This means that wind projects compete against other wind projects but not against, for example, biomass projects. The marginal accepted bid sets the price for the whole technology band.

1.6 Reading guide

The sources on which this report is based vary between Member States. Many of the descriptions of the policy instruments are based on policy documents and laws, others on secondary sources.

Per country an overview is given of the fuel mix in 1999, and the installed capacity from renewable energy sources in 1990, 1995 and 1999. The data used for the graphs and tables are Eurostat data. 1999 data is used because that data is complete and comparable to other years. In 2000 the Eurostat database changed some of its records and, as a result, is not easily comparable to previous years³. The aim of the fuel mix and installed capacity overview is to place renewable electricity production in the perspective of total electricity production in a country.

Then the targets and objectives are given. In many countries the EU renewables Directive targets are the main targets, but some countries have set other, more ambitious targets. Presenting the targets gives an idea of the urge to promote renewable electricity production.

The policy instruments are given next. The categorisation as described in this chapter is used.

Finally the country context is given. The institutional framework in which the policy instruments are created, implemented and regulated is given. The electricity sector and its main actors are described as well.

In a report like this there is always the possibility that errors are made, or that it is not totally complete. If you have comments, or find something that is not correct or should be added, please contact Hage de Vries (devries@ecn.nl, +31-22 456 4851). An update for 2004 is planned for which your comments are very much welcome.

³ Especially biomass categories differ from previous years.

2. AUSTRIA

2.1 Renewable energy in Austria

A large share of electricity in Austria is already produced from renewable energy sources, mainly hydropower (almost 68% in 1999). Gas and coal still account for about 23% of production.

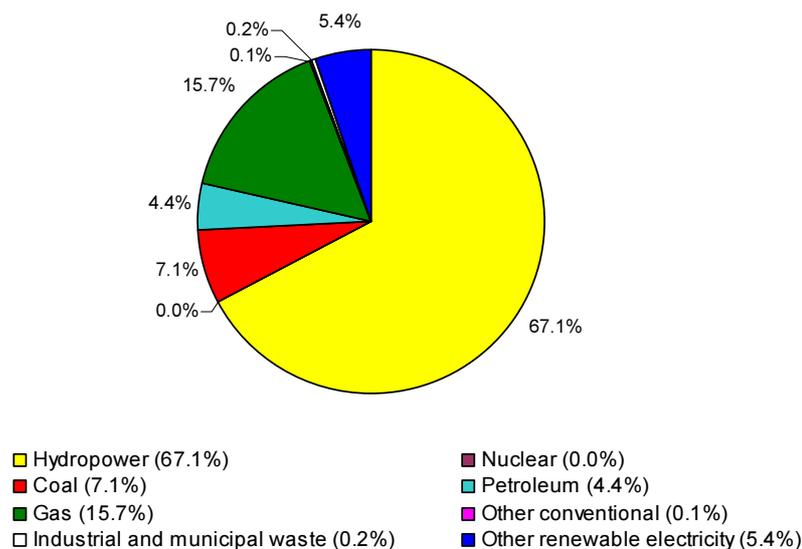


Figure 2.1 *Gross electricity production in 1999 in Austria*

Austria, sum of gross electricity production by all fuel types in 1999: 62.1 TWh (Eurostat).

Renewable sources other than hydro are becoming increasingly important. Especially the installed capacity of biomass (specifically wood waste) and wind is increasing.

Table 2.1 *Installed capacity in Austria in 1999 [MW]*

Austria	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	16690	17439	17726
Total thermal supply power stations	5740	6134	6160
Nuclear power stations	-	-	-
Total hydro-electrical production capacity	10950	11304	11531
Hydro plants < 1 MW	-	284	287
Hydro plants ≥ 1 MW and ≤ 10 MW	-	537	550
Hydro plants > 10 MW	-	10485	10835
Wind energy	0	1	35
Geothermal energy	-	-	-
Photovoltaics	0	1	2
Solar thermal	-	-	-
Municipal solid wastes ⁴	6	6	9
Wood/wood wastes	400	522	747
Biogas	0	0	0
Industrial wastes	0	0	0

(Source: Eurostat)

⁴ Municipal solid waste refers to the biodegradable fraction of MSW

2.2 Targets and objectives

Targets for renewable energy electricity implementation have been laid down in national law with the Acts EIWOG 1 (Elektrizitätswirtschafts- und organisationsgesetz, EIWOG, BGBl 1998/143) and EIWOG 2 (2000) and in the Renewable energy act (Ökostromgesetz, 2002). Targets for the percentage of energy from renewable sources are defined for 2001, 2003, 2005 and 2007. According to the EIWOG 2 and the Ökostromgesetz 4% of all electricity to be fed into the distribution network in the year 2007 should be produced from indigenous biomass combustion and digestion, wind, solar and geothermal sources. Besides this target there was a minimum quota for small hydro at 8% in EIWOG 2, which has been changed to an indicative target of 9% in the Ökostromgesetz. (ENER IURE, 2001), (De Lange et al, 2002), (Ökostromgesetz, 2002).

Table 2.2 *Renewable electricity targets for Austria in 2010*

78.1% of electricity from renewable sources of energy in:

- 62% from large scale hydroelectric plants (> 10 MW) without aid
- 9% from small scale hydroelectric plants (< 10 MW) supply tariffs
- 4% from green plants supply tariffs no detailed information for the proportions of wind power and biomass PV max. 15 MW
- 2-3% from other renewable sources Without aid (mixed incineration of household waste, animal bonemeal, etc.)

CHP:
Continuation of public remote heat and power aid tariff (additional cost in comparison with market price, electricity remains property of the CHP operator Saving primary sources of energy and therefore CO₂)

Source: E-control, 2003.

Table 2.3 *Ökostromgesetz targets for 2003, 2005, and 2007*

Targets	2003	2005	2007
% biomass, geothermal, solar, wind of electricity consumption	2	3	4
% hydro <10 MW of electricity consumption	8	9	9

2.3 Policy instruments

To realise the federal targets, both the Central State and the Provinces have several policy instruments. The targets first set by EIWOG functioned as minimum quota for the provinces. The provinces are free to fill in or extend the target, but most provinces have set their target at the minimum EIWOG level. Feed-in tariffs are the main instrument for RE stimulation at provincial level.

Besides the feed-in tariffs, the two main financial instruments that are used to promote RES are tax incentives and subsidies. Central State is responsible for the legislation concerning exclusive taxes (for example the electricity tax) and the Provinces are responsible for all the other taxes. Subsidies are the main policy instrument of the Provinces, but there are also programs on the federal level. Each Province has its own subsidy scheme (ENER IURE, 2002a). In the overview below the main policy instruments at both the Central State level and that of the Provinces are presented.

2.3.1 Policy Instruments at National Level

Feed-in tariffs

Under the EIWOG (1998) the system of feed-in tariffs worked as follows: The distribution system operators were obliged to buy renewable electricity offered by independent power producers and to pay minimum feed-in tariffs, which were defined by the governments of the nine Provinces. Each regional government set its own feed-in tariffs, quota and conditions for appliance. This resulted in a complicated and intransparent system, which was replaced in 2002 with the Green Electricity Law ('Ökostromgesetz')⁵. From January 2003, the Federal Government sets feed-in tariffs for new installations. The Ökostromgesetz sets uniform feed-in tariffs per technology for installations (to be) approved between 01-01-2003 and 31-12-2004 and put into operation before 30-6-2006. For installations approved before 31-12-2002 the feed-in tariffs of the provinces are still valid. In Annex A detailed information on the feed-in tariffs is presented.

- Name of the instrument: Ökostromgesetz⁶
Category: Feed-in tariffs
Applied from - until: 01-01-2003 - ongoing
Targeted technology: Solid biomass, fluid biomass, biogas, wind energy, photovoltaics, geothermal
Objective: Stimulate electricity production from Green Power Producers
Specification of the measure: Prices paid for:
 - Wind: 7.8 ct/kWh
 - Biomass and biogas: 10.2 - 16.5 ct/kWh (depending on installed capacity, subtractions for waste and co-combustion and technology)
 - Landfill: 3-6 ct/kWh
 - Geothermal: 7 ct/kWh
 - Small hydro: 3.15 - 6.25 ct/kWh (depending on achieved production and new/old investments)
 - PV: 47-60ct/kWh (depending on size of installation)The minimum period over which support under the Ökostromgesetz is given is 10 years, but the Ministerial Decree can increase this period. The 2002 ministerial Decree sets the period for 13 years.
- Name of the instrument: Elektrizitätswirtschafts- und organisationsgesetz (EIWOG)
Category: Feed-in tariffs
Applied from - until: Depending on province start between April and June 2000, end 31-12-2002
Targeted technology: Solid biomass, fluid biomass, biogas, wind energy, photovoltaics, geothermal
Objective: Stimulate electricity production from Green Power Producers
Operational period: Not specified in all cases (in general 10 years)
Specification of the measure: The governments of the Nine Provinces set the feed-in tariffs independently. The methods of categorisation and the height of the tariffs differ substantially between technologies and between provinces. The feed-in tariffs can be differentiated according to energy source, type and duration of contract, time of feeding in the electricity by season(summer/winter)and time of day (day/night/Weekend). Because of the different methods of Categorisation it is dif-

⁵ (Bundesgesetzblatt 2002).

⁶ Ökostromgesetzes, BGBl. I Nr. 149/2002.

difficult to compare between provinces. Example tariffs for solid biomass:

4.8 - 12.2 cent per kWh in Burgenland depending on time and season, 6.7 - 17.45 cent per kWh in Carinthia depending on quality of fuel and size of installation.

Investment subsidies

- Name of the instrument: Environmental Promotion Law: Umweltförderungsgesetz (UFG)⁷
Category: Investment subsidies
Applied from - until: 1993 - present, modified in 2002
Targeted technology: All RES
Objective: Stimulation of innovative technology
Specification of the measure: Because of guaranteed feed-in tariffs for 'green electricity' subsidies are given only for the heat producing part of a plant. Subsidies for electricity production will be only granted if a plant's technology exceeds state-of-the-art. As in that case the Community Guidelines would allow for higher subsidy rates than before, the national authorities for granting subsidies try to reach the maximum subsidy rate of 30% if possible. The subsidy rate is between 10% and 30%, depending on the type of investment.

Fiscal measures

- Name of the instrument: Electricity Tax Law: Elektrizitätsabgabegesetz⁸
Category: Fiscal measures
Applied from - until: 1996 - ongoing, modified in 2000
Targeted technology: Includes RES
Objective: Favour electricity production from RES by autoproducers
Specification of the measure: Tax exemptions are available to the electricity producers that produce electricity exclusively for their own use, if production does not exceed 5.000 kWh.

Green certificates

- Name of the instrument: Small-scale hydropower certificate
Category: Green certificates/quota system
Applied from - until: 2000 - 2002
Targeted technology: Hydropower between 10 kW and 10 MW
Objective: To increase the share of electricity generated from small hydro to 8% of the total of electricity generation
Specification of the measure: Electricity suppliers can use certificates to prove that domestic small-scale hydropower plants generate 8% of the electric energy sold to the final customers. The obligation to prove that 8% of their electricity consumption is met according to the quota is on final customers. In the case the electricity supplier or the final customer cannot prove compliance, the Provinces will impose an equalisation levy or fine on them. The Provinces calculate the levy based on the difference between the average production costs of small-scale hydropower plants and the market price. The quota and certificate system was ended on 1-1-2003.

⁷ BGBl. Number 185/1993 and amended BGBl. I Number 56/2002. (ENER IURE Database).

⁸ BGBl. Number 201/1996 and amended BGBl. I Number 26/2000. (website E-Control).

2.3.2 Policy Instruments at Province level

The main instrument that was available for the Provinces was the feed-in system in the EIWOG. With the introduction of the Ökostromgesetz, only fiscal measures and subsidies are available to the Provinces.

Fiscal measures

- Name of the instrument: The Electricity Tax Law
- Category: Fiscal measures
- Applied from - until: 1996 - ongoing, modified in 2000
- Targeted technology: All RES
- Objective: Implementation of energy saving and environmental protection measures, including measures for the promotion of RE.
- Specification of the measure: 11.8% of the tax revenue is available for the Provinces. The Provinces may substitute environmental expenditures from their own budgets, so they are not obliged to use these revenues additionally.

Investment subsidies

Subsidies are important instruments for the Provinces to stimulate investments in production of electricity from renewable electricity sources. They differ between Provinces, but typically have a short duration and local validity.

2.4 Country context

2.4.1 Institutional framework

Austria is a Federal State consisting of nine different Provinces⁹ (Bundesländer). Concerning legislation there are three levels, namely the level of Central State (Bund), the level of Provinces (Länder) and the level of local municipalities (Gemeinden). Two parliamentary chambers deal with Federal legislation, namely the National Council (Nationalrat) and the Council of Provinces (Bundesrat). The Provincial governments are relatively autonomous on the field of legislation as well as administration when it concerns own provincial matters. The local municipalities are relatively bound to the framework that is set up by the Central State and the Provinces (ENER IURE, 2002a).

Concerning energy policy Central State and the Provinces have the following objectives (ENER IURE, 2001):

- ensuring security of energy supply,
- integrating energy, environmental and societal policy,
- improving energy efficiency and promoting the use of renewable energy sources,
- introduce more market orientation in the energy supply industry, especially in the electricity sector.
- developing policy responses to international developments, especially those arising from Austria's accession to the European Union.

⁹ These provinces are Burgenland, Carinthia (Kärnten), Lower Austria (Niederösterreich), Salzburg, Styria (Steiermark), Tyrol (Tirol), Upper Austria (Oberösterreich), Vienna (Wien), Vorarlberg .

The responsibility for energy is not explicitly mentioned in Austria's Constitution, and energy issues are regulated by a large number of laws. The electricity sector, however, is explicitly mentioned in the Constitutional Law. The following competencies are given to the Central State (ENER IURE, 2001, p.3):

- legislation and execution in respect of the standardisation and typology of electrical plants and installations,
- safety measures in this field and the rules governing high tension lines, provided that the lines extend across more than one Province,
- the adoption of framework legislation on all other matters.

The following competencies are given to the Provinces (ENER IURE, 2001, p.3-4):

- setting rules governing high tension lines (covering all lines as well as transformation, conversion and switchboard plants over 1 kV) where the lines extend to only one Province,
- filling in the remaining areas of electricity law, with in particular the 'core legislation' on the organisation and regulation of the electricity sector.

The distribution of the competencies within the Central State between the Federal Ministries is regulated by the Federal Ministries Act¹⁰. The Federal Ministry of Economic Affairs is responsible for matters concerning the energy sector. At the Provincial Level these matters are assigned to different portfolios (ENER IURE, 2002c).

2.4.2 Electricity sector

Since the first of October 2001 the Austrian electricity market is fully liberalised.¹¹ This was approved by the Austrian Parliament in July 2000 by an amendment of the Electricity Act of 1998, (Law on the Organisation of the Electricity Industry: EIWOG¹²). The EIWOG 2000 implements the EU Electricity Directive¹³ on the common rules for the internal market in electricity.

The EIWOG 2000 provides the general framework for the new electricity market. This framework is complemented by laws of the Nine Provinces and by ministerial regulations. The Provincial Electricity Acts focus on the authorisation criteria for new power plants and on details on public service obligations and renewable promotion. Two ministerial regulations concern transmission pricing principles and stranded cost compensation modalities (De Lange et al, 2002).

The EIWOG 2000 has the following key elements:

- Designation of three control areas with independent system operators,
- Formation of balance groups (with a representative) which are virtual groups of suppliers and customers within which the amount of electricity procured (scheduled purchase volume, feed-in) and supplied (scheduled supply volume to customers, feed-out) are balanced.
- Creation of two clearing and settlement agencies (one for the Provinces Vorarlberg and Tyrol, one for the remaining Provinces) which are responsible for transactions and price formation with regard to balancing energy and balance groups.
- Prohibition of electricity imports from third countries where electricity production does not comply with the state of the art, fails to provide proof of the proper disposal of wastes or jeopardises the life or health in the Federal territory.
- Introduction of small-scale hydropower certificates (up to 10 MW). Electricity suppliers have to prove with such certificates that they provide at least 8% of their deliveries to final

¹⁰ Federal Law Gazette No. 389/193. In German this is the 'Bundesministeriengesetz'.

¹¹ Main reference for this paragraph: (ENER IURE 2001)

¹² Federal Law Gazette I number 143/1998. In German this is the Elektrizitätswirtschafts- und Organisationsgesetz.

¹³ EU Directive 96/92/CE.

customers from small-scale hydropower sources. This quota obligation/green certificate system was ended with the introduction of the Ökostromgesetz.

- Obligation to purchase eco-electricity (CHP energy only up until the end of 2004). Network operators have to prove that they purchase at least 4% of the final consumption in their grid area from such 'green' generators.
- Labelling of the electricity supply (fuel-mix of generation) to final consumers.
- Establishment of a new regulatory authority (Elektrizitäts-Control Commission and Elektrizitäts-Control GmbH).

The EIWOG 2000 has the following key objectives:

- To provide electricity of high quality at reasonable prices for the Austrian people and for Austrian industry.
- To create a market organisation for the electricity sector in accordance with EU primary law and the principles of the internal market in electricity in accordance with Directive 96/92/EC of 19 December 1996 concerning common rules for the internal market in electricity.
- To increase further the proportion of renewable energy in Austria electricity sector.
- To offset public service obligations imposed upon electricity undertakings in the general economic interest relating to the security, including security of supply, regularity, quality and price of deliveries, as well as to environmental protection.

The implementation of the legislation has to lead to five obligations that the electricity companies have to comply with. Electricity companies are obliged:

- To grant equal treatment to all customers connected to a grid.
- To conclude private-law agreements with grid users, providing for their connection to the grid (general obligation to connect).
- To set up and maintain an adequate grid infrastructure to ensure domestic electricity supply and the performance of obligations under public international law.
- To perform any obligations provided by law in the general economic interest.
- To purchase electric energy from generating plants using renewable energy sources.

3. BELGIUM

3.1 Renewable energy in Belgium

Electricity in Belgium is mainly produced from nuclear, gas and coal plants. Hydro plants produce most of the renewable electricity. The installed capacity of wind energy and biomass is increasing.

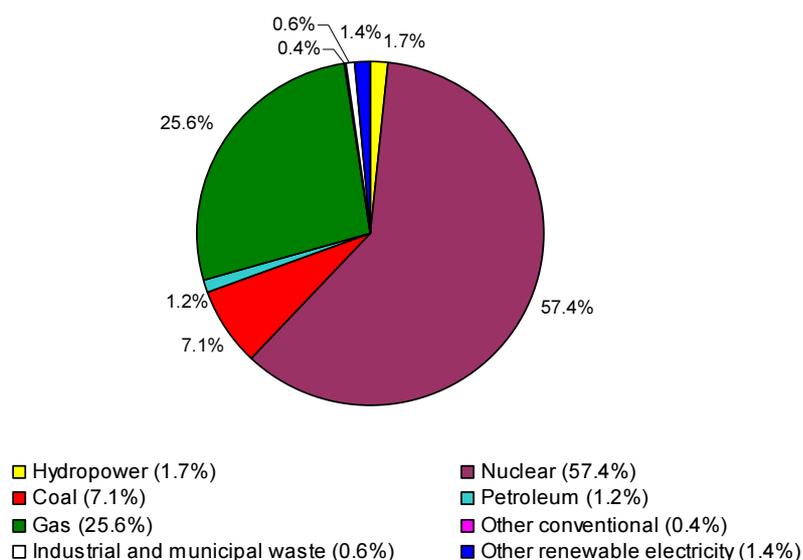


Figure 3.1 *Gross electricity production in 1999 in Belgium*

Source: Eurostat.

Table 3.1 *Installed capacity in Belgium in 1999 [MW]*

Belgium	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	14145	14916	15569
Total thermal supply power stations	7240	7877	8442
Nuclear power stations	5500	5632	5713
Total hydro-electrical production capacity	1400	1403	1404
Hydro plants < 1 MW	-	5	6
Hydro plants ≥ 1 MW and ≤ 10 MW	-	54	54
Hydro plants > 10 MW	-	43	43
Wind energy	5	4	10
Geothermal energy	-	-	-
Photovoltaics	0	0	0
Solar thermal	-	-	-
Municipal solid wastes	0	0	0
Wood/wood wastes	0	0	12
Biogas	0	0	9
Industrial wastes	0	0	0

Source: Eurostat.

3.2 Targets and objectives

The targets for renewable energy implementation are set at different levels. The Federal target is to raise the share of renewables (excluding waste) in electricity production from 1.9% (1999) to 3% in 2004. An official national targets after 2004 has not yet been set. The EU directive indicative target for electricity from renewable sources in 2010 in Belgium is 6%. The specific target for Flanders is 900 GWh electricity generated from RES by 2004 and 5% by 2010. Two thirds should be provided by wind energy, and the remainder is generated from biomass sources. The Walloon government has set its targets at 4.1% by 2004, and 12% by 2010 (including CHP using waste). In the Walloon region, priority is given to use of biomass, including organic waste, followed by small-scale hydropower, active and passive solar thermal applications and wind energy. The Brussels region has not set targets on shares of energy consumption to be provided by renewable sources.

Table 3.2 *Share of RES-E in 2000 and targets 2010 (indicative EU targets)*

Targets	[%] RES in 2000	[%] RES in 2010
[%] RES of electricity consumption	1.9	6.0

Table 3.3 *Regional RES-E targets for 2004 and 2010*

Region	[%] RES-E in 2004	[%] RES-E in 2010
Flanders	3	5
Wallonia	4.1	12
Brussels-Capital	n/a.	n/a.

3.3 Policy instruments

The main policy instruments for the stimulation of renewable energy at Federal level have been a feed-in system, a 13.5% tax abatement for investments in renewable energy technologies, and a 20% investment subsidy for schools and hospitals. In Flanders and Wallonia a quota obligation/green certificate system was developed.

Feed-in tariff

- Name of the instrument: Green Franc system
- Category: Feed-in tariffs
- Area: Country
- Applied from - until: 1995, modified in 1998. Projects implemented before 2003 receive support during 10 years.
- Targeted technology: All RES
- Objective: Increase supply of renewables
- Area: Production in Belgium
- Specification of the measure: Premium remains in place for 10 years, and for technical lifetime for PV projects. 5 ct/kWh for wind or hydro (<10 MW). 2.5 ct/kWh for other renewable energy sources

Green certificates/quota system

Major developments at regional level have taken place for renewable energy stimulation schemes in 2002. Flanders has introduced an obligation system with tradable green certificates in 2002. Wallonia is still in the process of developing such a system. The Flemish obligation was set at 1.4% in 2002, and will increase to 5% in 2010. The penalty level also increases in time. Furthermore, minimum prices for the green certificates are set per renewable energy. The Walloon Green Certificate System sets obligations on the supply from Renewable energy and CHP, increasing from 4% in 2004 to 12% in 2010. Only certificates originating from Wallonia

count in meeting the obligation. The Brussels region has introduced the possibility of also designing a Green Certificate System, but it is not clear when and if this system will be implemented.

Flanders

- Name of the instrument: Green Certificates Flanders
Category: Green certificates/quota system
Applied from - until: 2002 - ongoing
Targeted technology: All RES
Area: Production in Flanders (including Flanders off shore area)
Objective: Increase production of electricity from renewable energy sources
Specification of the measure: May be reviewed.
Obligation on all electricity supply licence holders to provide a certain percentage of electricity generated from renewables. This obligation is set to 1.4% for 2002, 2.05% for 2003, 3% for 2004, and 5% in 2010 (BEV, 2002). If a supplier cannot meet the obligations, a fine is imposed. The fines increase over time: from 50 Euro per missing certificate in 2002 to 124 Euro per missing certificate in 2005. Until the beginning of 2003, only electricity produced from renewable sources in Flanders was eligible to meet the obligation. Since February 2003 foreign production is eligible, but is excluded from the exemption of distribution charges, which is valid for national production. There are no minimum prices for green certificates.

Wallonia

- Name of the instrument: Green Certificates Wallonia
Category: Green certificates/quota system
Applied from - until: Not operational yet
Targeted technology: All RES and CHP
Objective: Increase production of electricity from renewable energy sources and CHP
Area: Only certificates produced in the Walloon region are eligible for meeting the quota.
Specification of the measure: An obligation on suppliers to meet a quota of electricity demand by electricity from RES and CHP. The quota increases from 3% in the first year to 7% in the fourth year (October 2007) Certificates have a fixed price of 65 € per certificate. If the quota is not reached, a fine is imposed of 75 € per certificate. From 1-4-2003 this fine is increased to 100 € per missing certificate.

Brussels-capital

- Name of the instrument: Green Certificates Brussels-capital
Category: Green certificates/quota system
Applied from - until: Not operational yet
Targeted technology: All RES
Objective: Increase production of electricity from renewable energy sources
Specification of the measure: In Brussels-Capital, a system of green certificates will be possibly set up.

Investment subsidies and fiscal measures

At regional level, subsidy schemes have been in place for renewable energy technologies since 1993. These subsidy schemes have had a broader scope than the stimulation of renewable energy implementation. The subsidy system in Flanders stimulates investments in renewable energy technologies or other environmental technologies. The subsidy schemes in Wallonia include both purchase and production for export of energy efficiency and renewable energy technologies. The subsidy for the private sector amounted to up to 15% of eligible costs. Subsidies in the Brussels region have had a stronger focus on energy efficiency than on renewable energy.

There are also several national schemes that focus on investment support. These include a 20% federal subsidy for investments in renewable energy installations by hospitals and schools (the Royal decree of 1983), a subsidy for investment for energy efficiency and renewable energy technologies, and tax reductions for industrial investments in renewable energy systems. Further, the RUE/ Electricity Generation Fund is used to support industrial product development and demonstration projects on renewables.

- Name of the instrument: Decree 15.12.1993.
Category: Investment subsidies
Applied from - until: 1993-1999
Targeted technology: All RES
Area: Country
Objective: Increase saving of energy from fossil sources
Specification of the measure: Subsidies to companies for investment in energy efficiency and renewable energy range from 10% for medium-sized and large organisations to 20% for small enterprises. The utility sector is excluded from this subsidy. For the stimulation of PV, the Flemish authorities also provide a subsidy of 75% for the installation of photovoltaic panels, 25% of which provided by the electricity producers Electrabel and SPE.
- Name of the instrument: Fiscal deduction on investments (industrial sector)
Category: Fiscal measures
Applied from - until: Applied since 1992
Targeted technology: All RES
Area: Country
Objective: Direct: increase energy efficiency in the industrial sector.
Indirect: increase supply of electricity from RES
Specification of the measure: A percentage of the investment costs can be deducted from the taxable income. The percentage is determined by the Ministry of Finance on an annual basis. In 2002 the rate of eligible deduction was 13.5%. The relevant regional governments are responsible for the certification of eligibility and conformity of the completed investment

3.4 Country context

3.4.1 Institutional framework

Belgium has a complex political structure. The Kingdom of Belgium is a Federal State consisting of three Regions (Flanders, Wallonia and Brussels-Capital). The federal structure of Belgium implies a division of competence, where the responsibilities are divided between the Federal Government, Regional Governments, provincial authorities and town and municipal councils. The operation of the electricity market, including the market for green certificates, and

conditions for electricity produced from renewable energy, is regulated by federal law (of 29 April 1999) which has to be complemented by regional decrees (UNF, 2002). While the Federal government is responsible for the large infrastructure for production and transmission, the regional government is responsible for distribution of electricity through low voltage networks (<70 kV). Renewable energy programmes including financial incentives can be provided at both levels.

The Law on liberalisation (April 5, 2000) requires that a minimum level of electricity produced by RES should be purchased by utilities at a reasonable price. The law also stipulates that a mechanism to cover the associated costs should be established such as a charge placed on electricity transmission or included in electricity prices for consumers. Distribution of electricity produced from renewable sources within Belgium is free of charge. The Belgian Federal Government has decided that parties who meet a significant part of their electricity demand with renewable energy (including autoproducers) will be progressively eligible to choose their electricity supplier.

With the introduction of free choice of electricity suppliers for households in July 2003, the electricity market in Flanders will be completely free. In the Brussels and Walloon areas the household markets will be liberalised in 2005 or later.

With the phased liberalisation of the electricity market, the responsibilities of monitoring of the market are gradually being moved from the national Monitoring Committee to federal and regional regulators: CREG (the Electricity and Gas Regulatory Committee) at *the* federal level, and VREG, BIM/IBGE and CWAPE in the Flanders, Brussels and Walloon region respectively.

3.4.2 Electricity sector

Electrabel dominates the Belgian electricity market (leading shareholder in Electrabel is Tractebel, which is the energy unit of Suez). Electrabel effectively has a monopoly on production, strong control on imports, and more than 60% of shares in the electrical transmission network operating company Elia.

4. DENMARK

4.1 Renewable energy in Denmark

The electricity production in Denmark is mainly based on coal and gas, which account for about 75% of national production of electricity (1999 statistics). Combined heat and power production has been strongly stimulated by government, on the one hand by not granting permits to thermal electricity production plants producing only electricity, and on the other hand by imposing obligations and enforcing regulations for a heat infrastructure and demand.

The use of biomass for electricity, but mainly for heating has been strongly facilitated in Denmark by the existence of heat demand and a heat infrastructure. Since the 1980s, new heating plants were based on biomass and many existing heating plants were converted to straw or chips.

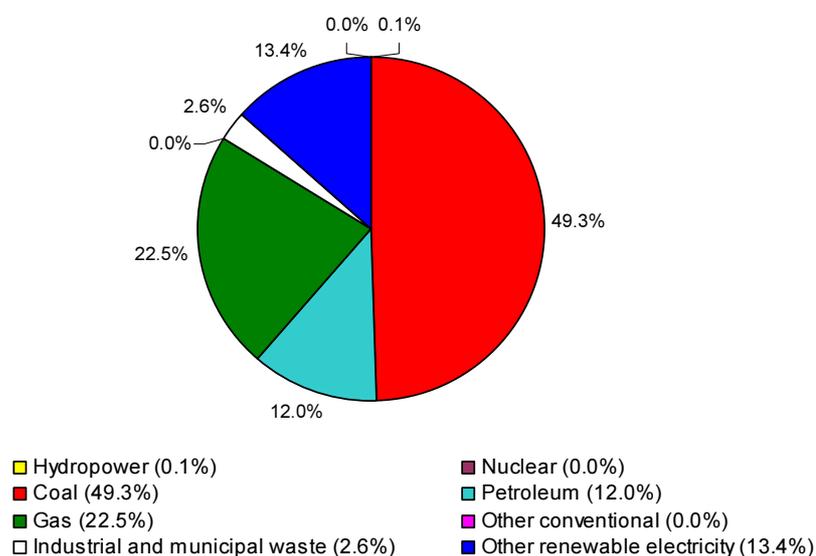


Figure 4.1 *Gross electricity production in 1999 in Denmark*

Source: Eurostat.

The development of wind capacity really took a flight in 1999. From 1999 to 2001 this trend continued.

Table 4.1 *Installed capacity in Denmark in 1999 [MW]*

Denmark	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	9133	10691	12728
Total thermal supply power stations	8780	10064	10946
Nuclear power stations	-	-	-
Total hydro-electrical production capacity	10	8	11
Hydro plants < 1 MW	-	6	5
Hydro plants \geq 1 MW and \leq 10 MW	-	4	6
Hydro plants > 10 MW	-	0	0
Wind energy	343	619	1771
Geothermal energy	-	-	-
Photovoltaics	-	-	-
Solar thermal	-	-	-
Municipal solid wastes	0	153	302
Wood/wood wastes	40	40	177
Biogas	20	17	22
Industrial wastes	0	0	0

(Source: Eurostat)

4.2 Targets and objectives

An important policy document regarding renewable energy is ‘Energy 21’, dating from 1996. This document contains the official Danish long-term energy plan, including the target to achieve 20% of electricity consumption (6.8 TWh) from renewables by 2003. This target was supported by the Danish Electricity Reform Agreement. The 20% target has already been surpassed. Targets are also set in Agreements with industry and electricity utilities. The Biomass Agreement, originally adopted by the Danish Government in 1993, includes objectives for the use of biomass until 2004. The plan was that biomass should cover 10% of the total consumption in year 2000. This term was extended to 2005. An agreement on wind turbine development was made in February 1996 between the Minister for Environment and Energy and the electricity utilities. Utilities became responsible for reaching a target of 1500 MW owned by private and utilities by 2005. This objective was already reached by the end of 2000, when almost 2.100 MW wind energy was installed. As a long-term goal 50% of primary energy use in 2030 (79% of electricity by 2030) was set. The EU renewables directive target is set at 29.0% electricity consumption from renewable electricity sources. In 1997 the percentage electricity from renewable sources was 8.7%.

Table 4.2 *Share of RES-E in 2000 and targets 2010 (EU indicative target)*

Targets	[%] RES in 1997	[%] RES in 2010
[%] RES of electricity consumption	8.7	29.0

4.3 Policy instruments

The main instruments used to promote renewables in Denmark are a feed-in system, political obligations, investment subsidies and tax refunds. A Green Certificate Market was planned to replace the existing feed-in system from January 2003. However, the introduction of such a green certificate system has been postponed indefinitely due to concerns from the renewable energy sector about the market for green certificates, especially in the European context. An intermediate scheme has been designed for the period until the introduction of green certificates.

Feed-in tariffs

Since 1993 the utilities are obliged by law to pay wind turbine owners a kWh price at 85% of the electricity price for household consumers, excluding charges (electricity tax, CO₂ tax, SO₂ tax and VAT¹⁴) and with a deduction for administrative costs. In addition there was a public subsidy for electricity production with private wind turbines of 0.17 DKK/kWh (2.3 ct/kWh). Also the Danish Government reimbursed wind turbine owners the 0.10 DKK/kWh CO₂-tax (1.4 ct/kWh). As a result, in 1998 the average selling price of electricity from private wind turbines was approximately 0.6 DKK/kWh (8.1 ct/kWh). Power utilities that own a wind turbine only receive the reimbursement of the CO₂ tax. Biomass production received a comparable level of support. This system has been changed in 2001.

- Name of the instrument: Electricity Act 31 May 1996
Category: Feed-in tariffs
Applied from - until: from 1996 until 1999
Targeted technology: Geothermal, tidal, biogas, wind, hydro
Biomass and solar PV
Objective: Stimulation of RE production
Specification of the measure: Utilities have to give priority access to renewable energy production, and pay a favourable buy-back rate at 85% of the consumer price of electricity in the area.
- Name of the instrument: Electricity Reform Agreement of 1999
Category: Feed-in tariffs
Applied from - until: from 1999 until 2001
Targeted technology: Geothermal, tidal, biogas, wind, hydro
Biomass and solar PV
Objective: Stimulation of RE production
Specification of the measure: The agreement establishes the framework of the manner in which consumer protection, environmental considerations and security of supply are to be safeguarded in the coming liberalised electricity market. One of the subjects in the agreement is the transformation of electricity production subsidies for renewable energy (RE). A market-based mechanism will be introduced for trade in renewable energy to ensure a cost-effective development of renewable energy production. To develop a market for electricity from renewable energy sources the introduction of green certificates was announced. In the Electricity Reform Agreement it was assumed that by 2003 a well-functioning green certificate market would be established.

Adaptations in 2001

In anticipation of the start of the green certificate market, new tariffs were adopted in 2001. The support is generally lower than that in previous policies. For example for onshore wind energy, the tariff set for electricity from new plants for the first running period is nearly 30% lower than that for existing plants.

¹⁴ In 1998 the price of electricity from power distribution utilities is approximately 0,37 - 0,45 DKK/kWh (5.2-6.3 ct/kWh). For private consumers a number of taxes are added to this price. In 1998 the electricity tax was 0,46 DKK/kWh (6.4 ct/kWh). The CO₂ tax is 0,10 DKK/kWh (1.4 ct/kWh). The SO₂ tax is 0,009 DKK/kWh (0.126 ct/kWh). On top of this 25% VAT is added. In 1998 the average consumer price for private consumers was 1,28 DKK/kWh (17.9 ct/kWh).

- Name of the instrument: Adaptation of the Electricity reform Agreement¹⁵
 Category: Feed-in tariffs
 Applied from - until: 2001 - 2002
 Targeted technology: All RES
 Objective: Stimulate the production of electricity from renewable energy sources
 Specification of the measure:
 - Non-utility wind turbines commissioned before 1 January 2000 receive 0.60 DKK/kWh (8.1 ct/kWh) until a certain 'full-load hour ration'¹⁶ has been used up, subsequently 5.8 ct/kWh until the wind turbine is 10 years old. No support is given when the turbine is older than 20 years.
 - Wind turbines commissioned in 2000, 2001 or 2002 receive 5.8 ct/kWh for the first 22,000 full-load hours. After that, up to 20 years operation, the tariff is reduced to 1.3 ct/kWh. The value of green certificates is additional to this feed-in tariff.
 - For wind turbines established by the electric utilities and mandated under the previous Electricity Supply Act, slightly different rules apply.
 - Maximum feed-in (including carbon taxes) has been set at 4.8 ct/kWh. This maximum is also valid for off-shore wind energy.
 - Electricity from biomass maintains the feed-in tariff of 8.1 ct/kWh.

Repowering for wind

The repowering scheme for wind turbines was agreed in the Danish Electricity Reform Agreement in 1999 and implemented in spring 2001. The Repowering scheme consists of two measures: a lower price for electricity produced by turbines older than 10 years, and a favourable electricity price when turbines below 100 kW (and in some cases 150 kW) are replaced by new turbines with a capacity up to 3 times as large. The scheme entitles new wind turbines that replace small turbines to an additional production subsidy of 8.1 ct/kWh.

Fiscal measures

- Name of the instrument: Fiscal incentive for wind energy
 Category: Fiscal measures
 Applied from - until: 1997 - present
 Targeted technology: Wind
 Objective: Support investments in wind energy
 Specification of the measure: The first 400 €/year of income is tax-free for individual persons who participate in wind energy co-operatives. The remainder is taxed at a 60% rate. An individual person can own up to 20,000 kWh/year-worth of shares in the co-operatives.

Obligations

Obligations have been imposed on electric power utilities to use certain amounts of biomass and to buy electricity from wind turbines and CHP plants at elevated prices. Also, obligations forced natural gas utilities to promote solar heating and district heating companies to use biomass. In

¹⁵ (van Sambeek, 2003).

¹⁶ Full load hour ration depends on the size of the turbine: 12000 hours for turbines >600 kW, 15000 hours for turbines between 200 and 600 kW, and 250000 hours for smaller turbines.

relevant geographic areas, to secure a maximum level of profitability to the investments, consumers are obliged to connect to district heating.

Auto-producers (i.e. industrial CHP-plants or micro-CHP plants that only supply part of their electricity to the grid) can use the auto-produced electricity to replace part of the obligation that all electricity consumers have to buy a certain fraction of their electricity as CHP or renewables.

Investment subsidies

Subsidisation of investment in renewable energy technologies follow from Act on utilisation of Renewable Energy Sources, which is detailed in a number of Executive orders and amendments.

- Name of the instrument: Act on utilisation of Renewable Energy Sources
 - Utilisation of Renewable Energy Sources Executive order. No. 692 (1999)
 - Executive order on grants to plants using renewable energy sources. No. 180 (1997)
 - Executive order to amend act on utilisation of Renewable Energy Sources, Act no. 427 (1997)
- Category: Investment subsidies
Applied from - until: from 1996 (1997 for tidal) - ongoing
Targeted technology: solar PV, wind, CHP, biomass, biogas, tidal
Objective: Increase in RE investment
Specification of the measure: The subsidy varies between 15 and 30% of the construction costs for standardised RE-equipment and up to 50% for development projects. For standard equipment subsidies amount to up to 30% of eligible costs for biogas plants and 16% for biomass installations. The maximum of the grant is 132.450 €. Many investment subsidies were cut in 2002.

4.4 Country context

4.4.1 Institutional framework

The Kingdom of Denmark is a democracy with directly elected Parliament (Folketinget). The Danish government elections in November 2001 resulted in a change of approach of government policies towards a focus on economic efficiency. This approach is presented in the reports: *'The Liberalisation of the Energy Markets'* (September 2002) and *'Conditions for Growth in Denmark: The Danish Growth Strategy'* (August 2002). This has had a large impact on renewable energy policy. The 'Energy 21', published in 1996, is still regarded as a basis for renewable energy policy.

The Ministry of Economic and Business Affairs is granted much authority by the electricity Supply Act, so that the regulatory body (ERA) and the energy authority (EA) are in fact subordinated to the government policy, making economic consideration secondary to decision making (Connor 2002). It is the responsibility of the Danish Energy Authority to administer energy policy schemes and follow through the liberalisation of the electricity and gas markets and to lay down guidelines for production and distribution of energy.

4.4.2 Electricity sector

The transmission network in Denmark is divided into two separate systems. One network covers the Western part of Denmark (Jutland and Funen) and is linked to the UCTE net. Eltra operates this network. The second network covering the eastern part of the country, is operated by Elk-

Elkraft System, and is linked to the Nordel net. A mixture of municipalities, consumer co-operatives and joint stock companies owns the distribution network.

Access to the transmission and distribution network occurs following the principle of regulated third party access. The non-distance related postage stamp principle is applied for use of both networks. The tariffs are published, e.g. on Internet (www.eltra.dk and www.elkraftsystem.dk).

A levy on the use of the distribution network awaits introduction, depending on approval of the European Commission. The suggested levy amounts to DKK 0.04 per kWh (0.56 ct/kWh) for households, and DKK 0.01 per kWh (0.14 ct/kWh) for VAT-registered companies for up to 15 GWh.

Concerning the construction of new generating capacity, Denmark has chosen the authorisation principle, combined with a tendering procedure for the construction of off shore wind parks. The Electricity Supply Act (ESA) specifically excludes nuclear power as an option.

The production of electricity is split between traditional production and 'prioritised production', covering 'eco-friendly (renewable) electricity based on wind power, biomass and small-scale combined heat and power (CHP)'. Presently, as a result of earlier agreements, the system operators are obliged to purchase the prioritised production at fixed, high billing prices.

5. FINLAND

5.1 Renewable energy in Finland

The fuel mix for electricity production in Finland consists of non-renewable energy sources (nuclear power, fossil fuels including peat) and renewable energy sources (hydropower and wind power).

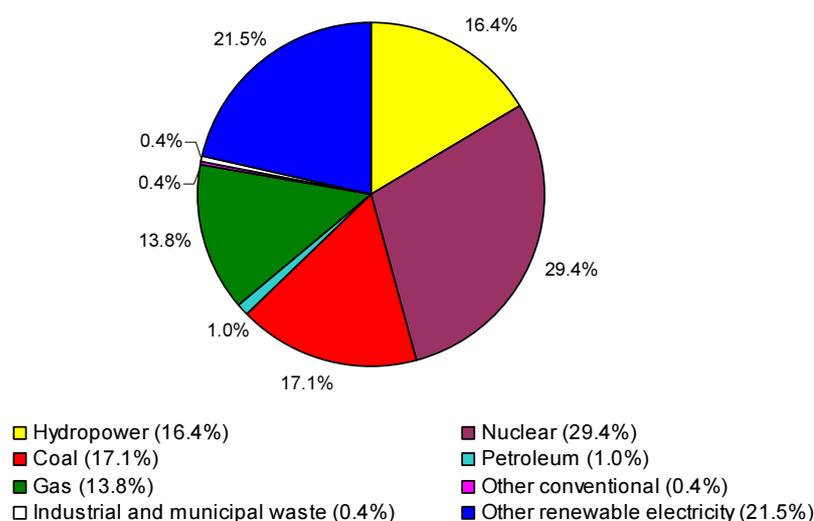


Figure 5.1 *Gross electricity production in 1999 in Finland*

Source: Eurostat.

Table 5.1 *Installed capacity in Finland in 1999 [MW]*

Finland	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	13220	14433	16164
Total thermal supply power stations	8240	9340	10605
Nuclear power stations	2360	2310	2640
Total hydro-electrical production capacity	2620	2777	2881
Hydro plants < 1 MW	-	25	30
Hydro plants \geq 1 MW and \leq 10 MW	-	285	274
Hydro plants > 10 MW	-	2460	2577
Wind energy	0	6	38
Geothermal energy	-	-	-
Photovoltaics	0	0	0
Solar thermal	-	-	-
Municipal solid wastes	1	1	0
Wood/wood wastes	983	1174	1200
Biogas	0	0	0
Industrial wastes	0	0	0

Source: Eurostat.

The data show a considerable growth of installed capacity for wind power. Within ten years the capacity has grown from 0 MW to 38 MW. In comparison the net installed capacity of hydro-power has grown over ten years from 2620 MW to 2881 MW (8.3%).

5.2 Targets and objectives

In April 1999 the Finnish Ministry of Trade and Industry published an Action Plan for Renewable Energy Sources in Finland. In the Action plan targets are given for the development of electricity production from renewable energy sources. The program objective is to enhance the penetration of RES technology on the market and increase the consumption of electricity from RES in absolute terms by 50% from the year 1995 to 2010. However, as the primary energy consumption will also grow in the future, this increase is not as high in relative terms. The same target of doubling the output also applies to electricity generation using renewable energies. Targets in the EU directive on Renewable Energy Sources are an increase up to 31.5% RES-E in 2010. (Act. Plan)

Table 5.2 *Share of RES-E in 2000 (realisations) and targets 2010 (EU indicative target)*

	Realisation	Target
[%] RES of electricity consumption	24.7 (1997)	31.5

5.3 Policy instruments

The main policy instruments used in Finland for renewable support are fiscal incentives - a refund for RES-E producers from tax revenues - and investment subsidies.

There are not many laws or programmes that are designed for Renewable Energy Policies specifically. The most important programmes before 1997 were the Bioenergy Promotion Programme, approved by the Government in 1994 and the Wind power Programme drawn up by the Ministry of Trade and Industry in 1993. The objective of the Bioenergy Promotion programme was to increase the use of Bioenergy by 25% between 1992 and 2005. The wind power programme aims at construction of 100 MW of wind power capacity by 2005.

In 1997 the Finnish government approved the Finnish Energy Strategy. In this strategy the role of renewable energy sources was:

- guiding the energy production structure towards an energy balance with a lower carbon content,
- promotion of the use of bioenergy and other indigenous energy,
- maintaining the high standard of energy technology,
- ensuring the security of supply in the energy sector,

In April 1999 the Finnish Ministry of Trade and Industry published an Action Plan for Renewable Energy Sources in Finland.

- Name of the instrument: Motion 510/98
- Category: Feed-in tariffs
- Applied from - until: 1998 - ongoing
- Targeted technology: Wind, biomass, small hydro < 1 MW
- Objective: Stimulate the production of renewable energy sources
- Specification of the measure: The electricity tax paid by consumers is refunded as subsidy to the producer. Wind: 0.69 ct/kWh
Biomass : 0.42 ct/kWh
Small hydro: 0.42 ct/kWh
It has been proposed the electricity production support for forest chips should be higher, 0.69 ct/kWh. Also under discussion is that electricity production from sorted waste material should get electricity production support (ENER-IURE, 2002b).

- Name of the instrument: Energy support subsidies based on state decision 29/99
- Category: Investment subsidies
- Applied from - until: 1999 - ongoing
- Targeted technology: Wind, other renewables
- Objective: To support investment in production capacity from renewable energy sources.
- Specification of the measure: The Council of State decision 29/99 sets the following *maximum* percentages of subsidy (% of total investment):
 - Wind power investment, 40%
 - Other investments in renewable energy, 30%

Projects involving innovative technology have the priority. The maximum percentages, shown above, are applied to new technology only.

In 2001 investment support was 21 million Euro, of which about 80% was for renewable energy sources. For wood fuels investments were 13.8 million Euro for 100 plants. Especially investment for pellet utilisation increased in 2001. In 2002 energy investment support was 25 million Euro (Enerdata, 2002; ENER-IURE, 2002b).

5.4 Country Context

5.4.1 Institutional framework

The Republic of Finland is a democracy, with one chamber of Parliament. All legislation in Finland is put down on a national level. The regional or local authorities have no competence to give legislation. Finnish electricity legislation is mainly the same for different energy sources. Finland has only special RES legislation for hydropower, which regulates the utilisation of rivers.

All legislation is compulsory for authorities and users. Only some fiscal legislation aids will be granted only by application. The District Customers Houses manage the tax rebates from electricity tax and excise taxes. Local offices of the Ministry of Trade and Industry manage investment aids, when the total eligible investment costs are less than 1.7 million EUR. The Energy Department in the Ministry of Trade and Industry manages larger investment and demonstration projects. Most of the public energy R&D funds are granted through Tekes, the National Technology Agency.

5.4.2 Electricity sector

The most important legislation for electricity related measures in Finland were updated in 1994, when the Finnish market was opened up for competition. The Electricity Market Act (Sähkömarkkina-laki 386/1995) and the amendments 1018/1995, 332/1995, 138/1999 and 466/1999 app. 1) and the Electricity Market Decree (Sähkömarkkina-asetus 518/1999, app. 2) were approved by the Parliament on 9 February 1995 and took effect on 1st of June 1995. With this legislation the Finnish were the third country in Europe to liberalise the energy market.

The Electricity Market Act aims to improve the efficiency and competitiveness of electricity generation, transmission and distribution. Under the key features of the new Act, transmission and distribution networks were opened to all participants, distribution companies are unbundled, and they lost their franchise rights in sales. Also the protection of the small consumers was taken into account. Since November 1998 all customers can change suppliers. Generation, sales

and import/export are under competition (state decisions 836/2000, 905/2000) since 2000. For power production (except from hydro and nuclear sites), sales, import or export no license for is needed in Finland.

On 1st September 1997 the National Grid Company was formed, called Fingrid plc. This company is responsible for the technical operation of the Finnish power system. The company sells grid services to all parties in the electricity market on equal and non-discriminating terms.

The electricity transmission and distribution is regulated, while the actual selling of electricity takes place in a free market. The Electricity Market Authority (EMA), an independent expert body which started operation in June 1995, promotes this free market. The task of the EMA is to supervise the pricing of transmission, distribution and other network services. It monitors the electricity prices, so that they stay on a reasonable and non-discriminatory level.

6. FRANCE

6.1 Renewable energy in France

Most electricity in France is produced from nuclear sources. Hydropower also plays an important role.

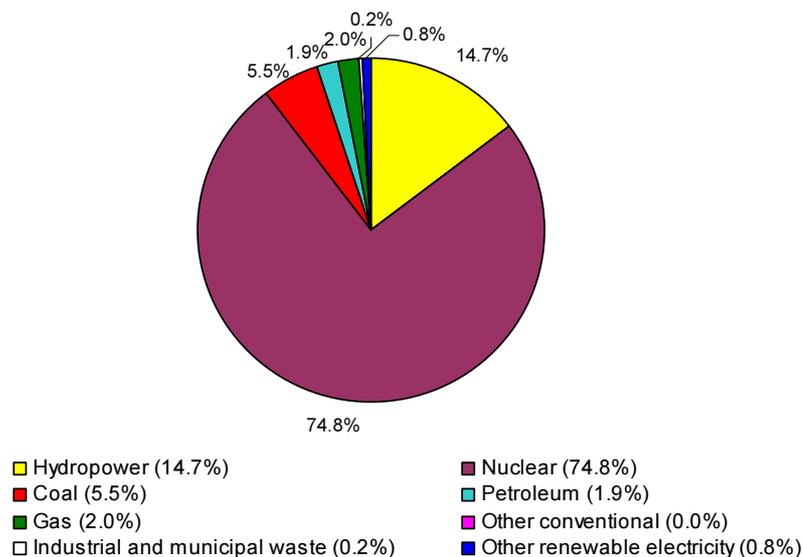


Figure 6.1 *Gross electricity production in 1999 in France*

Source: Eurostat.

The installed capacity of renewable electricity plants is increasing slowly. Especially wind energy is a growing market in France.

Table 6.1 *Installed capacity in France in 1999 [MW]*

France	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	103410	107614	114583
Total thermal supply power stations	22670	23869	26213
Nuclear power stations	55750	58515	63183
Total hydro-electrical production capacity	24990	25227	25170
Hydro plants < 1 MW	-	429	406
Hydro plants ≥ 1 MW and ≤ 10 MW	-	1517	1610
Hydro plants > 10 MW	-	18970	22916
Wind energy	0	3	17
Geothermal energy	-	-	-
Photovoltaics	0	0	8
Solar thermal	-	-	-
Municipal solid wastes	0	255	272
Wood/wood wastes	0	365	340
Biogas	0	0	0
Industrial wastes	0	0	0

Source: Eurostat.

6.2 Targets and objectives

In the EU Renewables Directive, the indicative target for France has been set at 21% of the electricity consumption in 2010 (including large hydro). This is an increase of more than 6% compared to the share of 15% in 1997.

Since 1996, France has a programme for the promotion of wind power (EOLE 2005) launched by the Ministry for Industry. The target is to achieve 250-500 MW installed wind power capacity by 2005. However, by the end of 2000, France had no more than 94 MW wind power installed, and 115 MW end 2001. A directive (Arrêté) of 7 March 2003 sets targets for future capacity investments by 2007. The objectives of this directive are:

- Electricity from biomass: 200 to 400 MW by 2007
- Wind energy: 2000 to 6000 MW (of which 500-1500 MW offshore)
- Geothermal energy: 10 to 60 MW
- Small hydro: 200 to 1000 MW
- Biogas: 50 to 100 MW

In 2000 the official wind power target was 5,000 MW by 2010. The strategy is to make wind energy profitable for (mostly small) investors and to open a wide range of potential sites across France.

Table 6. 2 *Share of RES-E in 2000 (realisations) and targets 2010 (EU indicative target)*

	Realisation	Target
[%] RES of electricity consumption	15.0 (1997)	21.0

6.3 Policy instruments

In December 2000, the French government announced the choice for feed-in tariffs for wind energy sites with a maximum installed capacity of 12 MW. The final choice for feed-in tariffs for projects up to 12 MW but retaining the EOLE 2005 tender system for projects over 12 MW is a well-conceived compromise. The Ministry of Industry, EdF, the ‘*Syndicat de Energies Renouvelables*’ (SER, the renewable energy producers umbrella group), the ‘*Association Francaise des Industriels de l’Eolien*’ (Afineole) and the French Wind Energy Association (FEE) obtained together this compromise.

Bidding system

The EOLE-2005 program, which had set in 1995 a target of 500 MW for 2005, was not very successful. By the end of 2000, no more than 94 MW wind power was installed, and 115 MW at the end of 2001 (BTM consult).

- Name of the instrument: EOLE 2005
- Category: Bidding system
- Applied from - until: 1995-2005
- Targeted technology: Wind onshore
- Objective: To achieve 500 MW installed capacity of wind power in 2005
- Specification of the measure: EOLE was a National Energy Plan, based on an agreement between EdF, various involved Ministries and ADEME. The implementation was in the hands of EdF, in charge of selecting the best projects. The criteria used by EdF for the selection of the projects were based on economical measures with the unit cost of electricity as criterion. The length of the contracts was often 25 years. The EOLE tender contracts resulted in prices of circa 4.5 ct/kWh.

A number of wind parks are still to be built under the EOLE programme. A new tender system for wind parks of over 12 MW is under consideration.

Feed-in tariffs

On 10 February 2000 the new French Electricity Law has been accepted. For renewable electricity installations up to 12 MW the network operator (EdF) is obliged to purchase electricity at fixed feed-in tariffs. The types of renewable electricity installations that are eligible for support under this article are further elaborated in separate regulations (décrets and arrêtés, see below). A producer of renewable electricity first has to demonstrate to the regional government that its installation is eligible under the Electricity Law in order to receive the right to the feed-in tariff (Décret 2001-410 of 10 May 2001). This is a structural change compared to previous practise, in which only avoided costs were compensated for. The feed-in tariffs have been in effect starting from 2001.

- Name of the instrument: Electricity Law 2000
Category: Feed-in tariffs
Applied from - until: 2000 - ongoing
Targeted technology: Geothermal, biomass, PV, biogas, MSW, small hydro, CHP, wind onshore

Objective: To support the installation of renewable capacity
Specification of the measure: The tariffs are specified in the table below. The basis for determining a feed-in tariff consists of a compensation for the investment cost, the avoided cost of electricity to the supply company and a supplementary remuneration for its environmental benefits. The tariff is indexed to labour cost and consumers price inflation, so those producers who apply for the feed-in tariff in future years will receive a higher tariff. However, the total amount of wind capacity that will be supported under this system is limited to 1500 MW. The costs of the feed-in system are spread out in the electricity rates to final consumers.

Table 6.2 *Feed-in tariffs France*

Technology	Feed-in tariff	Remarks
Geothermal	7.62 ct/kWh for France (continental area), 7.93 ct/kWh for the overseas regions (Guadeloupe in particular)	power limit of 12 MW [arrêté du 13 mars 2002]
Bioenergy	7 ct/kWh	Power limit of 12 MW (directive to be published)
Photovoltaic	15.25 ct/kWh for France (continental area), 30.50 ct/kWh for overseas including Corsica	[arrêté du 13 mars 2002]
Biogas	From 4.5 ct/kWh (unit power above the 6 MW level) to 5.72 ct/kWh under the 2 MW level.	Other parameters are taken into account (global energy efficiency, degree of availability) [arrêté du 3 octobre 2001]
Municipal solid wastes- MSW	From 1.74 ct/kWh (summer) to 3.72 ct/kWh (winter) in France (continental and Corsica) from 3.05 ct/kWh to 3.72 ct/kWh in the overseas areas	Power limit of 12 MW [arrêté du 2 octobre 2001]
CHP power plants	0.31 to 0.58 ct/kWh	(a complex tariff has been designed) [arrêté du 31 juillet 2001]
Small hydro power plants	Option 1: 6.10 ct/kWh (under 500 kVA) and 5.49 ct/kWh (above 500 kVA) Option 2: 8.42 ct/kWh (under 500 kVA) and 7.58 ct/kWh (above 500 kVA) in winter, and 4.45 ct/kWh (under 500 kVA and 4.01 ct/kWh (above 500 kVA) in summer	Power limit of 12 MW According to the quality of supply (quality supply factor), a more attractive tariff will be offered based on a 'premium', additional to the tariff listed here. [arrêté du 25 juin 2001]
Wind onshore	8.38 ct/kWh (5 first years) and then from 3.05 (above 3600 h) to 8.38 (under 2000 h) the following ten years In France (continental area), thus according to the quality of sites. The tariff structure is different in the overseas: 9.15 ct/kWh the first 5 years and then from 4.57 ct/kWh (above 3300 h) to 9.15 ct/kWh (under 2050 h)	Power limit of 12 MW Projects that are part of the first 1500 MW receive a higher tariff, in order to incite a fast development. [arrêté du 8 juin 2001]

Investment subsidies

The FACE fund is a source of finance for investments in renewables and demand-side management in rural areas. The annual budget for FACE is about 15 million €. The majority of funds are spent on PV systems in rural areas, and aim to reduce either grid extensions or grid strengthening, via reducing peak demand or increasing stand-alone generation capacity. There is an investment subsidy of 4.6 € per installed W_p or 6.1€ in case of supply secured through a battery system. This subsidy was used in the calculation of the total feed-in tariff.

A private investment fund called FIDEME exists which invests in projects (mainly RES projects): the maximum financial share of 25% of the total project costs. ADEME is providing one third of the fund financing and private banks are providing two thirds. This idea is to promote investments according to classical financial appraisal techniques but with a higher risk acceptance (which is balanced by higher commissions and interest rates).

6.4 Country context

6.4.1 Institutional framework

French renewable energy policy is the responsibility of the Ministry of Economy, Finance and Industry. It has a '*Service des Energies Renouvelables et Utilisation Rationnelle de l'Energie*' (SERURE), which formulates the propositions and controls the '*Agence de l'Environnement et de la Maîtrise de l'Energie*' (ADEME). Because of the increased interest in renewable energy, the annual budget of ADEME has increased from 318 million Euro up to 412 million Euro starting from 2000. However, the support to CEA, the French nuclear electricity institute, largely exceeds this amount. Moreover, besides attention paid to waste, transport, air pollution and noise, only 18% of the annual budget is spent to pursue the energy saving objectives and to support the use of renewable energies. Yet, this last category has benefited most of the recent budget increase.

ADEME participates in the European initiative 'Campaign for take off for Renewable Energy Sources-Electricity', launched by the European Commission, and will, up to the end of 2006, foster 26 state-region contracts of sustainable development with a significant augmentation of renewable energy. The main part of this programme is dedicated to the deployment of renewable energy technologies in the French overseas departments (DOM), the French territories (TOM) and Corsica.

The French utility EdF, as far as it concerns its activities with renewable energy development, seems also to have focused on the DOM-TOM-Corsica. EdF devotes a very small (but increasing) part of its turnover to develop renewable energies prominently in these regions. EdF primarily invested in wind and solar energy, or in a combination of those.

Previously, EdF was free to negotiate the contract with each IPP, and the price EdF was willing to disburse for green generation merely based on 'avoided cost'. Under current legislation however, as France chose for a combination of competitive tendering and fixed premium wind tariffs, EdF copes with a purchase obligation for all the power from renewable energy sources produced by IPPs, at least, up to 12 MW installed. For most technological sources, a legislative minimum price is even indicated (as indicated by recent Decrees).

6.4.2 The electricity sector

France opted for a regulated TPA for the access to the transmission and to the distribution network. The Transmission System Operator (RTE) is responsible for the operation, maintenance and development of the public high voltage and extra high-voltage power transmission system. EdF has a near monopoly in the production of electricity.

France is an important actor on the market for electricity. Yet in 2001, with a state-owned industry, a legal monopoly on imports and exports and a low speed to liberalise the sector, it had the most protectionist electricity regimes in Western Europe. In February 2000, a full year after the first EU deadline, France passed legislation that began the liberalisation of the electricity sector. Currently, about 1200 players (of which 600 large industrial and commercial consumers) comprising about 30% of the electricity market, have been able to choose their electricity supplier. These are also the actors that have access to the electricity exchange at the Powernext from the end of 2001 onwards. This resulted in only very few of these consumers having changed supplier.

France keeps its captive customers while most of the EU countries went further than the required rate of liberalisation. Thanks to the direct and indirect government support to the French nuclear industry, EdF contributes to a large extent to the security of supply in regard to fossil fuel dependency. Low production prices, especially in off-peak hours, make that the captive

customers benefit of the lowest electricity prices in Europe: domestic customers pay around 5 to 8 ct/kWh (night and day tariffs respectively).

7. GERMANY

7.1 Renewable energy in Germany

Electricity in Germany is mainly produced from coal, gas and nuclear sources. Renewable electricity is mainly produced from hydropower, although wind power capacity is increasing rapidly in the last decade.

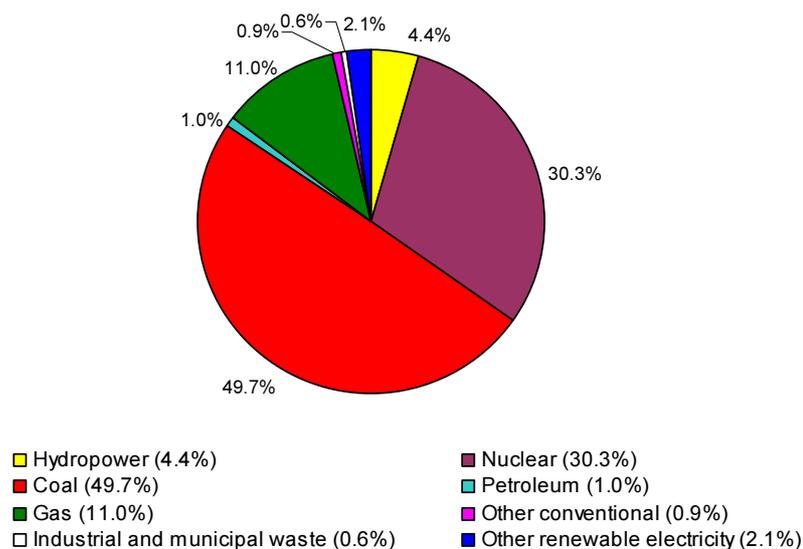


Figure 7.1 *Gross electricity production in 1999 in Germany*

Source: Eurostat.

Table 7.1 *Installed capacity in Germany in 1999 [MW]*

Germany	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	97598	115342	114691
Total thermal supply power stations	68440	82616	79371
Nuclear power stations	22260	22713	22329
Total hydro-electrical production capacity	6850	8876	8853
Hydro plants < 1 MW	-	418	532
Hydro plants ≥ 1 MW and ≤ 10 MW	-	922	870
Hydro plants > 10 MW	-	2024	1980
Wind energy	48	1137	4138 ¹⁷
Geothermal energy	-	-	-
Photovoltaics	2	10	40
Solar thermal	-	-	-
Municipal solid wastes	550	509	555
Wood/wood wastes	0	79	103
Biogas	229	229	321
Industrial wastes	0	0	0

Source: Eurostat.

¹⁷ Installed capacity in June 2003 was already 12,836 MW.

7.2 Targets and objectives

Federal objectives

Germany has formulated a national target in 1998 for future RES penetration. This target was set in a non-binding declaration of intent. The goal was to:

- Double the share of RES of the primary energy consumption from the present 2 to 4% by the year 2010
- Increase the share of RES of the primary energy consumption to 25% by the year 2030 and to 50% by the year 2050
- Double the share of RES in the electricity production from the present 5 to 10% by the year 2010.

In the EU renewables directive indicative targets for the production of electricity from renewable energy sources by the year 2010 are formulated. For Germany, this target means an increase from 4.5% in 1997 to 12.5% in 2010. These are the formal targets.

Table 7.2 *Share of RES in 2000 and targets 2010*

Federal minimum targets	[%] RES in 2000	[%] RES in 2010
[%] RES of electricity consumption	6.25	12.5 (EU indicative target)
[%] RES of primary energy consumption	2.1	4.2

7.3 Policy instruments

The German federal government, as well as the state and district governments, has put in place a number of measures for promoting renewable sources of energy. The main financial promotion measure on the national level was the Electricity Feed-in Law from 1990 to 2000. April 1st 2000, the Renewable Energy Law replaced this law. German energy policy is closely related to national policies to support climate protection. Renewable energy plays an important part in this policy, both on a national as on a state level. Most German regions also have energy policies, targets and support mechanisms designed to encourage the development of renewable energy.

7.3.1 Policies instruments at a national level

On a federal level the Electricity feed in Law of 1990 was the first to introduce feed-in tariffs. These tariffs were paid by the utilities. The electricity feed in law was replaced by the renewable energy sources act on 1st of April 2000. The grid operators pay the feed-in tariffs under this new law and cover their costs by an additional fee to be aid by all consumers.

Feed in tariffs

- Name of the instrument: Strom-Einspeisungs-Gesetz (StreG)
- Category: Feed-in Tariffs
- Applied from - until: Introduced in December 1990, came into effect on the 1st January 1991 updated with the amendment of the Energy industry act in 1997, until 1st April 2000.
- Targeted technology: All RES technologies
- Objective: Increase the share of electricity produced from RES
- Specification of the measure: This law obliged utilities to buy electricity from producers of RE and guaranteed a fixed price in combination with a digressive price element. The tariff was set as a percentage of the average utility electricity rates for consumers:
 - 90% for wind and solar power
 - 80% for biomass and for hydropower, sewage and

- landfill gas installations <0.5 MW
- 65% for hydropower, sewage and landfill gas plants with a capacity between 0.5 MW and 5 MW (REMAC, 2000).

The regulatory authority fixed the tariffs for a one-year period based on the value of the average utility revenue per kWh sold. This value was drawn from an official statistic and based on last year's value. The measure stimulated particularly the development of wind energy and made Germany one of the leading wind power producers. There were a few difficulties with this law (a.o):

- The feed-in tariffs were not financed from taxes but from revenues of utilities, which distorted the competition between utilities
- The guaranteed premiums applied only to the non-utility sector, so utilities were generally not eligible
- Since the tariffs were based on utility revenues, the tariffs would go down when the electricity prices would go down

The prices paid for electricity during the period 1990-1998 are given in Table 7.3.

Table 7.3 *Feed-in tariffs for electricity under the Strom-Einspeisungs-Gesetz*

Technology	Price [ct/kWh]
Photovoltaic	Between 8.2 and 8.8
Wind	Between 8.2 and 8.8
Biomass < 0.5 MW	Between 7.05 and 7.85
Biomass between 0.5 MW and 5 MW	Between 5.95 and 6.38
Hydropower < 0.5 MW	Between 7.05 and 7.85
Hydropower between 0.5 and 5 MW	Between 5.95 and 6.38

- Name of the instrument: Erneuerbare Energien Gesetz (EEG)
 Category: Feed-in Tariffs
 Applied from - until: The REL passed by the German parliament on the 25th of February 2000 and came into effect on the 1st of April 2000.
 Targeted technology: Wind, photovoltaics, geothermal, small hydro (<5 MW) and certain forms of waste biomass plants are included. Electricity generated from offshore wind parks, geothermal energy as well as gas from mines is covered.
 Objective: Double the 2000 state contribution of RES to Germany's power mix (~6% by 2010) and to contribute towards bringing the cost of renewable generation in line with that of conventional methods in the medium to longer term
 Specification of the measure: The EEG no longer required the utilities to pay the feed-in tariffs, but the grid operators. The utilities still have the legal obligation to take off the electricity produced from RES. The grid operator whose grid is closest to the location of the RES installation has the obligation to pay the tariffs. The tariffs are only paid to generators within the territorial scope of the Act, or within Germany's exclusive economic zone. The EEG states that the electricity from renewable energy must be transported and charged

to the final customer.

The prices paid under the EEG are based on a fixed price scheme combined with a decreasing price element. From 2002 on, new installations of biomass (minus 1%), wind (minus 1.5%) and PV (minus 5%) receive lower tariffs. From 2003 on, new installations of these types receive tariffs lowered by a further, 1, 1.5 or 5%, and so on for the next following years. For every installation, the expiry date is in 20 years time from the installation.

The tariffs for 2001 and 2002 are given in Table 7.4.

Table 7.4 Feed-in tariffs for electricity under the EEG

Technology	Price 2001 [ct/kWh]	Price 2002 [ct/kWh]
Photovoltaic	50.62	48.1
Onshore Wind	9.1 for first 5 years, 6.17 for following years	9 for first 5 years, 6.17 for following years
Offshore Wind	Turbines before 2006 9.1 for first 9 years, 6.17 for following years	Turbines before 2006 9 for first 9 years, 6.17 for following years
Biomass < 0.5 MW	10.23	10.10
Biomass between 0.5 MW and 5 MW	9.2	9.1
Biomass > 5 MW	8.69	8.6
Hydropower < 5 MW	7.67	7.67
Gas from Landfills, Mines, Sewage Treatment plants	7.67	7.67

[Rem, Ener-Iure1]

Investment subsidies

- Name of the instrument: 100.000 Roof Photovoltaic Programme

Category: Investment subsidies/soft loans

Applied from - until: 1999-2004

Targeted technology: PV

Objective: To stimulate the installation of PV (expectations are up to 300MW at the end of 2003)

Specification of the measure: The programme supports the installation or extension of photovoltaic systems with a peak nominal power of at least 1 kW_p. The Ministry of economic affairs (Bundesministerium für Wirtschaft und Arbeit, BMWi) offers a low interest loan (1.9-% in 2002) with a repayment period of 10 years and up to 2 starting years without credit repayment. After a repayment period of 9 years it is possible to waive the final payment if the PV is still operable. The share of financing is up to 100% with a maximum of 500.000 €. The subsidy can be combined with other support programmes.
- Name of the instrument: 250 MW wind programme (initially 100 MW wind programme, since 1995 the 250 MW wind programme)

Category: Investment subsidies

Applied from - until: 1989-2006

Targeted technology: Wind

Objective: To stimulate the installation of wind as well as to acquire statistical data on the operation of wind turbines

Operational period: 1989-2006

Specification of the measure: The programme provided grants for the installation and

operation of wind turbines at suitable sites. The subsidies (grants) go up to 25% of the investment with a maximum of 46.000 €. Additionally the programme provides operation subsidies of up to 4-ct/kWh fed into the public grid with a maximum of 25% of the total investment costs. The last grants were approved in 1996 for turbines that had to be connected to the grid by mid 1998. All turbines that receive financial support will be analysed for 10 years.

- Name of the instrument: General funding for RES by the ministry of Economics and Technology
 - Category: Investment subsidies
 - Applied from - until: 1999-2002
 - Targeted technology: All RES technologies except Wind and PV. PV at schools is eligible for support as well.
 - Objective: Promotion of the use and implementation of RES
 - Specification of the measure: National individual measures are funded from the federal budget. The measures that concern electricity from RES are:
 - Installation, extension, and re-activation of hydro power plants up to an energy output of 500 kW: 767 €/kW for a new installation, 307 €/kW for an extension or re-activation (minimum years of shutdown: 3 years).
 - Installation of PV in schools > 1 kW_p flat rate of 3068 € per installation.

7.3.2 Policy instruments at a State level

Most German regions have energy policies, targets and support mechanisms designed to encourage the development of renewable energy. German State Governments have put in place a number of measures for promoting renewable sources of energy. Responsibility for the development of renewable energies indeed rests with a number of different institutions at the national and regional levels; full co-ordination has still to be achieved.

Mainly due to the great success of the national fiscal measures (Electricity Feed In Law/ The New Renewable Energy Law) many State programmes have been stopped or reduced. A list of the still active State programmes is given below (state April 2002):

Bayern

Subsidies for small hydro power plants smaller than 1000 kW with a maximal support of 4000 €/kW. Subsidies go to refurbishment, maintenance and upgrading.

Brandenburg

Subsidies for biomass power plants (up to 35% of the total plant cost, maximum of 1176 €/kW), hydro power plants (up to 20% of the total plant cost, maximum of 920 €/kW or 306775 €) and for photovoltaics (up to 50% of the total plant cost, maximum of 7669 €/kW). Subsidies are only given if no national subsidy can be taken into consideration.

Bremen

Subsidies for wind power plant up to 30% of the investment and operational costs. Refinancing within 12 years.

Nordrhein-Westfalen

Subsidies for photovoltaic plants from 2 kW_p (1000 €/kW_p in building integration cases, 750 €/kW_p without building integration), biomass power plants (25% of the investment costs) and hydro power plants up to 1000 kW (30% of the investment costs with a maximum rate of 5000 €/kW).

Rheinland-Pfalz

Subsidies for river hydro power plants up to 20% of the investment costs with a maximum of 100000 € per plant.

Saarland

Subsidies for wind power plants (> 500 kW) up to 30% of the investment costs with a maximum of 77000 € per plant. Subsidies also for biomass power plants (between 100 kW and 1 MW) up to 30% of the investment costs with a maximum of 130 €/kW.

Sachsen

Subsidies for biomass power plants (up to 80 €/kW for power plants smaller than 30kW and up to 40 €/kW for power plants greater than 30 kW). Subsidies for biomass-photovoltaic combined power plants (up to 100 €/kW for power plants smaller than 30kW and up to 50 €/kW for power plants greater than 30 kW). Subsidies for hydro power plants up to 30% of the investment costs for new power plants and up to 70% of the investments costs for other kind of power plants with a maximum of 102260 € per plant.

Thüringen

Subsidies for photovoltaics (3000 €/kW_p with a maximum of 30000 € per installation) take place only if no national subsidy can be taken into consideration. Subsidies for wind power plants (100 €/kW with a maximum of 75000 € per plant).

7.4 Country context

7.4.1 Institutional framework

Germany is a Federal Republic comprised of 16 Sovereign States (*‘Länder’*). The Federal level decides on the general legislative framework through the constitution, (*‘Grundgesetz’*), as well as national laws and acts. The States have their own state constitution, the *‘Landesverfassung’*. Both the States and the Federation exercise original legislative power with respect to the promotion of renewable energy sources. Within the states there are local communities (*‘Gemeinde’*) that have a certain amount of derivative legislative power. Above national Laws the European Law rules as incorporated and supranational law.

Responsibility for the development of renewable energy sources rests with a number of different institutions at national and regional levels.

Organisations involved in policy making:

Federal level:

- Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU))
- Federal Ministry for Consumer Protection, Food and Agriculture (Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft, BMVEL)
- Federal Ministry of Economics and technology (Bundesministerium für Wirtschaft und Technology, BMWi).

State level:

- Environmental and economical ministries (Umwelt- und Wirtschaftsministerien der Bundesländer)

The different levels of legislative and planning powers are set in the constitution. For certain legal fields of particular federal interest, the federal government is accorded exclusive legislative competence ('ausschliessliche Bundeskompetenz'). This is defined in article 71 GG. For other fields, there is a concurring competence, which means that the states are competent as long as the federation does not exercise its prior competence. The German federal legislator exercises its concurring competence in the following legal sectors concerning electricity:

- Act on the supply of Gas and Electricity (Energy Industry act, Energiewirtschaftsgesetz). This act was amended in November 1997 and came into force on 29 April 1998. The act replaced the December 1935 act for promotion of the energy industry. The act was necessary to apply the liberalisation directive of the European Commission and to introduce competitive elements to the electricity and gas sector.
- Act on granting priority to Renewable Energy sources (Erneubare-Energien-Gesetz, EEG). This act (March 2000) succeeded the act on the supply of electricity generated from RES into the Public Grid. The Renewable Energy Sources Act regulates the feed-in of electricity, the legal obligation of utilities to take off all electricity generated from RES as well as the prices paid for electricity generated from renewable sources.
- Act against Restraints of Competition (Gesetz gegen Wettbewerbsbeschränkungen). This act provides the basis for clients to choose their electricity supplier freely.
- Ordinance on Generation of Electricity from Biomass (Biomass ordinance, BiomassV). This ordinance of 21 June 2001 sets forth what substances shall be considered biomass, what technical processes for generating electricity from biomass fall within the Renewable Energy Sources Act and what environmental standards must be met in the generation of Biomass.

7.4.2 Electricity sector

German energy markets have been fully liberalised: this has been the case in the oil and coal markets for a lengthy period already, and was subsequently true for the grid bound energy electricity and gas. In comparison to the other European Member States, the market opening for electricity and gas in Germany is far advanced. Electricity prices have considerably declined in Germany in the course of liberalisation; prices for industrial customers now move within the medium field in Europe. Nearly 100% of electricity needs in Germany are met by domestic production. In the future, however, rising electricity imports should be anticipated. Their levels will be determined not only by cost efficiency in electricity production but also the competitive conditions in the European Union. The future competitiveness of electricity production in Germany is of great significance for energy policy. For electricity imports reduce the national CO₂ balance, but electricity produced near consumers increases the reliability of supplies. European energy markets are taking on ever more importance for German companies since energy demand is still rising in the rest of Europe and competition intensity in Germany is increasing.

8. GREECE

8.1 Renewable energy in Greece

In Greece electricity is mainly produced from traditional sources: coal, petroleum and gas. Hydropower delivers most renewable electricity, but installed capacity in wind is increasing rapidly.

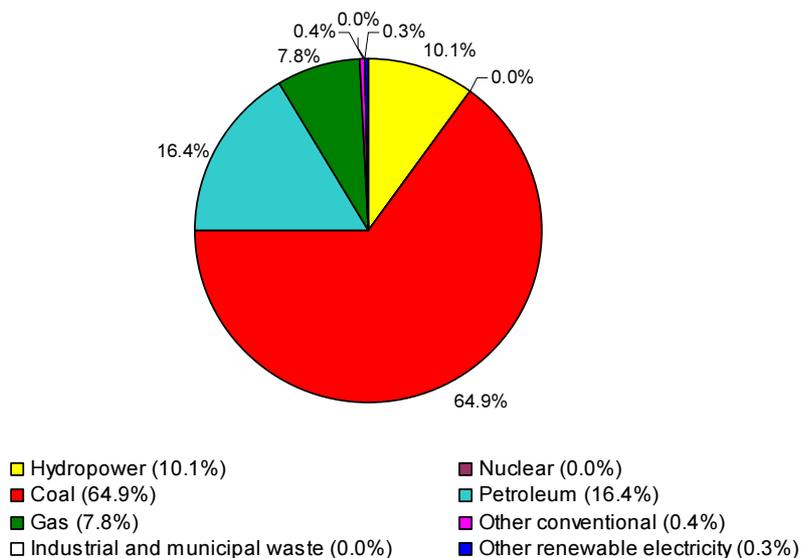


Figure 8.1 *Gross electricity production in 1999 in Greece*

Source: Eurostat.

Table 8.1 *Installed capacity in Greece in 1999 [MW]*

Greece	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	8514	8942	10905
Total thermal supply power stations	6100	6390	7692
Nuclear power stations	-	-	-
Total hydro-electrical production capacity	2410	2523	3102
Hydro plants < 1 MW	-	3	7
Hydro plants ≥ 1 MW and ≤ 10 MW	-	39	42
Hydro plants > 10 MW	-	2516	3052
Wind energy	2	27	109
Geothermal energy	2	2	2
Photovoltaics	0	0	0
Solar thermal	-	-	-
Municipal solid wastes	0	0	0
Wood/wood wastes	0	0	0
Biogas	0	0	1
Industrial wastes	0	0	0

Source: Eurostat.

8.2 Targets and objectives

In the EU Renewables Directive, the indicative target for Greece has been set at 20.1% of the electricity consumption in 2010 (including large hydro). This target corresponds to about 2500 MW_{el} of RES installations, which indicates an eightfold increase over the currently installed RES capacity of about 320 MW_{el} (ENER IURE, 2002a). This is a significant increase compared to the share of 8.6% in 1997.

Law 2773/99 defines renewable energy as energy produced from wind, solar, biomass, biogas, geothermal, sea (wave/tidal) and small (10 MW_{el}) hydro resources, or their combinations. This definition is slightly different from the definition of renewables in the EU Directive 2001/77/EC. The Greek version does not include the biodegradable fraction of industrial and municipal wastes, nor RES hybrid systems also using conventional energy sources.

Table 8.2 *Share of RES-E in 1997(realisations) and targets 2010 (EU indicative target)*

	Realisation	Target
[%] RES of electricity consumption	8.6 (1997)	20.1

8.3 Policy instruments

Investment subsidies

The main financial instrument to support renewable energy sources is the Operational Programme for Energy (OPE). The first OPE was active during the period 1994 to 1999 and was partly funded by the European Community Support Framework II (CSF II) as well as the Greek Government. The total budget was € 340.1million. There were two calls for proposals in which 82 projects were approved for funding. These projects had to generate 238.9 MW_e and 90.9 MW_{th}.

- Name of the instrument: Operational Programme for Energy
- Category: Investment subsidies
- Applied from - until: 1994 - 1999
- Targeted technology: Wind, biomass, small hydro, photovoltaic, geothermal, solar, passive solar
- Objective:
 - Support of projects necessary to satisfy electricity demand,
 - Reinforcement of efforts to develop alternatives for more efficient energy use in the consumption sector
 - Reinforcement of a broader penetration of RES and of other indigenous energy forms.
- Specification of the measure: Funding rates were between 35% and 50%.
 - € 142 million for wind and an investment subsidy of 40% (19 proposals with a capacity of 128.2 MW_e),
 - € 87 million for biomass and an investment subsidy between 45% and 50% (12 proposals with a capacity of 41 MW_e and 87 MW_{th}),
 - € 103 million for small hydro with a subsidy of 45% (31 proposals with a capacity of 69.5 MW_e),
 - € 1.4 million for photovoltaic and an investment subsidy of 50%, 55% or 70% (six proposals with a capacity of 0.2 MW_e),
 - € 0.2 million for geothermal and an investment subsidy of 45% (1 proposal with a capacity of 0.9 MW_{th}),
 - € 2.8 million for solar and an investment subsidy between 35 and 50% (ten proposals with a capacity of

- three MW_{th}) and
- € 3.7 million for passive solar and an investment subsidy between 40% and 50% (three proposals with an unknown capacity in MW_{th})

(Agores, 2000, ENER IURE Database, ENER IURE, 2002b)

The follow up of OPE I is the New Operational Program of Energy 2000-2006 (NOPE). The NOPE has a total budget of € 505 million for RES installations, which also was funded by the Greek government and the Third Community Support Framework of the EU (CSF III). Compared to OPE, the NOPE program gives more support to geothermal, PV and passive solar systems.

- Name of the instrument: New Operational Programme for Energy
- Category: Investment subsidies
- Applied from - until: 2000 - 2006
- Targeted technology: Wind, biomass, small hydro, photovoltaic, geothermal, solar, passive solar
- Objective: To stimulate the investment in RES technologies in the line of the OPE.
- Specification of the measure: A public subsidy on the total cost for the investment of 30% for wind parks, of 40% for small hydro, biomass, geothermal and passive solar and of 50% for PV.

(Agores 2000, ENERDATA, 2001, ENER IURE, 2002b)

In addition to these programs, the Development Law 1892/1990 and its successor Development Law 2601/1998 provide investment subsidies and tax deductions up to 40% and 100% respectively.

- Name of the instrument: Development Law 1892/1990
- Category: Investment subsidies
- Applied from - until: 1990 - 1998
- Targeted technology: All RES
- Objective: To modernise, develop and regulate investments for RES production and electricity generation from RES
- Specification of the measure: This law provides the framework for the provision of subsidies for productive investment. Rates of subsidy were between 40% and 55% of the total budget of the project, depending on the level of development of the region. These subsidies were direct as a proportion of investment. Besides this there were tax deductions up to 100%.

- Name of the instrument: Development Law 2601/1998
- Category: Investment subsidies
- Applied from - until: 1998 - ongoing
- Targeted technology: All RES
- Objective: To reinforce private investments for, among other things, RES production and electricity generation from RES
- Specification of the measure: Subsidy up to 40% of the total budget of the project, sometimes depending on the level of development of the region.
The subsidies are in the form of partial funding of the cost of capital expenses, loan interest or leasing.
Besides this there are tax deductions up to 40% or 100%.

(ENER IURE Database, ENERDATA, 2001)

Feed-in tariffs

Feed-in tariffs are given to the Autoproducers (AP), Independent Power Producers (IPP) and Local Authorities that generate electricity and sell this to the Public Power Corporation (PPC). The tariffs are based on a percentage of the consumer price, and are annually set by the authorities.

- Name of the instrument: Law 2244/1994 and Law 2773/1999
 - Category: Feed-in tariffs
 - Applied from - until: 1994 - present
 - Targeted technology: All RES
 - Objective: To motivate investments in RES electricity generation
 - Operational period: 10 year agreement
 - Specification of the measure:
 1. For Autoproducers, the buy-back rate is set at 70% of the utility's low-voltage (domestic) consumer tariff, for RES electricity produced and sold in the non-interconnected Greek islands, and at 70% of the utility's consumer tariff corresponding to the actual grid-connection voltage of the RES installation (be it low-, mid- or high-voltage), for RES electricity produced and sold in the Greek mainland.
 2. For Independent Power Producers, the buy-back rate for RES electricity is set at 90% of the utility's low-voltage (domestic) consumer tariff (in the non-interconnected Greek islands), and at 90% of the utility's mid-voltage (commercial) consumer tariff (in the Greek mainland),
- A few key provisions of Law 2773/99 concerning renewables are (ENER IURE, 2002a):
- the Transmission System Operator (TSO) is obligated to grant priority access (priority in load dispatching) to RES electricity-producing installations up to 50 MWe in power capacity (up to 10 MWe in the case of small hydroelectric units),
 - the TSO is obligated to enter into a 10-year contract (PPA) with the RES-electricity producer, for the purchase of his electricity. The contract always includes a renewal option,
 - the RES-electricity production of an independent power producer, or the surplus electricity production of a RES Autoproducer, is sold to the TSO at a predetermined buy-back rate, which is a fixed percentage of the corresponding consumer electricity rate,
 - the RES-electricity tariffs distinguish between Autoproducers, i.e. RES producers consuming part of their electricity production themselves and selling the surplus to the grid, and Independent Power Producers, i.e. RES producers selling their entire electricity production to the grid. The buy-back rates for both cases are based on the public utility's tariffs for specific categories of electricity consumers.
 - every RES-electricity producer is subject to a special reciprocity charge (annual fee), specified by a joint decision of the Ministers of Finance and Development, and equal to two-percent (2%) of the pro-

ducer's electricity sales to the grid. This charge is collected by the TSO and is given to the local authority, within the area of which the RES generation unit operate, for the purpose of realising local development projects.

The tariffs for 2001 are given in Table 8.2.

(ICCS, 1999)

Table 8.2 *Feed-in tariffs in Greece in 2001*

Interconnected system		Autoproducers (energy: 70% of kWh selling price)	Independent Power Producers (energy: 90% of kWh selling price)
Low voltage (220/230 V)	Energy	0.05826	-
Medium voltage (6.6, 15, 20, 22 kV)	Energy	0.04712	0.06059
	Capacity [€/kW]	-	1.55540
High voltage	Peak zone	0.03077	
	Oct-April: 10-14, 18-21 h		
	May-September: 10-14 h		
	Med. Zone	0.02132	0.06059
	Remaining hours		
	Low zone	0.01582	
	Oct-April: 01-08 h		
May-September: 00-08 h			
	Capacity × €/kWh (peak zone)	-	1.55540
Non-interconnected islands		0.05826	0.07491

8.4 Country context

8.4.1 Institutional Framework

The Greek republic, officially the Hellenic Republic, consists of 13 regions, which can be seen as regional governments. In the republic legislative powers are exercised by a single Chamber Parliament, called the Vouli, while executive powers are in the hands of the Government and the President.

Concerning energy policy, the governmental authority is the Ministry of Development. This ministry monitors all the activities related to the application of Renewable Energy Sources and regulates the energy market in general (Agores, 2000). Some jurisdictions and competencies concerning renewable energy projects have been transferred from the Ministry of Development, to the 13 regional governments (ENER IURE, 2002a).

CRES is the Centre for Renewable Energy Sources (RES), Rational Use of Energy (RUE) and Energy Saving (ES). CRES is an agency under the auspices of the Ministry of Development and the General Secretariat of Research and Technology and founded in September 1987. It is a public entity that has financial and administrative independence. CRES's main goal is the promotion of RES/RUE/ES applications on the national as well as the international levels. To

achieve its goals the Centre for Renewable Energy Sources is, among other things, the official consultant to the Greek government on matters concerning RES/RUE/ES national policy, strategy and planning. It also implements commercial RES/RUE/ES applications in relevant energy projects that are being realised by the private sector, the local authorities, professional associations, etceteras. (Website EVA).

Law 2773/99 brought into force the obligation of Greece to open the electricity market to eligible customers by 28% per 19 February 2001. This obligation was imposed on Greece by the EU Directive 96/92/EC (the Electricity Directive). Main features of the law were (ENER IURE, 2002a):

- the provision for the establishment of a Regulatory Authority for Energy,
- the retaining of regulatory powers in the Ministry of Development, notably with respect to authorisations for any electricity activities, tariffs, and public service obligations,
- the setting out of regulatory principles, notably that tariffs must cover all costs, including public service obligations, and that the PPC cannot cross-subsidise between liberalised and captive (non-eligible) customers,
- the requirement of the PPC to keep separate accounts for its generation, transmission, and distribution supply activities,
- the removal of the PPC's legal monopoly on generation by introducing an authorisation regime for the mainland and interconnected islands and a tendering process for non-interconnected islands,
- the removal of the PPC's legal monopoly on supplies by introducing an authorisation regime but retains PPC as the unique supplier to non-eligible customers.
- the retaining of the PPC as the exclusive owner of transmission, and exclusive owner and operator of distribution,
- the requirement that a supplier owns adequate generation capacity in an EU Member state and provides long-term access to the necessary transmission and distribution capacity,
- the provision for the establishment by June 2000 of a system operator (TSO), the Greek Transmission System Operator S.A. to operate, manage, secure the maintenance of, and plan the development of the transmission system. It also procures ancillary services. It is owned 51% by the state and 49% by the generators connected to the system, initially only PPC,
- the provision for access to the transmission and distribution grids at tariffs set by the System Operator and PPC, respectively,
- the provision that, on 19th February 2001, consumers totalling 30% of demand, including all customers with annual consumption over 100 GWh, will become eligible to choose the supplier.

8.4.2 Electricity market

The Greek electricity market was liberalised for 28% from the 19th of February 2001. Because Greece consists of many islands an exception was made for the non-interconnected islands. A date has not been set for the full liberalisation of the electricity market.

In the process of liberalisation the Regulatory Authority for Energy (RAE, or shortened PAE in Greek) was established in July 2000. This independent authority mainly has an advisory role. (ENERDATA, 2001).

Besides this regulating authority there is the Hellenic Transmission System Operator (HTSO¹⁸). This operator is responsible for the Hellenic Transmission System of Electric Energy and has a double role:

- balancing production and consumption

¹⁸ In Greek the HTSO is called D.E.S.M.I.E.

- to settle the market (Website DESMIE).

The two main responsibilities of the HTSO are the dispatching of the generating installations and the granting of access to the system. The granting of system access is regulated by Third Party Access (TPA).

The PPC¹⁹ can be seen as the distribution system operator. PPC is responsible for the operation, exploitation, maintenance and development of the network. (Database Policy Watch).

The other two market parties are the Autoproducers (AP's) and the Independent Power Producers (IPPs). The first are generating electricity for their own needs and are selling any surplus back to the grid. The other market party is the Independent Power Producers (IPPs).

Large-hydro plants and wind parks are the most important generating technologies in Greece. PPC is the owner of the total large-hydro installed capacity and most of the small hydro installed capacity as well as a big part of the installed wind capacity. AP's and IPPs also have an amount of wind parks and small-hydro plants. Besides this there are also a few small-hydro plants in the hands of municipalities. (Delkis, 1999).

¹⁹ The PPC is called Dmossia Epichirissi Electrismou in Greek, shortened by DEI.

9. IRELAND

9.1 Renewable energy in Ireland

The fuel mix for electricity production in Ireland consists of five energy sources. The first is gas that has a relatively big and rising share in the mix. Other sources are peat and coal and oil. Renewable energy sources consist of wind and hydropower. Both sources are increasing their share, which can be seen in Table 9.1.

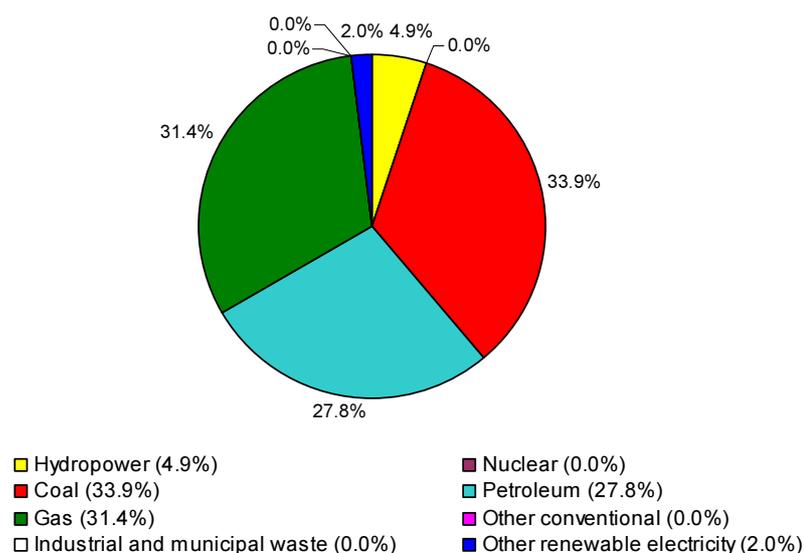


Figure 9.1 *Gross electricity production in 1999 in Ireland*

Source: Eurostat.

Table 9.1 *Installed capacity in Ireland in 1999 [MW]*

Ireland	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	3820	4393	4346
Total thermal supply power stations	3300	3870	3754
Nuclear power stations	-	-	-
Total hydro-electrical production capacity	520	517	525
Hydro plants < 1 MW	-	6	7
Hydro plants ≥ 1 MW and ≤ 10 MW	-	23	27
Hydro plants > 10 MW	-	200	199
Wind energy	0	6	67
Geothermal energy	-	-	-
Photovoltaics	0	0	0
Solar thermal	-	-	-
Municipal solid wastes	0	0	0
Wood/wood wastes	0	0	0
Biogas	0	0	15
Industrial wastes	0	0	0

Source: Eurostat.

The data show a considerable growth of installed capacity for wind power. Within ten years the capacity has grown from 0 MW to 67 MW. In comparison the net installed capacity of hydro-power has grown over ten years from 520 MW to 525 MW (1.0%).

9.2 Targets and objectives

Concerning targets and objectives for electricity generated by RES, the Irish government has set the goal to deliver an additional 500 MW of renewable electricity generating capacity by 2005. An annual target of 31 MW of new electricity generation capacity from renewable sources between 2000 and 2010 has been set. This target will be reviewed in line with experience and technological developments. Additional targets for 2005 - 2010 will be set in the light of this (ENER IURE, 2002a).

In the EU Renewables Directive, the indicative target for Ireland has been set at 13.2% of the electricity consumption in 2010 (including large hydro). This is an increase of 9.6% compared to the share of 3.6% in 1997.

Table 9 2 *Share of RES-E in 2000 (realisations) and targets 2010*

	Realisation	Target
% RES of electricity consumption	3.6 (1997)	13,2 (EU indicative target)
% RES of primary energy consumption	2.1(1999)	n.a.

9.3 Policy instruments

The two main instruments used to realise the targets set in the Irish energy policy are a corporate tax relief and a bidding system, the Alternative Energy Requirement (AER). Both will be described below, starting with the most important one: the AER.

Bidding system

The AER mechanism is the only dedicated subsidy system for production of renewable energies and it combines grant aid from the European Regional Development Fund (ERDF-subsidies) with price support above avoided fuel costs²⁰.

The objective of an AER competition is to compete for rights to generate electricity and to sell it to the ESB at agreed rates over a fifteen-year period. Prospective generators are invited to compete based on a price per unit of electricity.

An interaction has been found between the tax incentives and the AER, while the competitive nature of the AER tendering process makes successful bidders use the gains from tax relief systems into lower bid prices. It shifts the burden of supporting renewables from the State utility, ESB, to the general taxpayer.

The five AERs can be described as follows. (ENER IURE, 2002a, ENER IURE, 2002b, Policy Watch, Eneco)

- Name of the instrument: AER I
Category: Bidding system
Applied from - until: 1994
Targeted technology: Wind, Hydro, Biomass/Waste, CHP
Objective: To support renewable energy technologies that cannot yet compete with fossil fuel technologies in order to make them competitive in the future
Operational period: A period of 15 years
Specification of the measure: The first Alternative Energy Requirement competition started in 1994 with the objective of acquiring a total of

²⁰ Currently avoided fuel costs are € 0.022 per kWh during the day and € 0.018 per kWh during the night respectively (ENER IURE, 2002b).

75 MW new generating capacity from wind, hydro, biomass/waste and Combined Heat and Power (CHP). An inevitable percentage of projects were calculated in advance to fail so contracts totalling 111 MW was awarded. By the end of 1997, some 76.5 MW new electricity generating capacity from renewables was on-line or under construction.

The feed-in tariffs offered under AER I were fixed in advance amounting to 6.1 - 6.6 p/kWh (7.8-8.4 ct/kWh) and 2.4 - 2.5 p/kWh (3.1-3.2 ct/kWh) for day hours (08:00 to 21:00, Monday to Friday) and night & weekend hours respectively - averaging 4 p/kWh (5.1 ct/kWh).

- Name of the instrument: AER II
 Category: Bidding system
 Applied from - until: 1995
 Targeted technology: Biomass/Waste
 Objective: To support renewable energy technologies that cannot yet compete with fossil fuel technologies in order to make them competitive in the future

Operational period: A period of 15 years
 Specification of the measure: The second AER competition started in 1995. Finally, in February 1997 a consortium of Foster Wheeler Power Systems and ESB Power Generation was selected as the winner. It would set up a single biomass or waste fuelled electricity generating plant of up to 30 MW. But there were some problems with this project. First of all the European Commission refused to sanction ERDF support for the project because the proposed level of subsidy aid would not affect overall project economics. Besides this the project developers are awaiting a decision from 4 local authorities in the Dublin region as to whether they will supply the required waste. Planning permission and an integrated pollution control licence are also outstanding. In other words, the actual installed capacity is still zero. The bids were capped at 3.6 p/kWh (4.6 ct/kWh). The successful developer bid in at 3.2 p/kWh (4.1 ct/kWh). In the first place the project was to be completed by the end of 1999 but now the project developers are still waiting for a decision from four local authorities for the supply of the required waste. Besides this, a planning permission and an integrated pollution control license are also outstanding.
- Name of the instrument: AER III
 Category: Bidding system
 Applied from - until: 1997
 Targeted technology: Wind, Hydro, Biomass/Waste, Wave (Pilot)
 Objective: To support renewable energy technologies that cannot yet compete with fossil fuel technologies in order to make them competitive in the future

Operational period: A period of 15 years
 Specification of the measure: The third Alternative Energy Requirement was launched in April 1997, with a target of 100 MW (90 MW from

wind, 7 MW from biomass and 3 MW from hydro). In this AER some 280 expressions of interest were submitted and 92 proposals (a total of 640 MW) passed technical and commercial assessments. The technologies were treated separately in the competition with an additional small wind (< 5MW) category and a pilot wave energy plant included. The maximum size of wind farms was fixed at 15 MW, and no developer received contracts totalling more than 20 MW. In the end, 30 contracts were awarded, supporting almost 159 MW of electricity generating capacity (101 MW large wind, 36.5 MW small wind, 4.4 MW hydro, 14 MW waste to energy and 3 MW land-fill gas). Figuring ERDF-subsidy into tenders was compulsory. Afterwards the subsidy was not available for all successful projects. However, it is argued that not all successful projects will proceed, so a reserve list has been created for projects currently without ERDF-subsidy. The projects had to be commissioned in 1999 but this was not done yet. The projects have progressed through planning permission.

The intense competitiveness together with the existence of subsidy support and tax relief was evident in bid prices as low as 2.8 ct/kWh among successful tenders. There was a cap price of 4.9 ct/kWh for wind, hydro, biomass/waste and a cap price of 6.3 ct/kWh for pilot wave energy plants. The successful bid prices ranged from 2.8 ct/kWh to 4.9 ct/kWh.

- Name of the instrument: AER IV
 Category: Bidding system
 Applied from - until: 1997
 Targeted technology: CHP (existing and new)
 Objective: To support renewable energy technologies that cannot yet compete with fossil fuel technologies in order to make them competitive in the future
 Operational period: A period of 15 years
 Specification of the measure: The fourth Alternative Energy Requirement competition was held in September 1997. This AER had to support the sale of surplus electricity from combined heat and power (CHP) installations: it aimed to support up to 25 MW generating capacity from new CHP plants and 10 MW generating capacity from existing installations. ERDF-subsidy was available for all projects and there was an installed cap price of 3.8 ct/kWh.

- Name of the instrument: AER V
 Category: Bidding system
 Applied from - until: 2001
 Targeted technology: Large wind (>3 MW), Small wind, Biomass/ Waste, Small hydro
 Objective: To support renewable energy technologies that cannot yet compete with fossil fuel technologies in order to make them competitive in the future
 Operational period: A period of 15 years
 Specification of the measure: The fifth AER from August 2001 took experiences from

the previous rounds into account. An important experience was the fact that bids did not have planning permission to build and operate the proposed plant yet, which led to the fact that many projects were not installed. In this AER the bids therefore must have a planning permission. The total size of the tender is 255 MW and subdivided in technology bands, namely large wind (200 MW), small wind (40 MW), biomass/waste (10 MW) and small hydro (5 MW). The division between small and large wind projects is made to stimulate small community-based projects, which are deemed important for the longer-term sustainability of rural communities.

A list of successful applicants shows that the projects count up to 363 MW of renewable energy (318.3 MW large-scale wind, 35.8 MW small-scale wind, 8 MW biomass/waste, 0.9 MW small hydro), which is a significant step towards the government's target of 500 MW of additional renewables by 2005. The projects should be installed and operational by 31 December 2004.

The bids are capped at a maximum price per kWh depending on the technology. Twenty-five percent (25%) of the bid price is indexed to the Consumer Price Index to allow for inflation. The range for large wind is from 4.5 to 4.8 ct/kWh, for small wind from 4.72 to 5.3 ct/kWh, for biomass/waste from 3.8 to 5.9 ct/kWh and for small hydro there is a weighted average price of 6.4 ct/kWh.

- Name of the instrument: AER VI
- Category: Bidding system
- Applied from - until: 2003
- Targeted technology: Biomass (including CHP), hydropower, onshore and offshore wind
- Objective: To support renewable energy technologies that cannot yet compete with fossil fuel technologies in order to make them competitive in the future
- Operational period: A period of 15 years
- Specification of the measure: The sixth AER from February 2003. The total size of the tender is 578 MW and subdivided in technology bands, namely large wind (400 MW), small wind (85 MW), Wind Offshore (50 MW), biomass (8 MW), biomass CHP (28 MW), biomass-Anaerobic Digestion (AD, 2 MW) and small hydro (5 MW). The division between small and large wind projects is made to stimulate small community-based projects, which are deemed important for the longer-term sustainability of rural communities.
Price caps in each category are:
Large scale wind: 5.216 ct/kWh
Small scale wind: 5.742 ct/kWh
Offshore wind: 8.4 ct/kWh (indicative price cap)
Hydro: 7.018 ct/kWh
Biomass 6.412 ct/kWh
Biomass - AD 7 ct/kWh
Biomass - CHP 7 ct/kWh

The table below summarises the key information on the different AER rounds.

Table 9.2 *AER bidding rounds*

AER No.	Launched in year	Technology	Capacity [MW] (Amount actually installed in brackets)	ERDF-subsidy Aid	[ct/kWh]
AER I	1994	Wind,	73 (46)	ERDF-subsidy aid was initially offered, but suc- cessful applicants did not request subsidy aid.	5.1
		Hydro, Biomass/ Waste,	4 (2.5)		5.1
		CHP	12 (12)		5.1
		Total	22 (16)		5.1
AER II	1995	Biomass/ Waste	111 (76.5) 30 (0)	8,230,000 € Of- fered but later refused by EU ²¹	4.6
AER III	1997	Wind,	90 (0)	82,278 €/MW 82,278 €/MW 82,278 €/MW 1,270,000 € Figuring ERDF- subsidy aid into tender was com- pulsory ²³	≤ 4.9
		Hydro, Biomass/ Waste,	3 (0)		≤ 4.9
		Pilot Wave ²²	7 (0)		≤ 4.9
		Total	5 (0)		≤ 6.9
AER IV	1997	CHP Exist. CHP (New)	10 25	50,632 €/MW Figuring ERDF- subsidy aid into tender was com- pulsory	3.8 3.8
AER V	2001	Large wind, Small wind, Biomass/ Waste, Small hydro	200 40 10 5	n.a.	Cap: 4.8 Cap: 5.3 Cap: 5.9 Average: 6.4
AER VI	2003	Large wind	400		5.216
		Small wind Off- shore	85 50		5.742 8.4 (ind.)
		Hydro Biomass	8		7.018
		Biomass AD	28		6.412
		Biomass CHP	2		7
			5		7

Table from Ener Iure, 2002b, page 12, adapted and extended.

Besides this subsidy for energy production there are no subsidies specifically for investment in renewables. However, small-scale renewable projects may, and in some cases have, benefited from national, regional and local enterprise funds (ENER IURE, 2002b). There is also the National Development Plan 2000 -2006 in which an amount of 67 million € is allocated for infrastructure investment in the electricity grid to accommodate renewable energy projects, for small scale renewable projects and for CHP projects (ENER IURE, 2002a).

²¹ The European Commission refused to sanction ERDF support for the projects based on the argument that the level of grant aid proposed will not affect overall project economics. The decision to proceed is now a matter for the developers.

²² The results of wave energy competition have not been publicised.

²³ Figuring grant aid into tenders was compulsory. Subsequently, however, grant aid was not available for all successful projects.

Fiscal measures

There is a tax relief that relates to renewables, which can be found under Section 62 of the 1998 Finance Act.

- Name of the instrument: Finance Act 1998 - Section 62: corporate tax relief for equity investment
Category: Fiscal measures
Applied from - until: March 1999 - March 2001
Targeted technology: Wind, biomass, hydro, PV
Objective: To support renewable energy projects, by stimulating investment in equity
Specification of the measure: The tax relief is a deduction for tax purposes from a company's profits for an investment in new ordinary shares in a qualifying company. The relief is capped at 50% of all capital expenditure (excluding land), net of grants, on a single project up to approximately 9.5 million €. Investment by any one company or group of companies in more than one qualifying energy project is capped at approximately 12.7 million € per year. The Department of Public Enterprise certifies qualifying renewable energy projects and thereafter the Revenue Commissioners administer the tax relief.

The Business Expansion Scheme provides a personal income tax relief. It has been used to gain cheaper finance for projects to generate electricity from small hydropower. There is a limit of approximately 316.500 €, which eventually limits its applicability to small-scale projects (ENER IURE, 2002b).

- Name of the instrument: Business Expansion Scheme
Category: Fiscal measures
Applied from - until: n.a..
Targeted technology: All smaller RES.
Objective: To encourage investment in establishing and expanding small Irish companies
Operational period: Minimal five years
Specification of the measure: Tax relief is given to investors from qualified firms. The advantage is found in the fact that the cost of finance will be considerably lower than financing through commercial banks. Besides this there is the advantage of cash flow, while money comes in and repayments are required until the end of the first five years.
A qualifying activity is the generation of electricity. In the past a few hydropower projects were qualified. The maximum amount the BES will give is 316.456 €.

9.4 Country Context

The Republic of Ireland is a parliamentary democratic republic. It consists of 26 counties. The president is the head of the state and the government and is elected via direct elections for a period of seven years. The Irish parliament (Oireachtas) consists of the Senate (Seanad) and the House of Commons (Dáil Éireann), which is directly elected by the people. (Website Ireland and Website Landenweb).

9.4.1 Institutional framework

In the field of (renewable) energy the most important governmental player is the Department of Public Enterprise and Sustainable Energy. This department is responsible for the implementation of the European legislation concerning energy and also for the national policies of Ireland. Other regulatory institutions affecting renewable energy development include the Department for the Environment and Local Government and their local & regional authorities, which have a significant role relating to planning and environment protection issues (Policy Watch).

The Irish energy policy is based on the Electricity Regulation Act and the Green Paper on Sustainable Energy, both from 1999.

- The Electricity Regulation Act can be seen as a step towards the implementation of the EU Electricity Directive, while it provides the regulatory framework for the introduction of competition in the generation and supply of electricity in Ireland (Policy Watch: Website William Fry).
- The Green Paper on Sustainable Energy, published in September 1999 by the Department of Public Enterprise, describes the way Ireland wants to live up to its energy requirements over the next 10 to 15 years in an environmentally and economically sustainable way. The major features of the Green Paper focusing on the green electricity market are the allocation of approximately 46.8 million € for renewables and Combined Heat and Power and the increase in target for new electricity capacity based on RES from 180 MW to 500 MW by 2005. (Website Biobase).

The Green Paper has an ambitious approach to increase the role of renewable sources of energy in the power generation sector. One action in this approach is the establishment of a Renewable Energy Strategy Group. This group includes representatives of planning authorities, the ESB, the Irish Energy Centre/Renewable Energy Information Office and relevant Government Departments. It should recommend measures to redress the many constraints in the deployment of renewable energy. The Strategy Group reports to the Minister (Policy Watch).

9.4.2 Electricity market

Important players in the electricity market are the Commission for Energy Regulation (CER), the Electricity Supply Board (ESB) and the ESB National Grid, EirGrid and the Transmission System Operator (TSO) and Eirtricity. While describing these players in the market an overview of the (renewable) electricity market developments will be given.

The electricity market is characterised by an enormous growth in demand, 67% increase since 1990 to a level of 20 TWh in 2000. More significant growth is expected until 2010, namely an increase of 50% in comparison with the year 1998. The production of electricity is mainly in the hands of the Electricity Supply Board. The ESB is a state-owned utility and owns 23 thermal generating stations and three renewable energy plants (wind and hydropower). ESB has almost 97% of the total electricity market. The last years there has been the emerging production of the Independent Power Producers (IPPs). These IPPs use the electricity they produce on site or sell it to ESB. Mainly the electricity produced by the IPPs comes from renewable energy sources (RES) or from co-generation plants. It is expected that the number of IPPs will grow with the liberalisation in the electricity market.

The ESB is, besides its producing activities, the only distributor for Ireland. It also manages the electricity network, the ESB National Grid. EU legislation requires the existence of an Independent Transmission System Operator (ITSO) that operates, maintains and develops the national electricity grid. The Commission for Electricity Regulation (CER) has licensed EirGrid to be that ITSO but the ESB National Grid maintains the functions of the TSO while the full transfer scheme to EirGrid is not yet effected and negotiations are still going on between ESB and EirGrid concerning the infrastructure. Until this time ESB National Grid is the legal entity with

full responsibility for the Transmission System Operator functions (Website Eirgrid). EirGrid will eventually facilitate the entry of independent power producers and suppliers to the market, which is important for in meeting the growing demand for electricity in Ireland.

These developments around the ESB have started with the Directive for the European Electricity market, (96/92/EC). Ireland will follow the EU Directive concerning the opening of 33% of the market in February 2003. In 2004 the market will be opened for 40% and in 2005 there is a full opening planned for green electricity and electricity generated from combined heat and power (ENER IURE, 2002a, Website Europe Enterprise).

The main producer of green electricity is Eirtricity (Policy Watch). Another important player is the Commission for Energy Regulation (CER), first established under the Electricity Regulation Act in 1999 with a slightly different name: the Commission for *Electricity* Regulation. In 2002, the CER became responsible for the regulation of the gas sector as well besides the electricity sector (ENER IURE, 2002a). The CER is an independent body that has as its principal task ensuring effective regulation of the electricity sector and protecting consumer interests (Website William Fry). The CER licenses and regulates the generation and supply of electricity. The CER also authorises the construction of new generating plant and oversees third party access to the transmission and distribution systems of the ESB. The activities of the CER are being financed by means of a levy on electricity undertakings. The CER is also committed to a wide ranging public consultation process with the objective to inform decisions about the future direction of the Irish electricity industry. Therefore, the CER will publish consultation documents from time to time (ENER IURE, 2002a). Besides informing the public the CER also has to inform the Minister for Public Enterprise and a Committee of the Parliament (Website William Fry).

10. ITALY

10.1 Renewable energy in Italy

Italy's electricity is produced mainly from gas, petroleum and hydropower. Interesting fact is that Italy has a reasonable capacity of geothermal installations (585 MW in 1999). The installed capacity wind energy is increasing slowly. The installed capacity Biomass plants however (and especially waste) is increasing rapidly.

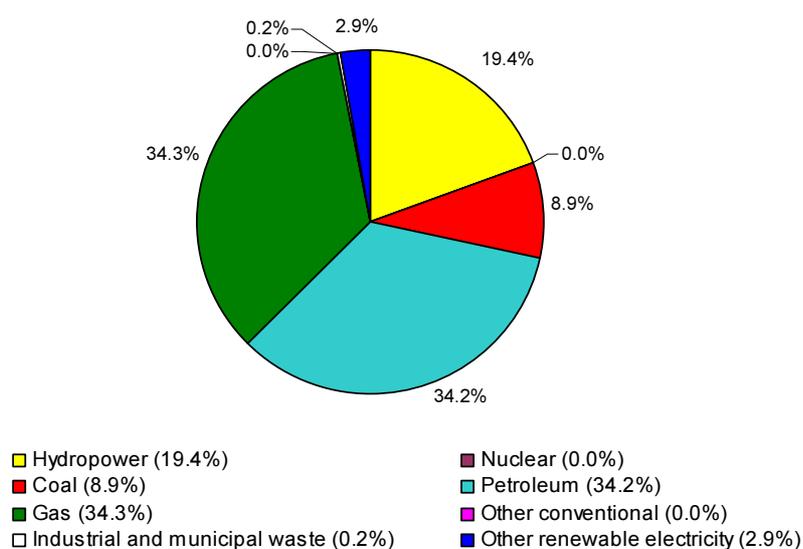


Figure 10.1 *Gross electricity production in 1999 in Italy*

Source: Eurostat.

Table 10.1 *Installed capacity in Italy in 1999 [MW]*

Italy	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	56563	65913	73684
Total thermal supply power stations	37290	45571	52426
Nuclear power stations	0	0	0
Total hydro-electrical production capacity	18770	19850	20444
Hydro plants < 1 MW	-	357	414
Hydro plants ≥ 1 MW and ≤ 10 MW	-	1787	1787
Hydro plants > 10 MW	-	13911	14370
Wind energy	3	22	229
Geothermal energy	500	470	585
Photovoltaics	4	15	6
Solar thermal	-	-	-
Municipal solid wastes	46	79	168
Wood/wood wastes	4	68	0
Biogas	41	21	141
Industrial wastes	0	0	179

Source: Eurostat.

10.2 Targets and objectives

In the ‘Italian White Paper for the valorisation of renewable energy sources of 1999’ development targets per technology were set. This is shown in Table 10.2.

Table 10.2 *Development targets in the Italian white paper for the valorisation of renewable energy sources (1999)*

Technology	1997 MW _e	2002 MW _e	2006 MW _e	2008-2012 MW _e
Hydro > 10 MW	13942	14300	14500	15000
Hydro < 10 MW	2187	2400	2600	3000
Geothermal	559	650	700	800
Wind	119	700	1400	2500
PV	16	25	100	300
Biomass & Biogas	192	380	800	2300
Waste	89	350	500	800
Total	17104	18805	20600	24700

Source: white paper.

The EU directive on renewable electricity sets a target of 12.5% in 2010 for Italy. This is a doubling of the realisation in 2000.

Table 10.3 *Share of RES in 2000 and 2010 (targets)*

Federal minimum targets	[%] RES in 2000	[%] RES in 2010
[%] RES of electricity consumption	6.25	12.5
[%] RES of primary energy consumption	2.1	4.2

10.3 Policy instruments

To reach these targets several instruments are available.

Feed-in Tariffs

- Name of the instrument: Law 9/91 and CIP provision 6/92
- Category: Feed-in Tariffs
- Applied from - until: 1991 - ongoing
- Targeted technology: All RES
- Objective: Giving incentives to the implementation of RES, by paying the a premium on top of the basic selling price
- Specification of the measure: Law No. 9/91 of January 1991, jointly with CIP Provision No. 6/92 of April 1992 established some new reference rules for the electricity sector, liberalising electricity generation and preparing the conditions to create a free electricity market. As a result of Law 9/91, independent producers could produce electricity from different energy sources without any capacity limit (the 3 MW power limit introduced by Law 308/82 was eliminated). Article 20 of the above Law, modifying Law No. 1643 of 1962, allowed to produce electricity both for auto-consumption and for sale to ENEL (National Electricity Board). Electricity prices were established in this connection according to modalities provided for by CIP 6/92, based on the concept of ‘avoided costs’. Further prices concerning electricity generated by renewable sources and assimilated included a premium as incentive for the higher costs

of different RES technologies. This latter price component should be paid only in the first 8 years of plant operation; after that the plant should continue getting only the basic component of the energy-selling price.

ENEL (the National Electricity Board) was turned into a joint-stock company in August 1992 and was obliged to purchase the electricity so produced at set prices.

The selling prices were based on the 'avoided costs' which represent the prices ENEL would have paid if it did not purchase that energy from third parties. The avoided costs are in turn based on:

- the avoided cost of plants comprising the capital, operation and maintenance costs, which are fixed with an upgrading according to the inflation rate,
- fuel costs, which are upgraded according to the fuel price and inflation rate (Thermal cost, CT).

The Prices were set in 1998. For wind energy they were about 10 ct/kWh for the first 8 years, and 5 ct/kWh for the following years.

The CIP 6/92 incentive has thus been provided on the basis of the electricity produced by the plants: the more electricity a plant produces, the higher the incentive the plant will receive.

Investment subsidies

- Name of the instrument: Law 10/91
 Category: Investment subsidies
 Applied from - until: 1991 - ongoing
 Targeted technology: All RES
 Objective: To promote RES implementation by granting subsidies on investments
 Specification of the measure: Law 10/91 was passed in January 1991. This provided norms and rules promoting energy savings and RES projects. This was done by granting funds on investments with percentage rates generally ranging within 30-40% of eligible costs and going up to 80% for PV projects only. The priority of this law was put on energy saving.

- Name of the instrument: Italian Photovoltaic Roof-top programme
 Category: Investment subsidies
 Applied from - until: 2001 - ongoing
 Targeted technology: Solar PV
 Objective: Promoting the setting-up of small (5 to 50 kW_p) photovoltaic systems on roofs and other structures of buildings, at least 10.000 units
 Specification of the measure: The long-awaited programme (the so-called 'Photovoltaic Rooftop Programme', under discussion since 1997) has just got under way after the issuing, in March 2001, of the first implementing decree by the Ministry of the Environment. This Decree is providing most of the relevant funds (these funds will be handled partly by Municipalities and other local entities and partly by Regional Governments).

The programme is aimed at promoting the setting-up of small (5 to 50 kW_p) photovoltaic systems on roofs and other structures of buildings. The target of installing at least 10 thousand plants, or hopefully even more units, will be achieved by granting approved projects a zero-interest funding equalling up to 85% of capital cost (provided that funding is below a given upper limit). Installed PV plants will feed energy into the low-voltage distribution networks to which buildings are connected. Fed-in electric energy will be paid, in principle, at the same price as it is bought from the utility by the building owner (it will actually be the result of a 'net metering' through a meter of outgoing and incoming energy).

Green certificates

- Name of the instrument: Law 79/99
- Category: Green certificates/quota system
- Applied from - until: 1999 - ongoing
- Targeted technology: All RES
- Objective: At least 2% of electricity should be produced from renewable sources.
- Specification of the measure: Decree no. 79/99 (the Bersani decree) and the Decree of 11th November 1999 by the Ministry of Industry, oblige all electricity producers or importers to feed at least 2% of the total amount of electricity from non-renewable sources they produced or imported the previous year into the national grid. This electricity has to come from renewable energy plants put in operation or re-powered after 1st April 1999 (Decree No.78/99, Art.11, and paragraph 1).

More specifically, this obligation refers to those who produced or imported an amount of electricity from non-renewable sources exceeding 100 GWh/y, net of co-generation, power station self-consumption and exports (Decree No. 79/99, Art.11, paragraph 2). In order to meet this annual threshold, interested operators are required to file green certificates (GC) with the Transmission System Operator (GRTN) (Article 3 of the Decree of 11th November 1999).

Example:

A thermal power station generated, in the year 2001, 1300 GWh of electricity. 200 GWh were self-consumed and another 500 GWh came from CHP plants. The first 100 GWh are not to be calculated.

The owner of the power station must prove that, out of 500 GWh (namely 1300-200-500-100), in 2002 he has produced at least 10 GWh from renewable energy plants that entered in operation or were re-powered after 1st April 1999.

Considering that each green certificate, as will be shown later, has a size of 100 MWh, the power station owner is expected to submit 100 GC's to GRTN by 31st March 2003.

To fulfil this obligation, the power station owner can either buy this amount of green certificates from GRTN, or build new RES plants or re-power older RES plants. Renewable energy plants are entitled to receive GC's, related to the number of kWh produced from RES, for the first eight years of production since their commissioning. GC's are issued by GRTN, with reference to the previous year's actual production, or in accordance with the foreseeable quantity of energy that is expected to be produced by the requesting operator over the following year. RES producers that already benefit from the energy feed-in prices provided for under CIP 6/92 could not obtain green certificates. The GC's corresponding to the amount of energy they have produced by plants put in operation after 1st April 1999 are issued and kept by GRTN for the purpose of trading them directly.

Requirements for the Issuance of Green Certificates

As a preliminary matter, it should be underlined that GC's are granted only with respect to plants that exploit renewable energy sources recognised as such. According to the Bersani Decree (79/99), renewable energy sources are: 'the sun, the wind, the water, geothermal sources, tides, the wave-motion and the transformation of vegetal products as well as organic and inorganic waste into electric energy'. Only plants that have been tested and commissioned after 1st April 1999 are entitled to the issuance of green certificates. Plants that have entered into production after that date or are expecting to produce energy by 2002 are currently entitled to apply for GC's.

The steps to be taken in order to obtain green certificates according to the Decree of 11th November 1999, can be summarised as follows:

- Firstly, the operator must request a certificate attesting the qualification of the plant as a renewable energy plant. GRTN has to reply within 90 days, otherwise, should GRTN fail to reply within this term, the requested approval should be considered as granted.
- Once the plant's qualification has been certified, it is possible to request for the GC's concerning the current, subsequent, or previous year's production.

A declaration has to be submitted to GRTN stating the amount of energy produced by the plant over the previous year, together with a copy of the declaration of the same production to the Financial Technical Office.

10.4 Country Context

10.4.1 Institutional framework

The Constitution (art. 114, 115 and 128) assigns to Italy a peripheral administrative organisation based on three territorial levels of competencies: Regions, Provinces and Communes. Italy is divided in 20 regions with some autonomy (5 with greater autonomy) and 103 provinces.

The most important national and regional institutions that represent the authority in charge of making laws regarding renewable energy are:

- Parliament, Government, Ministries of Industry and Environment (mainly national legislation)
- Authorities for Electrical Energy and Gas for provisions concerning prices and electricity transmission and supply
- Regional and local Bodies in force of Legislative Decree 498/12 concerning the decentralisation of public administration, have power in energy planning and granting authorisation for building RES power plants

Other institutions, such as the Ministries or regional Bodies, can also have influence in the development within more general provisions concerning other sectors.

10.4.2 Electricity market

The framework of the electricity sector in Italy up to the beginning of the nineties had as a basic reference the law 1643 of December 6, 1962. This law accomplished the nationalisation of the sector by establishing a monopolistic regime governed by the national public utility managed as a state-owned company (ENEL). In the context of this law it was allowed (within strict limits) to produce electricity only for selfconsumption (auto-producers) or for distribution at a local level. Starting from the eighties, the production of electricity from RES was liberalised up to 3 MW. In 1991 the laws 9/91 and 10/91 in combination of the CIP provision 6/92 the first steps towards total liberalisation were made. Changes were:

- Liberalisation of production of electricity, but with the obligation to transfer the generated electricity to the ENEL grid
- Concepts of auto-production and auto-consumption were enlarged and free of any limits
- Electricity from RES was totally liberalised (no 3MW limit any more)

In 1995 the Authority for Electrical Energy and Gas (AEEG) was created. Aim of this organisation is to regulate the electricity prices and control the whole internal system. Within the set of resolutions set up by the AEEG, the production of electricity from RES is promoted by a supporting mechanism based on feed-in tariffs. In 1999 the Legislative Decree 79/99 provided a new electricity policy based on a free electricity market. This decree set the basic framework for the legislative acts to implement the liberalised market.

11. LUXEMBOURG

11.1 Renewable energy in Luxembourg

Most of Luxembourg's domestic electricity production is hydropower. However, not all domestic consumption is covered by domestic production. Most of Luxembourg's electricity is imported.

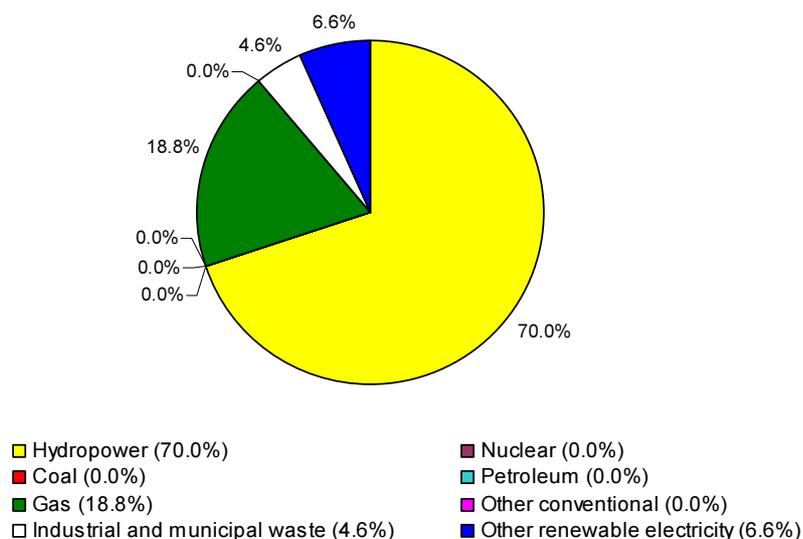


Figure 11.1 *Gross electricity production in 1999 in Luxembourg*

Source: Eurostat.

Table 11.1 *Installed capacity in Luxembourg in 1999 [MW]*

Luxembourg	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	1240	1257	1216
Total thermal supply power stations	110	117	68
Nuclear power stations	-	-	-
Total hydro-electrical production capacity	1130	1140	1139
Hydro plants < 1 MW	-	1	2
Hydro plants ≥ 1 MW and ≤ 10 MW	-	29	37
Hydro plants > 10 MW	-	0	0
Wind energy	0	0	9
Geothermal energy	-	-	-
Photovoltaics	0	0	0
Solar thermal	-	-	-
Municipal solid wastes	9	9	9
Wood/wood wastes	0	0	0
Biogas	0	0	0
Industrial wastes	0	0	0

Source: Eurostat.

11.2 Targets and objectives

In 1998 the National plan for sustainable development set some targets for the production of electricity from renewable energy sources:

- To increase the share of renewable energy in the public system (electricity distributed by CEGEDEL) from 2.5% in 1997 to 5% in 2010.
- To double the share of wood in final energy consumption from 0.5% to 1% in 2010.

The EU indicative targets are given in Table 11.2.

Table 11.2 *Share of RES in 1997 and 2010 (EU indicative targets)*

Federal minimum targets	[%] RES in 1997	[%] RES in 2010
[%] RES	2.5	5.0

11.3 Policy instruments

Luxembourg is a small country, which is one of the reasons that the legislation on Renewable Energy Sources is marginal. The interest in the use and promotion of RES by the Luxembourg government is mainly visible in the ‘skeleton law’ (or Energy efficiency law) of 5-08-1993 by the ministry of Energy. This law has five targets:

1. To guarantee a sufficient, secure and economic energy supply,
2. To promote energy savings and the rational use of energy,
3. To favour the use of renewable energy,
4. To alleviate the negative impact of the production and consumption of energy on the environment and
5. To co-ordinate all these activities in the framework of the European Union.

The legal basis of this law is defined in a series of ‘*reglèment grand-ducaux*’ (Grand Ducal Regulations).

The National Plan for Sustainable Development, finalised in 1998, lays out a strategy for sustainable development in the different economic areas of Luxembourg. It sets objectives and proposes measures, which will be described in more detail below. The main focus is also on energy efficiency.

The main policy instruments applied in Luxembourg are feed-in tariffs, fiscal measures, loans and subsidies on investment.

Feed-in Tariffs

- Name of the instrument: Framework law of 5 August 1993
- Category: Feed-in Tariffs
- Applied from - until: 1994 - ongoing
- Targeted technology: Wind, PV, (biomass)
- Objective: Encourage the use of renewable energy technologies
- Specification of the measure: The basis of the feed-in tariffs is the framework law of 5 August 1993. This law is defining the key for the implementation of energy saving measures, the RUE and RES objectives. The detailed legal basis is defined in a series of ‘*reglèments grand ducaux*’. Tariffs are paid by the public utility CEGEDEL and the local distributors. The feed-in tariffs for electricity produced by renewable sources has a legal basis in the Grand Ducal Regulation of 30-5-1994. There are two classes of feed-in rates for producers, depending on their size and technology:

- Class 1 renewables (Wind, Biomass or Photovoltaic) 1-500 kW: 10 ct/kWh
 - Class 1 CHP 1-150 kW: 10 ct/kWh
 - Class 2 renewables 501-1500 kW: 5.8 ct/kWh (day tariff) and 3 ct/kWh (night tariff)
 - Class 2 CHP 150-1500 kW: 5.8 ct/kWh (day tariff) and 3 ct/kWh (night tariff)
- CHP minimum average 2500 hours/year of operation and 80% all-over efficiency. Adaptation of the tariffs to index of life cost. Negotiated tariffs when > 1500kW
- Bonus for Wind energy and PV: in addition, average peak load deliveries during the three principal annual peak load period's leads to an extra bonus of 11.2 ct/kWh.

Fiscal measures

- Name of the instrument: Flexible depreciation
- Category: Fiscal Measures
- Applied from - until: 1989-1999
- Targeted technology: All RES
- Objective: To stimulate investment in the protection of the environment and energy savings in enterprises
- Specification of the measure: The taxpayer (enterprise) has the right to an accelerated depreciation in the declaration concerning income taxes. This special depreciation goes to a maximum of 60% of the investment costs.

Investment subsidies

- Name of the instrument: Advantageous loans SNCI Société Nationale du Crédit à l'Investissement. The law from 2-8-1977 forms the privileged instrument of the SNCI.
- Category: Investment subsidies/Loans
- Applied from - until: Since 1948
- Targeted technology: RES in general
- Objective: To support environmental protection
- Specification of the measure: The state is granting advantageous loans to craft industry and commercial industry having as objective the structural amelioration of the above mentioned sectors. The capital of the applicant should not exceed 4.9 million Euro. Investment in the equipment insuring protection of the environment (RES technology in general) is also eligible.
Maximum amount per project: 50 million LUF (1.22 M€)
Minimum investment is 500.000 LUF (12.261 €)
Equipment loans can cover between 25% and 60% of the eligible investment cost and up to 75% in the case of business start-ups.
The interest rate is fixed at 3%.
In general, equipment loans are granted for a maximum of ten years, the duration being fixed in each case in accordance with the nature of the investment. The maximum duration may, in exceptional cases, be extended to fourteen years.

A grace period of no more than two years for repayment of the capital may be agreed in individual cases when the loan is granted.

Investment Subsidies

- Name of the instrument: Ministerial regulation from 6-12-94, Ministry of Energy
Category: Investment subsidies
Applied from - until: 1994-1999
Targeted technology: Co-generation and renewable energy from wind, CHP, Solar thermal, PV, biomass and heatpumps.
Objective: Stimulate the production of energy from RES
Specification of the measure: This Ministerial regulation gave financial support for RES and RUE technologies as:
 - CHP
 - Wind energy
 - Solar thermal and PV
 - Heat pumps
 - BiomassThe funding was as follows (non industrial generators only):
CHP: 6000 LUF/kW_e (148.76 €/kW_e), with a maximum of 6 million LUF (148736.7 €) per installation. The minimum all-over efficiency is 80% and the minimum load factor should be 2500 hours/year. The heat should be delivered to third parties.

Wind: 3000 LUF/kW_e (74 €/kW_e), with a maximum of 6 million LUF (148736 €) per project. Minimum capacity of 50 kW_e. Wind turbines with a capacity less than 50 kW_e receive a direct subsidy of 25% of the investment cost.

Solar thermal/PV, Biomass, Heat pumps: subsidy of 25% of the investment cost, with a maximum of 60000 LUF (1487 €) per house, or in the non residential sector 25% subsidy with a maximum of 1.5 million LUF (36785 €)
- Name of the instrument: Programme d'actions d'Economies d'Energie dans les Communes (PEEC).
Category: Investment subsidies
Applied from - until: 1996 - 2001
Targeted technology: CHP, solar thermal and PV, Wind energy, Heat pumps
Objective: Encourage initiatives taken by municipalities in the field of RES and RUE.
Specification of the measure: The aim of the PEEC program was to launch initiatives and measures adopted by the municipalities to promote the rational use of energy and renewable sources of energy. The Energy agency which is in charge of developing this programme has the following tasks:
 - To enter into consultation with the municipalities to help them to benefit from PEEC at the stage of planning projects
 - To motivate the municipalities in their energy strategy in the framework of the PEEC
 - To elaborate pre-feasibility studies

- To inform them about the financial support, licensing, tariffs etc. available.

The funding of the programme is as follows:

Wind: 6000 LUF/kW_e (148 €/kW_e) with a maximum of 6 million LUF (148736.7 €) per project. The minimum capacity of the generator should be 50 kW.

CHP: 6000 LUF/kW_e (148 €/kW_e) with a maximum of 6 million LUF (148736.7 €) per installation. The minimum load factor is 2500 hours/year and the minimum efficiency 80%. Heat should be delivered to third parties.

- Name of the instrument: Skeleton law 27-7-1993 and Grand Ducal regulation from 5-8-1993 concerning economic development and diversification
- Category: Investment subsidies
- Applied from - until: 27-7-1993
- Targeted technology: CHP, Hydro energy, Geothermal energy, Solar, Wind, Biomass
- Objective: The aim of the law is to stimulate the economic development as well as the amelioration of the general structure and the regional equilibrium of the economy.
- Specification of the measure: The competent ministers can allocate financial support up to 25% of the investment. The support can be raised by 5% in case of an investment in one of three defined geographical zones. Own capital is required.

11.4 Country context

11.4.1 Institutional framework

The Grand Duchy of Luxembourg is a constitutional monarchy, which means that the Grand Duke is the Chief of State, but the legislative power is at the people's representatives in the Government. The Ministry of Energy was changed to the department of Energy within the Ministry of Economic Affairs in 1999. The ministry of Environment is in charge of policy to curb air pollution and CO₂ emissions. Both ministries have authority for energy efficiency and renewable energy issues. The Grand Ducal Regulation of 11 August 1996 established the Conseil National de l'Énergie (National Energy Council) as an advisory body to the government on energy issues. It provides advice on questions put by the ministry of Energy and can, on its own initiative, give advice on energy policy matters, which it considers useful.

11.4.2 Electricity sector

Most of the electricity in Luxembourg is produced by RWE (German) and Electrabel (Belgian). Only a small part of the consumed electricity is produced in Luxembourg itself.

In Luxembourg, there are two different Grids. The first is owned by CEGEDEL (Compagnie Grand-Ducale de l'Électricité), the second is owned by SOTEL (Société de transport de l'Électricité). These grids are not connected, but they share a 220kV back-up line each. This allows some power exchanges of a limited quantity for a limited period of time.

12. THE NETHERLANDS

12.1 Renewable energy in The Netherlands

Electricity in The Netherlands is mostly produced from gas and coal plants. Renewables, specifically wind, and waste are contributing to the electricity production on a scale comparable to petroleum.

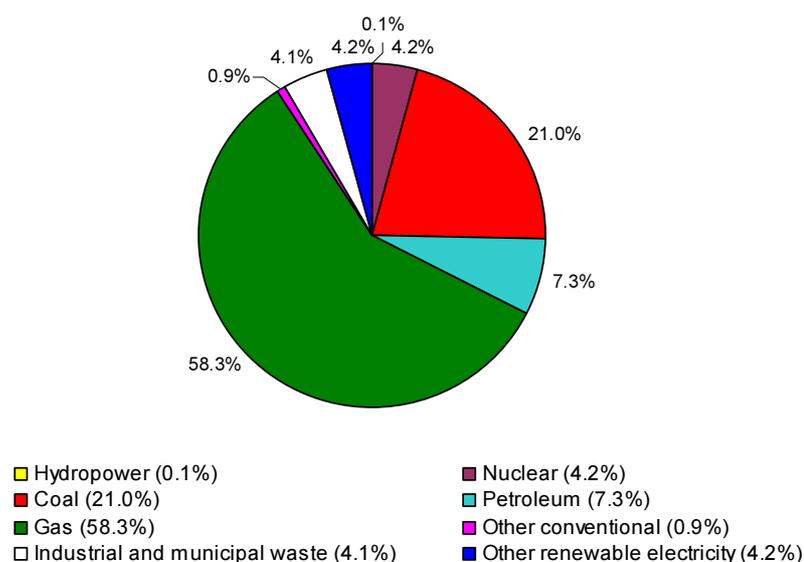


Figure 12.1 *Gross electricity production in 1999 in The Netherlands*

Source: Eurostat.

Table 12.1 *Installed capacity in The Netherlands in 1999 [MW]*

Netherlands	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	17567	18994	20619
Total thermal supply power stations	16960	18195	19724
Nuclear power stations	510	505	449
Total hydro-electrical production capacity	40	37	37
Hydro plants < 1 MW	-	2	2
Hydro plants ≥ 1 MW and ≤ 10 MW	-	0	0
Hydro plants > 10 MW	-	35	35
Wind energy	57	257	409
Geothermal energy	-	-	-
Photovoltaics	1	2	10
Solar thermal	-	-	-
Municipal solid wastes	149	189	395
Wood/wood wastes	0	0	0
Biogas	0	0	0
Industrial wastes	0	0	0

Source: Eurostat.

12.2 Targets and objectives

The Dutch targets for renewable energy for the year 2000 were set through agreements with the electricity sector. The Dutch national target for renewable energy is 10% of total energy consumption in 2020. For electricity the target is 17% of total electricity consumption. The indicative target for 2010, as set in the EU Renewable Energy Directive²⁴ is 9% of electricity consumption. National targets for renewable energy have also been formulated for 2010 in order to meet the emission reduction targets under the Kyoto protocol. These renewable energy targets have been set at 5% of energy consumption, which is estimated to be equivalent to 8.5% of electricity consumption.

Table 12.2 *share of RE and RE-E in 2000 and targets 2010*

Targets	[%] RES in 2000 ²⁵	[%] RES in 2000 (realised ²⁶)	[%] RES in 2010
[%] RE-E of electricity consumption	3.2	2.5 (3.9 ²⁷)	9.0
[%] RES of primary energy consumption	3.0	1.2	5.0

The Netherlands RE policies have focussed on stimulating demand for RE-E. This has caused increasing imports, especially in 2000 and 2001. National production of RE-E in 2000, at 2570 GWh, was still higher than imports (1500 GWh), but in 2001 imports had increased to 7645 GWh, while national production only showed a small increase to 2948 GWh. The share of imports is expected to decrease in 2003 due to policy changes.

12.3 Policy instruments

The Dutch government has actively supported renewable energy implementation since 1989. Throughout the 1990s, this support was embedded in the Environmental Action Plan 1991-2000 (Milieu Actie Plan, MAP) and further encouraged through investment subsidies and fiscal stimulation of investment in environmentally friendly technologies. The other main instruments relevant for renewable energy in the 1990s were the VAMIL and IEA, both fiscal measures on investment, other investment subsidies, and the Green Funds. Since 2000 the most important policy scheme has been the REB: a combination of financial stimulation of green electricity consumption on the one hand, and support on renewable energy production on the other hand. This policy scheme uses Green Certificates. In 2003 the REB was partly replaced by a feed-in system: the MEP.

Voluntary agreements

- Name of the instrument: The Environmental Action Plan 1991-2000 (Milieu Actie Plan, MAP)²⁸
- Category: Voluntary agreements
- Applied from - until: From 1990 until end 2000
- Targeted technology: Energy efficiency and renewable energy technologies
- Objective: Promote energy efficiency and energy production from renewable sources. A specific target for renewable energy was introduced in 1997: at least 3.2% of the electricity distributed from renewable sources by the end of 2000.
- Specification of the measure: The MAP is a voluntary agreement between the energy

²⁴ Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market, OJ L283/33, 27 October 2001.

²⁵ (EZ 1997)

²⁶ (Joosen 2002)

²⁷ including imported RE-E

²⁸ Based on: (Eiff, 2001)

sector and the ministry of economic affairs. All energy companies in The Netherlands were committed to CO₂ reduction, and later also renewable energy targets.

Utilities designed and implemented their own programmes under MAP, financed by a so-called 'MAP levy' (on average 1.8%) on energy consumption. In 1997, the utilities introduced a system of Green Labels (green certificates) to distribute the cost burden of the renewable electricity target over themselves in a fair manner.

Feed-in premiums

- Name of the instrument: Milieukwaliteit van de Elektriciteitsproductie (MEP, environmental quality of electricity production)
- Category: Feed-in premiums
- Applied from - until: From July 2003 - ongoing
- Targeted technology: Renewable energy technologies
- Area: Domestic production only
- Objective: Stimulation of the production and consumption of renewable electricity
- Specification of the measure: The MEP is paid to producers of electricity from renewable sources who feed in on the national grid, and is guaranteed for a maximum of 10 years. The level of producer support is differentiated for technologies. The highest support level (6.8 ct/kWh) will be granted for wind offshore, PV, small stand-alone biomass installations, hydro, wave and tide energy. For wind onshore the production support is 4.9 ct/kWh for the year 2003. The subsidy is financed by a levy on all connections to the electricity grid in the Netherlands. The MEP producer support exists next to REB exemption for specific RE technologies (see above).

Fiscal measures

- Name of the instrument: Willekeurige Afschrijving Milieu-investeringen VAMIL (Original name: Vervroegde Afschrijving Milieu Investeringen, early depreciation environmental investments)
 - Category: Fiscal measures
 - Applied from - until: 1991 - 2002
 - Targeted technology: Environmentally friendly technologies- including all renewable technologies (wind turbines since 1996).
 - Objective: Stimulation of non-conventional investments in environmentally friendly technologies
 - Specification of the measure: The VAMIL scheme allows investors in environmental technologies (defined explicitly by a VAMIL-list) to freely offset their investments against taxable profits, resulting for the investor in an interest benefit. The VAMIL is especially interesting for entrepreneurs with high profits (higher tax scale). The advantage of VAMIL is maximal at the beginning of a project, as taxes will increase during operation.
- Name of the instrument: REB: Regulating Energy Tax (Regulerende Energiebelasting)
 - Category: Fiscal measures
 - Applied from - until: From 1997- ongoing

Targeted technology:	Energy conservation and renewable energy technologies- Since 01-2002 no consumption support for hydro, since 01-2003 no production support for hydro and biomass.
Area:	No distinction made between domestic and imported electricity since 01-2002.
Objective:	Energy conservation and stimulation of the production and consumption of renewable electricity
Specification of the measure:	The Regulating Energy Tax (REB) is an energy levy on electricity and gas consumption by small and medium-size customers. Energy from renewable sources is exempt for the tax. The proceeds from the tax can be used by suppliers as a premium tariff for renewable energy producers (not mandatory). In 2002 this combination added up to 8.0 ct/kWh (6.0 ct/kWh tax exemption + 2.0 ct/kWh production support). Since 2001, a Green certificate System has been used for the validation and monitoring of the production and sales of green electricity under the REB.

The REB system was adapted in July 2003. The envisaged policy scheme combines a lower exemption level of taxation on consumption with a technology specific feed-in tariff (MEP). Green certificates will remain to be used. The REB was reduced in scope to a tax and tax exemption. The exemption is set at 2.9ct/kWh for wind onshore and offshore, 100% biomass (that is, biomass with an organic fraction of more than 97%), small stand-alone biomass, PV, wave, tidal and landfill (not for mixed biomass, waste or hydro). The development of the ReB is given in Table 12.3.

Table 12.3 *Regulatory energy tax (REB) for electricity per user category [ct/kWh]*

Electricity consumption [kWh]	1996	1997	1998	1999	2000	2001	2002
0-800	0	0	0	0	0	5.83	6.01
800-10000	1.34	1.34	1.34	2.25	3.72	5.83	6.01
10000-50000	1.34	1.34	1.34	1.47	1.61	1.94	2.00
50000-10 mln	0	0	0	0.10	0.22	0.59	0.61
> 10 mln	0	0	0	0	0	0	0
Production subsidy	1.34	1.34	1.34	1.47	1.61	1.94	2.00

Investment subsidies

• Name of the instrument:	Energy Investment Deduction (EIA)
Category:	Investment subsidies
Applied from - until:	January 1997 - ongoing
Targeted technology:	Energy efficiency and renewable energy technologies as defined on a qualifying list, updated annually
Objective:	energy saving by stimulating investment in energy efficient and renewable energy technologies
Specification of the measure:	This fiscal measure allows investment in certain technologies (including wind) to be deducted from taxable profit up to a percentage of investment costs in the first year. In 2002 this was 55%. With a taxation level of 35% for Dutch entrepreneurs, the EIA amounts to a discount of 19 % of investment costs if the entrepreneur can indeed

use the full deduction. The maximum deduction is 99 million € per fiscal entity. The minimum investment (in the year of application) is 1900 €.

- Name of the instrument: Subsidy Regulations Energy Supply in Non-profit and Private Sectors (EINP)
Category: Investment subsidies
Applied from - until: January 1997 - ongoing
Targeted technology: Energy efficient and renewable energy technologies
Objective: Energy saving by stimulating investment in energy efficient and renewable energy technologies
Specification of the measure: The EINP is a subsidy meant for stimulation of investment in renewable energy by non-profit organisations. This subsidy applies for the majority of farmers who invest in wind energy as private persons. The subsidy amounts to 18.5% of investment for not-for profit organisations and 20% for individual persons. (Jong 2002) The subsidy only applies for investments larger than 1750 €.
- Name of the instrument: Energy Performance Advice (EPA) and Energy Premium (EPR)²⁹
Category: Investment subsidies
Applied from - until: EPA as from January 2001.
EPR from January 2000, operational for indefinite period. List of measures that are eligible can change from one year to another. Energy generating technologies first became included in January 2001
Targeted technology: Energy efficiency and renewable energy technologies in residential areas (housing and offices)
Objective: Energy saving by stimulating investment in energy saving measures, inciting purchase of energy-efficient equipment and use of renewable energy technologies such as PV, solar water heaters and heat pumps.
Specification of the measure: EPA is a consultation carried out by certified EPA advisors, which can be requested by (an association of) owners, landlords and tenants, to improve the energy performance of their dwellings or offices. The consult is performed by a certified company, and lists the possible measures to be taken. If the advice is neglected, a bill is presented. In case one or more of the measures is carried out the EPA advisor will not send a bill, and EPR will subsidise part of the cost. In addition, EPA adds a bonus of 10% (for private persons) to 25% (for housing co-operatives and landlords) to the EPR premium.

Both measures are financed by means that become available from the energy tax REB. The mechanism thus discourages energy use and encourages energy-efficiency.

For the current overview of RES support, only PV is at stake. For other measures other requirements can occur. The electricity generated can be used at the consumer's, or can be fed into the grid. In the year 2002, the subsidy

²⁹ (EPA 2002)

mounted to 3.50 €/W_p installed PV capacity. In case the system is larger than 600 W_p a certified company should check the electric part of the installation. If the EPR-request follows from an EPA, additional subsidy will be handed out (see notes above).

Other investments subsidies

Between 1989 and 1996, wind energy was stimulated through investment subsidies of up to 40%. Investment subsidies for CHP plants and a regulation forbidding construction of power plants larger than 100MW has stimulated decentralised electricity production, and indirectly also the use of biomass for co-generation. Biomass digestion projects were supported as R&D or demonstration projects.

Green Funds with tax exemption for private investors in environmentally beneficial projects. The private investor receives tax exemption when he participates in these environmentally beneficial projects. The interest rates banks have to pay to the investor can be lower since they share the tax advantage. As a result the interest rates for the specific projects can be lower. To be eligible for this measure, a bank has to apply for a 'green declaration' of a project. Such a declaration has a maximum duration of 10 years. Under the current tax system in the Netherlands the Green Funds make conditions for investments considerably more favourable.

12.4 Country context

12.4.1 Institutional framework

Institutional context

Energy issues, and therefore also renewable energy stimulation, is the responsibility of the ministry of Economic Affairs. The implementation of the policy is mainly carried out by two institutes financed by the Ministry of Economic Affairs: subsidies on energy efficiency and renewable energy are distributed through Novem (which deals mainly with R&D budgets, demonstration programmes and monitoring projects) and Senter (which deals mainly with fiscal instruments).

The electricity market in The Netherlands is undergoing large changes due to the liberalisation process. The market will be opened in phases until complete opening in 2004. The renewable energy market already opened in 2001. Since the enforcement of the Electricity Law in 1998 electricity production and supply are competitive and open for new entrants.

Permits

Due to strong procedures for public influence in permitting procedures, the procedure towards obtaining permits can be very time consuming in the Netherlands. Especially for wind energy, the time to obtain a permit is regarded as a main barrier to project implementation by project developers.

Program responsibility (Programma Verantwoordelijkheid)

The liberalisation of the energy market is imposing new demands on renewable energy producers. In order to match supply and demand in an efficient manner, the Netherlands grid operator TenneT requires producers and consumers of electricity to state their energy production or consumption one-day in advance. Since 1 January 2002 all electricity producers larger than 100kW are obligated to comply with energy measurement demands. The programme responsibility will be extended in phases until 2004 when all suppliers will be included.

12.4.2 Electricity sector

There are four large-scale electricity producers in The Netherlands, supplying approximately 50% of the Dutch electricity consumption. The owners of these companies are Electrabel Nederland, UNA/Reliant, E.ON Benelux and Essent Energy Production/EPZ. Decentralised production makes up 30% of electricity produced, and the remaining 20% of electricity are imported. Decentralised electricity production consists largely of co-generation plants, which are commonly joint ventures between supply companies and industrial firms.

There is one national transmission network operator and system operator: TenneT. The distribution side of the energy sector has been characterised by mergers and take-overs between energy distribution companies over the last few years. There are now three large distribution network operators: NUON, ESSENT and Eneco, all subsidiary companies of incumbent energy suppliers, who together cover approximately 87% of the electricity, market in 2001. The remaining distribution network operators are mainly very locally oriented.

In the Netherlands there is a legal unbundling of distribution network operation and supply since 1998. The distribution network operators are licensees for energy supply to captive customers until end 2003, when all new players on the market can supply to all customers. The market for renewable energy was already opened in 2001. Although there are new entrance suppliers on this market, it is still dominated by the large incumbent suppliers.

Electricity prices to small consumers are relatively high in The Netherlands compared to other EU countries. In 2002 kWh cost 16.14 ct for households, or 11.6 ct for SME. Large consumers, using 1-9 GWh annually, pay 6.75 ct/kWh. (Inra, 2002)

13. NORWAY

13.1 Renewable energy in Norway

Electricity in Norway is generated for more than 99% by hydropower. Wind energy is growing, but it accounts still for only a very small part of the total electricity produced. For heat production bio-energy and natural gas are the most important sources.

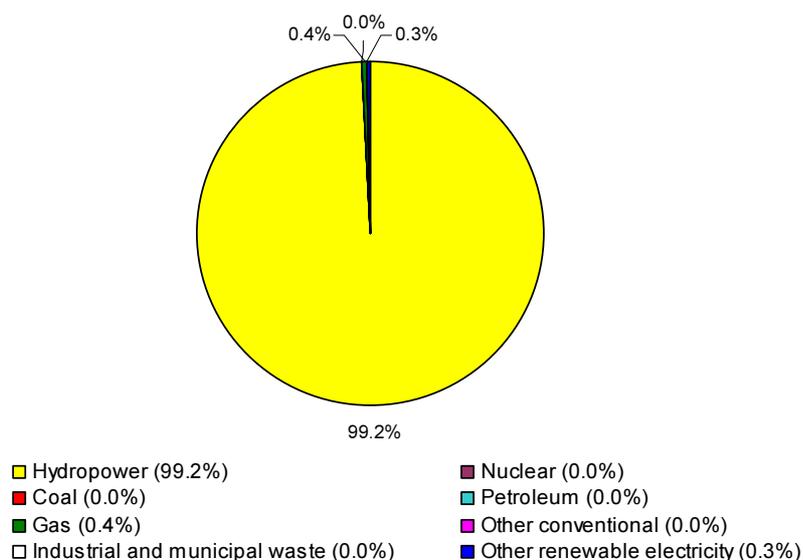


Figure 13.1 *Gross electricity production in 1999 in Norway*

Source: Eurostat.

Table 13.1 *Installed capacity in Norway in 1999 [MW]*

Norway	1990	1995	1999
Total installed capacity thermal, nuclear, hydro and wind	0	0	-
Total thermal supply power stations	0	0	-
Nuclear power stations	0	0	-
Total hydro-electrical production capacity	0	0	-
Hydro plants < 1 MW	-	59	0
Hydro plants >= 1 MW and <= 10 MW	-	844	889
Hydro plants > 10 MW	-	26887	26652
Wind energy	0	0	-
Geothermal energy	-	-	-
Photovoltaics	0	0	0
Solar thermal	-	-	-
Municipal solid wastes	147	146	0
Wood/wood wastes	99	87	30
Biogas	0	0	0
Industrial wastes	0	0	0

Source: Eurostat.

13.2 Targets and objectives

Since most of Norway's electricity is already generated from hydro plants, the national targets focus more on the introduction of specific technologies (wind energy and heat production from biomass) than on general increase of RES.

The targets are as follows:

Table 13.2 *increase of the share of RES in 2010*

Targets	2010
Wind power production	+ 2.4 %
Increase of central heating based on RES	+ 3.25 %

13.3 Policy instruments

Even though the production costs for electricity from wind power at good sites will be lower than for other new renewable sources, they still need some public funding to be profitable. The most important policy instruments for promoting wind energy in Norway are investment grants and exemptions from the 7% investment tax. In addition, production support for wind power plants at a rate corresponding to half the electricity tax was introduced in 1999. Altogether, these measures to promote wind power correspond to about NOK 0.1/kWh (about 1.4 ct/kWh).

Corresponding tax exemptions and subsidies are provided for other renewable energy sources as well. Investments in biofuel reactors, district heating, and heat pumps are also exempted from investment tax and may be eligible for a 25% direct state subsidy. In total the budget for the promotion of RES has grown in recent years. In 2001 the budget totalled about 68 M€.

13.4 Country context

13.4.1 Institutional framework

The ministry of Petroleum and Energy is responsible for the allocation of state funds, the long-term strategy and evaluation the changes in the use of policy instruments.

On 27th of March 2001 the parliament approved the establishment of a new directorate to promote efficient energy use and production, new renewables and environmentally friendly natural gas solutions. This directorate was named ENOVA and is operational from 1 January 2002. ENOVEA is fully owned by the government of Norway, represented by the Ministry of Petroleum and Energy. The objectives of ENOVA are as follows:

- Reduce the consumption of energy more than business as usual
- Increase the use of water based heat distribution systems that utilise renewable energy, heat pumps and waste heat. Further, such systems should cover 4 TWh more in 2010 than 2002
- Construct wind power facilities that will produce 3 TWh by 2010
- Increase the domestic use of natural gas.

ENOVA is a result of the Prospective document NOU 1998:11 (the energy and electricity balance towards 2020) which recommends a number of actions to increase production of energy from renewable energy sources other than large hydro. Some of the recommendations in this document are:

- Investigate wind energy resources and actual projects. The investigation must also highlight grid connection possibilities and local environmental consequences

- Improve the external condition for investments in wind power through temporary economic stimulus. Similar measures for heat pumps and biomass should also be considered.
- Make local authorities obliged to investigate their own energy resources
- Remove regulatory barriers obstructing district heating
- Consider economic stimulus for district heating systems with low business profitability, however still with socio-economic profitability

13.4.2 Electricity sector

The Norwegian Parliament (Stortinget) is the legislative body that regulates and plans energy-related subjects in Norway. The electricity market is deregulated. This deregulation started with the introduction of the Energy Act in 1991. Following the liberalisation of the electricity markets in the Nordic countries, Norway, Sweden, Denmark and Finland now have a common electricity market. There are no special charges for trade between Norway and the other Nordic countries.

14. PORTUGAL

14.1 Renewable energy in Portugal

In Portugal electricity is generated from the traditional sources coal, petroleum and gas. Hydro-power contributes to the electricity production for a large share as well. The installed capacity of wind and biomass plants is increasing rapidly.

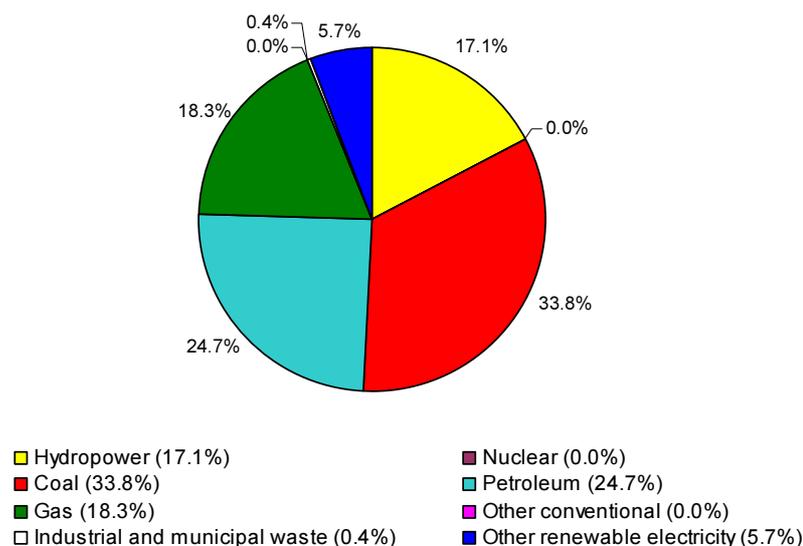


Figure 14.1 *Gross electricity production in 1999 in Portugal*

Source: Eurostat.

Table 14.1 *Installed capacity in Portugal in 1999[MW]*

Portugal	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	7396	9318	10750
Total thermal supply power stations	4050	4893	6156
Nuclear power stations	-	-	-
Total hydro-electrical production capacity	3344	4409	4527
Hydro plants < 1 MW	-	22	22
Hydro plants ≥ 1 MW and ≤ 10 MW	-	224	235
Hydro plants > 10 MW	-	3471	3507
Wind energy	1	8	57
Geothermal energy	1	8	10
Photovoltaics	0	0	1
Solar thermal	-	-	-
Municipal solid wastes	0	0	81
Wood/wood wastes	0	0	360
Biogas	0	0	1
Industrial wastes	0	0	0

Source: Eurostat.

14.2 Targets and objectives

The objectives of the Portuguese energy policy are to modernise the Portuguese economy and to strengthen Portugal's competitiveness through wide ranging actions in the energy sector. The goal is to reach simultaneously a secure supply, a reduction of the national energy bill and the preservation of the environment. This should be reached by four main lines of action, namely to increase security of supply, to diversify the access to energy sources available in the market, to promote energy efficiency and to promote the use of endogenous/renewable energy sources. The 'E4 Programme' is the basis for these objectives. This programme creates the conditions for reaching the target of 39% of the electricity consumption generated from renewable sources in 2010, which follows the EU Directive on electricity from renewable sources [EC 2001] 2001/77/EC (ENER IURE Database, 2002, ENER IURE, 2002). To reach this target the programme plans more than 4000 additional renewable megawatts, from which nearly 3000 MW is wind power (Enzensberger et al., 2003).

Table 14.2 *Share of RES in 1997 and 2010 (EU indicative targets)*

Federal minimum targets	[%] RES in 1997	[%] RES in 2010
[%] RES	39.0	39.0

14.3 Policy instruments

The policy instruments that are used in the realisation of the Portuguese energy policy are mainly feed-in tariffs and investment subsidies. Besides these instruments there are also loans and grants covering investment costs.

Feed-in tariffs

- Name of the instrument: Decree-law number 339-C/2001 (update of Decree-Law number 168/99³⁰)
 - Category: Feed-in tariffs
 - Applied from - until: December 2001 - ongoing
 - Targeted technology: All RES
 - Objective: Stimulation of RES-E production
 - Specification of the measure: This measure revises DL no.168/99. The decree of 1999 guarantees power producers that the public grid will buy their produced electricity during the period in which the licences are valid. The guaranteed buying period is increased from 8 to 12 years. After this period of 12 years the buying price calculation will be defined and the environmental benefits are accounted partially. The feed-in tariff is calculated as the sum of three parts related to the avoided costs for the public power system and the environmental benefits from the use of endogenous energy resources. The environmental part of the tariff is based on the unit valuation of the avoided CO₂ emissions of a reference plant: 370 g (CO₂) /kWh and 75 €/ton. The feed-in tariff will be regularly updated based on the consumer price index. Decree-law number 339-C/2001 led to the establishment of differentiated tariffs as a function of the technology and operating regime. This decree also compensates local authorities in the case of installation of wind farms in their municipalities. Besides this the decree creates the

³⁰ DL no. 168/99 is an update of DL 189/88 and DL number 313/95.

conditions for developing projects relying on emerging technologies with high potential in the medium long term, for example PV, wave energy and biomass.

Since 2001 the feed-in tariffs have been specified per technology. In 2003 the tariffs were as follows:

Small hydro (≤ 10 MW): 7.2 ct/kWh
Wind < 2000 full load hours: 8.31 ct/kWh
Wind 2000 - 2200 full load hours: 8.2 ct/kWh
Wind 2200 - 2400 full load hours: 8.021 ct/kWh
Wind 2400 - 2600 full load hours: 7.8 ct/kWh
Wind 2600 - 2800 full load hours: 7.56 ct/kWh
Wind > 2800 full load hours: 7.25 ct/kWh
Biomass: 6.198 ct/kWh
Solar PV < 5kW: 41.0 ct/kWh
Solar PV > 5kW: 22.4 ct/kWh
(solar PV until 50 MW is reached)

Fiscal measures

The fiscal measures will be described here: (ENER IURE, 2002a)

- Name of the instrument: Favourable taxation on personal income tax (DL number 442-A/88)
Category: Fiscal measures
Applied from - until: 1988 - ongoing
Targeted technology: All RES
Objective: Stimulation of investment on renewable energy technologies.
Specification of the measure: Private investors receive tax credits on their personal income tax for investment in renewable energy technologies. In 1999 deductions to the tax total amount were allowed to the limit of 20% of the investment made or 125 € per year. This is raised to maximal 30% of the investment in 2002. There is a maximum ceiling of 700 € per year.
- Name of the instrument: VAT reduction
Category: Fiscal measures
Applied from - until: ? - ongoing
Targeted technology: All RES, excluding services and auxiliary investment
Objective: Stimulate investment in renewable energy technologies
Specification of the measure: The reduced VAT rate for Renewable energy technology is 5% (compared to the normal VAT rate of 17%). Due to European fiscal harmonisation this measure was revised in 2001 to the present rate of 12%.

Investment subsidies (ENER IURE, 2002b)

- Name of the instrument: ENERGIA Programme
Category: Investment subsidies
Applied from - until: 1994 - 2002
Targeted technology: All RES, natural gas, energy efficiency technology
Objective: To support investments for the introduction of natural gas, RES, energy efficiency
Specification of the measure: This programme was the financial tool of the Ministry of Economy to support projects in the energy sector that were realised under the CSF II (Community Support

- Framework³¹) between 1994 and 1999. .
- For renewable energy projects this led to subsidies based on the so-called Measure 2: the Valorisation of Energy Endogenous Potential. From this measure refundable subsidies (loans) were given at zero interest rate. The level of subsidy was calculated based on the energy production, technical and economic value of the project, on its regional social and environmental impacts.
- Name of the instrument: MAPE/POE³² Programme
 - Category: Investment subsidies
 - Applied from - until: 2000 - ongoing until 2006
 - Targeted technology: All RES, energy efficiency technology, natural gas, transport fuels
 - Objective: to improve energy efficiency and to increase use of renewable energy sources.
 - Specification of the measure: This programme is the financial tool of the Ministry of Economy to support projects in the energy sector that are being realised under the CSF III (Community Support Framework³³) between 2000 and 2006.
The programme gives subsidies to public and private organisations for investment projects in four categories. The first is ‘Renewables for Electricity Generation’, the second is ‘Energy Management Measures and Co-generation’, the third is ‘Green Fuels for Transport Fleets’ and the fourth is ‘Fuel Switching to Natural Gas’. The amount of subsidy given varies with the type of technology and economical feasibility of a project. In general the subsidy is about 40% of the investment.

14.4 Country Context

14.4.1 Institutional framework

The Republic of Portugal consists of 11 provinces and two autonomous regions: the Azores and Madeira. The capital is Lisbon, where the government and the ministries are situated.

The Central Government is responsible for the energy policy. The Ministry of Economy is responsible for the national energy policy within the Directorate General for Energy³⁴ (DGE). The DGE is the body of the Portuguese Administration that is responsible for the conception, execution and evaluation of energy policy (DGE, 2003). The Ministry of Finance is responsible for the financial execution of the policy in the form of fiscal measures and subsidies.

On a regional level the provinces do not have any significant influence on energy policy. This is different for the two Autonomous Regions of Azores and Madeira, which have specific local legislative powers. On a local level, municipalities have some regulatory powers in land use, taxes for waste, water, and forest maintenance etceteras. In practice they do not use these powers while the National Plan for Energy Management in Municipalities lays great emphasis in Renewable Energy Sources (ENER IURE Database, 1998).

³¹ In Portuguese Quadro Comunitário de Apoio (QCA).

³² In English MAPE stands for Measure for Supporting the Use of Energy Potential and Rational Use of Energy, while POE means ‘Operational Economic Program’. In Portuguese MAPE stands for Medida de Apoio ao Aproveitamento do Potencial Energético e Racionalização de Consumos. POE stands for Programa Operacional da Economia.

³³ In Portuguese Quadro Comunitário de Apoio (QCA).

³⁴ In Portuguese Direcção Geral de Energia.

14.4.2 Electricity sector

The Portuguese electricity market can best be described by giving an outline of the developments of the electricity market structure and the liberalisation of the electricity market. In 1988 two decrees were adopted that created the basis for the liberalisation of the electricity market. The first one was Decree-Law number 449/88, which opens the electricity market to competition and the second one was Decree-Law number 189/88, which established the rules for independent power production from RES and co-generation. A second important step concerning the liberalisation of the electricity market was made in the year 1991. In that year the most important organisation on the Portuguese electricity market, the Electricidade de Portugal-Group (EdP), was transformed. Until 1991 EdP had a monopoly of generation, transport, distribution and public supply of electricity. From 1991 EdP no longer had a monopoly in generation, although it kept the monopoly in transmission and distribution and had an obligation to supply. In 1994 there was another restructuring of the electricity sector that involved unbundling EdP into business areas. This led to the following structure:

- A holding company EdP³⁵,
- A production company (CPPE³⁶) which runs 43 power stations,
- A grid company (REN³⁷) which owns and operates the 220 and 400Kv-transmission grid and is engaged in interconnections with Spain. REN keeps responsibility or co-ordination and dispatch to ensure security and reliability of supply,
- Four regional distribution companies (EN, CENEL, SLE, LTE)³⁸. These have access to the above mentioned interconnections (subject to capacity limitations),
- Ten service companies.

The reform of the electricity sector was described in Decree-Law number 182/95. In this decree the roles of the different actors and the guidelines for activity interaction are defined. The following five decrees complement the former decree and are establishing the legal framework for the production, distribution, transportation, co-generation and regulation activities respectively. Decree-Law number 313/95 created the new framework for independent power production. The system described above is called the National Electricity System³⁹ (SEN). The SEN consists of two parts, namely the centralised and closely regulated part (SEP)⁴⁰ and the independent part (SEI)⁴¹. SEP focuses on fulfilling the needs of all electricity clients by following a uniform tariff system in the Portuguese territory. The generators in the SEP are in charge of ensuring public service, which means security and obligation of supply. SEI covers all power generators operating under specific legislative framework but without the public service obligations. Therefore SEI includes the non-bounded, independent generators linked to the EdP distribution grid (SENV⁴²: HDN, HIDROCENEL and Hidrotejo) and more than one hundred independent power producers from renewable energy sources and co-generation plants. (ENER IURE, 2002, IEA, 2000)

In this system there are two entities that can be called the ‘surveillance authorities’, namely the planning entity and the regulatory entity. These entities regulate the electricity market or SEN. Besides this there is the Electricity Supply Regulatory Office (ERSE⁴³), which is responsible for the SEP regulation and the electricity trading business between SENV and SEP (IEA, 2000w). Consumers with an annual consumption of over 100 GWh (19 consumers representing 13.2% of national consumption) and distributors for a minimum of 8% and a maximum of 15% of their

³⁵ In 1997 30% of EdP shares were put on the market and in 1998 the government decided to privatise another 16,2% of the company.

³⁶ In Portuguese Companhia Portuguesa de Produção de Electricidade.

³⁷ Rede Eléctrica Nacional.

³⁸ Divided into geographical areas: North (EN), Central (CENEL), South (SLE) and the Lisbon (LTE) area.

³⁹ In Portuguese Sistema Electrico Nacional.

⁴⁰ In Portuguese Sistema Electrico de Servico Publico and in English the Public Electricity System.

⁴¹ In Portuguese Sistema Electrico Independente and in English the Independent Electricity System.

⁴² In Portuguese Sistema Electrico Não Vinculado and in English the Not Binding Electricity System.

⁴³ In Portuguese Entidade Reguladora do Sector Eléctrico.

consumption had the right to choose their supplier. These distributors can contract directly from producers in the SENV, by direct imports or by imports via the transmission-network. For the remainder of their electricity purchases, distributors in the regulated market are obliged to contract from REN. The percentage of eligibility is adjusted upward every three years. ERSE can alter this percentage at any stage. For 1999, this percentage is fixed at 8%.

Since February 1999, consumers with an annual consumption of 9 GWh are eligible to choose a producer. They represent 25.22% of national electricity consumption (or 189 eligible consumers) and 18% of the electricity sold by SEP. The 8% eligibility of the distributors has to be added to this.

Nowadays, every consumer connected to the grid by medium voltage, high voltage or very high voltage is free to choose its electricity supplier. This results in a 45%-open electricity market (Personal Communication with ERSE, EC, 2003).

In 2001 the E4 Programme was developed, which stands for Energy Efficiency and Endogenous Energies⁴⁴. This programme planned the reduction of more than 20 decrees to promote renewables, to simplify administrative procedures, to increase efficiency etc. (Enzensberger et al., 2003). With the programme the government creates the conditions to reach the European indicative target for renewable electricity.

⁴⁴ In Portuguese Eficiência Energetica e Energias Endógenas.

15. SPAIN

15.1 Renewable energy in Spain

Electricity in Spain is produced using coal-powered plants, petroleum and gas plants, and nuclear plants. Renewable electricity is generated from hydro plants, but the installed capacity wind energy is increasing rapidly.

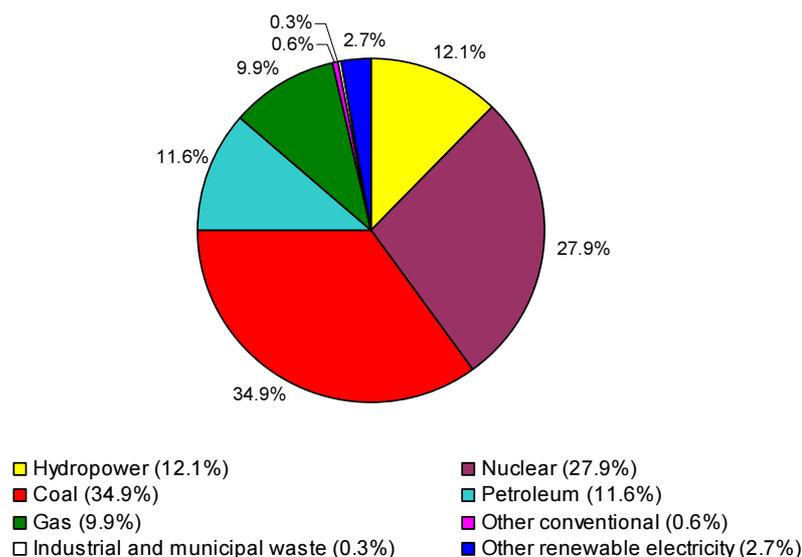


Figure 15.1 *Gross electricity production in 1999 in Spain*

Source: Eurostat.

Table 15.1 *Installed capacity in Spain in 1999 [MW]*

Spain	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	43417	45849	52413
Total thermal supply power stations	20210	21882	25644
Nuclear power stations	6970	7068	7354
Total hydro-electrical production capacity	16230	16784	17920
Hydro plants < 1 MW	-	196	227
Hydro plants ≥ 1 MW and ≤ 10 MW	-	1117	1303
Hydro plants > 10 MW	-	11394	11193
Wind energy	7	115	1495
Geothermal energy	-	-	-
Photovoltaics	0	2	9
Solar thermal	0	0	0
Municipal solid wastes	27	69	94
Wood/wood wastes	115	126	138
Biogas	0	0	34
Industrial wastes	0	0	0

Source: Eurostat.

15.2 Targets and objectives

In 1999 a national RES development plan 2000-2010 was accepted by the central government. The targets in this plan are the same as the indicative targets of the EU. These are as follows:

Table 15.2 *Share of RES in 2000 and EU indicative targets 2010*

Federal minimum targets	[%] RES in 2000	[%] RES in 2010
[%] RES - E	16.9%	29.4%

15.3 Policy instruments

Renewable energy is supported on national level under the Special System as defined in the Electric Power Act (law 54/1997). The most important instrument is a system of feed-in tariffs. Furthermore, there are many regional policies supporting the development of renewable energy.

Feed-in tariffs

- Name of the instrument: Royal Decree 2818/1998
Category: Feed-in tariffs
Applied from - until: 1999 - ongoing
Targeted technology: Wind, hydro, solar PV, Biomass, Biogas, CHP <50MW
Objective: to stimulate the production of electricity from Renewable Energy Sources.
Specification of the measure: Guaranteed purchase and a fixed price or fixed premium for electricity generated from renewable sources and electricity generated by co-generation plants with a capacity of under 50 MW. Green power producers operating under the 'special system' can choose between a fixed price and a premium on top of the market price. This allows them to sell the electricity they generate at a fixed price set above the market price, or at a variable price calculated by adding a premium to the average market price for electricity generated. The agreement regarding grid connection is made for a minimum of five years.

The premiums established by RD2818/1998 have been updated annually in line with interest rates and the average price of electricity. In the case of co-generation plants, the updating has also taken into account the average price of natural gas. Both RD 2818/1998 and the premium systems are revised annually, in line with the evolution of the market prices for electricity, the contribution of RE installations to overall electricity demand, and their impact on the technical management of the system. Table 15.3 gives an overview of the premiums and fixed prices under the special system for 2003. (RD 2818/1998; RD 1483/2001).

Table 15.3 *Premiums and fixed prices in 2003 for RE under Royal Decree 2818/1998*

	Fixed price [ct/kWh]	Premium [ct/kWh]
Wind	6.21	2.66
Small hydro	6.49	2.94
Energy crops	6.85	3.32
Other biomass	6.05	2.51
Solar PV < 5 kW	39.6	36.0
Solar PV > 5 kW	21.6	18.0
Solar Th. E	-	12.0
Geothermal, wave and tide	6.49	2.94

Investment subsidies

- Name of the instrument: Aid programme to support Solar Photovoltaic Energy (IDEA)
 - Category: Investment subsidies
 - Applied from - until: 2001 - ongoing. Evaluated on a yearly basis
 - Targeted technology: Solar PV
 - Objective: To stimulate electricity production from Solar PV installations
 - Operational period: Annually adjusted subsidy, first round in 2001 (under the Plan de Fomento de las Energías Renovables 2000-2010)
 - Specification of the measure: Subsidies for Solar PV installations of which the subsidy is decided upon an annual basis.
For 2002 the subsidy varies between 5.53 €/W_p for stand-alone auto-producers and 2.07 €/W_p for grid-connected installations with a prospective output > 5kW_p.
The subsidy has a maximum of 40% of the total investment costs, unless the investment is made by SMEs, then the maximum is 50% of the investment costs and when these businesses are in the areas mentioned in Article 87, under 3, under c in the EC treaty (IDEA).

- Name of the instrument: Línea ICO-IDAE
 - Category: Investment subsidies/loans
 - Applied from - until: Annually adjusted incentive first applied in 1999
 - Targeted technology: Biomass, small hydro, solar PV, solar thermal, waste, biogas, biofuels
 - Objective: Stimulate investments in renewable energy sources
 - Operational period: Annually adjusted.
 - Specification of the measure: The Instituto de Crédito Oficial (ICO) in combination with the Instituto para la Diversificación Renovables y Eficiencia Energética (IDAE) developed a reduced interest rate program for organisations (both public and private) which invest in renewable energy sources. The reduction on interest varies from 2% to 4% in 2002. The maximum loan size per project is 6.3 million €. The total amount of money available for loans in 2002 is 150.2 M€, the amount available for compensation of the interest rate is 12 M€ (IDEA).

Autonomous regions

The Autonomous regions have implemented their own plans for renewable energy. One of the most ambitious and successful regions is Galicia, which aims to increase the share of renewable energy sources in its final energy consumption to 15%. Targets are specified per technology in installed capacity and output. An indication of targeted installed capacities: wind: 500 MW, small hydropower: 291 MW, Forest and industrial waste: 175 MW.

15.4 Country context

15.4.1 Institutional framework

The energy sector in Spain is regulated at national level, and at the level of the Autonomous Communities. The Autonomous Communities are responsible for the development of a large part of administrative procedures and provisions related to the environment, as well as planning provisions. The State however, is the exclusive authority for installations that concern more than one Autonomous Community, for example for hydropower when the water runs through more than one Autonomous community, or when energy is transported over territory borders (ENER-IUER, 2001c).

The promotion of renewable energy sources for electricity has been a state policy for 20 years, both in strategic plans and the legal framework. The 'First Renewable Energy Plan' was published in 1986 (PER '86). The current targets for production of electricity from renewable sources and the framework for implementation are provided by the 'Plan de Fomento de las Energías Renovables 2000-2010'.

The legal framework aimed at fostering RES-E has shown great continuity through different governments and different political majorities. The three Acts that have regulated the energy and/or electricity sectors in Spain since 1980 (the Energy Conservation Act 82/1980, the National Electricity Systems Act 40/1994 and the Electric Power Act 54/1997) have given support to the development of RES. The main reason of the development of RES under the Act of 1980 was to reduce energy dependence of Spain. The emphasis changed to the environmental benefits of RES in the Acts of 1994 and 1997. With the introduction of the Electric Power Act 54/1997 the liberalisation of the Spanish market was made possible. The Act brought into force the dispositions of the European Directive 96/92/EC. (IEA, 2001; ENER-IUER, 2001c)

The basic purpose of Electric Power Act 54/1997 is the regulation of the electricity sector in the interest of guaranteeing the supply and quality at the lowest cost possible. Unified operation of the Spanish electricity system (a State-owned public service) was changed to a system in which two private stock companies were responsible for economic and technical management of the system. The Act aimed at liberalisation of the electricity market, improvement of energy efficiency, reducing energy consumption and to increase the level of environmental protection. Due to an accelerated liberalisation process, the market was open for all electricity consumers by January 2003.

The Electric Power Act distinguishes between two electricity production systems: the Ordinary System and the Special System. In the ordinary system the regulatory basis is the free generation market or electricity pool where demand and supply bids for electricity are matched and prices are set in consequence. In the special system generation plants below 50 MW belonging to three clearly separated areas (co-generation, renewable energy sources and waste) are given a special status. According to the Act RES-E producers are entitled to:

- Feed all their power into the grid system.
- Receive the conventional market price plus a premium so that the total amount paid must be in the range between the 80% and 90% of the average electricity price (Feed-in Tariffs).

Royal decree 2818/1998

The Royal Decree 2818/1998 formed the legal basis on which the special system was developed. It is applied from January 1st 1999. The Royal Decree fixed the amounts for the 1999 RES-E premiums. The premiums are adjusted annually by the central Government in line with the variation in the average electricity sale price calculated based on forecasts (RD2818, ENER IURE3, IEA).

15.4.2 Electricity sector

Law 54/1997 of the Electric Sector of 27-11-97 (BOE n°285 of 28-11-97) has, as its main purpose, the ordering and regulating of the activities involved in the supply of electric power (generation, transport, distribution, marketing, intra-Community and international exchanges) as well as the economic and technical management of the electric power system. This law substantially modifies the previous legal framework and liberalises the production, marketing and electricity consumption and regulates transport and distribution, allowing the access to third parties to the public service grids. The objective is to improve the competition in the electricity sector, since putting the electric system at the disposition of the different 'subjects' (market players) and consumers, the associated costs are reduced, for a better economic efficiency that derives from the existence of a single public service grid.

However, the retribution of the transport and distribution will continue being set by the administration. There are regulated activities for avoiding the abuse of the authority positions that the existence of a single service grid has. The 'public service' concept of the electric supply activities subject to State Planning is abandoned, being substituted by the express guarantee of supply to any consumer, in addition to liberalising the electricity activities (ENER-IUER, 2001c).

The operating rules are defined as the wholesale electricity market for increasing the competition of the market players and enables reduction of electricity consumer price.

The Operation of the Market (its economic management) is carried out by the Operadora del Mercado Español de Electricidad, S.A. company and that of the System (the technical management) is carried out by the REE, S.A. company. These 2 companies are trading corporations.

The legal separation of the liberalised activities from the regulated activities is made obligatory.

16. SWEDEN

16.1 Renewable energy in Sweden

The electricity production in Sweden is dominated by two resources, nuclear and hydropower. Besides the two major resources, biomass-based CHP plays a significant role. Natural gas is not used for electricity production in Sweden.

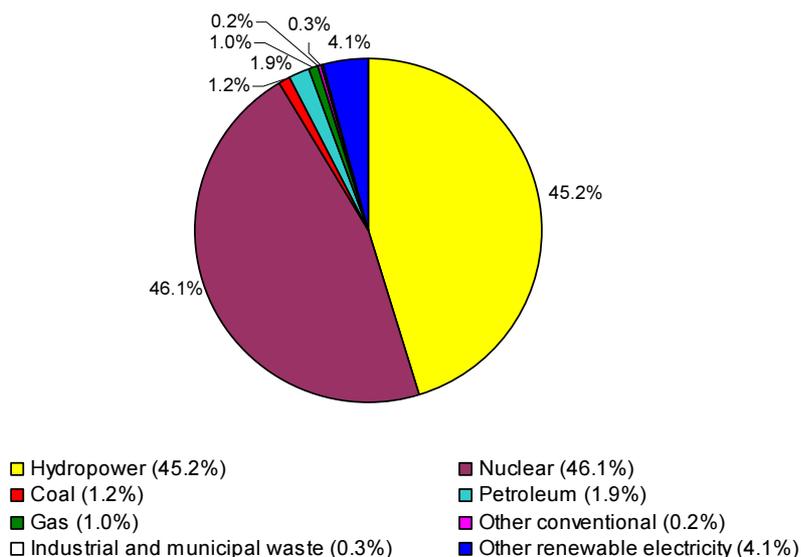


Figure 16.1 *Gross electricity production in 1999 in Sweden*

Source: Eurostat.

Table 16.1 *Installed capacity in Sweden in 1999 [MW]*

Sweden	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	34187	33623	33588
Total thermal supply power stations	7880	7349	6870
Nuclear power stations	9970	10055	10076
Total hydro-electrical production capacity	16330	16152	16432
Hydro plants < 1 MW	-	209	168
Hydro plants ≥ 1 MW and ≤ 10 MW	-	762	775
Hydro plants > 10 MW	-	15181	15489
Wind energy	7	67	210
Geothermal energy	-	-	-
Photovoltaics	0	0	3
Solar thermal	-	-	-
Municipal solid wastes	30	76	77
Wood/wood wastes	1200	1200	1490
Biogas	0	0	18
Industrial wastes	0	0	0

Source: Eurostat.

The data show a considerable growth of installed capacity for wind power. Within ten years the capacity has become 30 times larger.

16.2 Targets and objectives

The Swedish Energy Bill sets a target for the increase of the consumption of RES-E by 10 TWh from 2002 to the year 2010. To give an indication, in 1998 the total production of renewable electricity was 81.9 TWh (RECerT, 2000). The year 2004 has been set as a milestone for evaluating efforts concerning climate change, and has therefore been chosen for an evaluation of the target. If this evaluation shows that it is possible to increase production of RES-E further, the Swedish government considers an increase of annual production by 15 TWh from the 2002 level to 2012. The increase of RES-E consumption by 10 TWh also serves as a basis for developing the quotas for an electricity certificate trading system.

In the EU Renewables Directive, the indicative target for Sweden has been set at 60% of the electricity consumption in 2010 (including large hydro). This is an increase of more than 10% compared to the share of 49.1% in 1997.

Table 16 2 *Share of RES-E in 2000 (realisations) and 2010 (targets)*

	Realisation	Target
[%] RES of electricity consumption	49.1(1997)	60.0
[%] RES of primary energy consumption	27.0 (1999)	n.a.

Furthermore, a ‘planning objective’ is proposed by the Government and states a national target for wind power of 10 TWh by the year 2015. The main purpose is to make wind power visible in physical planning and in connection with the granting of permits.

16.3 Policy instruments

Since the nineties, Sweden has made use of subsidies and tax incentives to stimulate renewable electricity production. Subsidies can give an incentive to investors while tax incentives can stimulate the consumption of renewable electricity by exempting the use of renewable electricity from certain taxes. In May 2003, a new system based on tradable green certificates was introduced.

The *1997 energy policy programme* (Government Bill 1996/97:84) was set up to compensate for the closure of two nuclear power stations by promoting the production of electricity from renewable energy sources. It includes measures aimed at reducing the consumption of electricity for heating purposes, to make more efficient use of the existing power system and to increase the supply of electricity and heating from renewable energy sources. It consists of a short-term programme, which focuses on ways to increase the supply of renewable electricity and to reduce electricity consumption, and a programme of a more research-directed and long-term nature.

Subsidies for Renewables R&D

The RD&D programme, applied 1998-2004, has the objective to stimulate research, development and demonstration for the promotion of renewable energy sources, new conversion and also of end-use energy technology. It covers CHP and power from biomass, large scale and off shore wind power, and PV. The programme started in January 1998 with a volume of almost 257 million € (SEK 2.31 billion). STEM, the Swedish Energy Agency, is responsible for the implementation of the programme.

Investment subsidies

There are several investment subsidies as components of the short-term energy programme. One of the main targets of these subsidies is to stimulate the investment in new electricity production capacity from renewable energy sources. The subsidies under the programme are administered by the Swedish National Energy Administration.

- Name of the instrument: Decree 1998:22
 Category: Investment subsidies
 Applied from - until: July 1997 - 2002
 Targeted technology: Wind onshore (> 200 kW)
 small-scale hydropower (< 1500 kW)
 CHP based on biomass, under the condition that at least 70% of the fuel used by the plant is biomass during a period of five years.
- Objective: To increase the supply of RES-E with a total of 1.5 TWh in the period 1997-2002. The technologies contribute as follows: 0.5 TWh (Wind onshore), 0.25 TWh (Small-scale hydropower) and 0.75 TWh (CHP).
- Specification of the measure:
 - Wind: subsidy of 10-15% of the capital costs for new wind turbines with a capacity over 200 kW. Besides this, the wind power producer gets a so-called environmental bonus for the electricity generated. This bonus is equal to the electricity tax (1.99 ct/ kWh).
 - Small hydro: subsidy of up to 15% of the investment cost
 - CHP plants based on biomass: subsidies of about 330 €/kWe (SEK 3000 per kWe) or a maximum of 25% of the total capital cost for the project.

The total amount of money budgeted for this measure was almost 50 million € (SEK 450 million).

Fiscal measures

Since 1994, small-scale RES-E production is partially or totally exempted from the energy tax. This is beneficial for small-scale electricity producers.

- Name of the instrument: Act 1994:1776
 Category: Fiscal measures
 Applied from - until: 1994 - ongoing
 Targeted technology: All small-scale RES-based electricity production
 Objective: To favour small-scaled electricity production based on renewable energy sources.
- Specification of the measure: Small-scaled RES-E production is partially or totally exempted from the energy tax levied on households and the service sector, this gives a tax benefit of 1-2 ct/kWh.

Furthermore, producers and consumers of biomass-based electricity are exempted from various environmental taxes, such as the CO₂ tax, the sulphur tax and the NO_x levy. This is also part of the regulation under Act 1994:1776 and is a part of Sweden's strategy for climate change.

Flexible depreciation

Investors in certain environmentally friendly projects may opt for a preferential depreciation scheme (European Commission, 2002).

Green certificates

The Swedish Government Energy Bill of 2002 (2001/02:143) is the result of an evaluation of the 1997 programme. It gives an outline of the planned policy and objectives for the use of electricity from renewable energy resources until 2010. The objective to increase the RES-E consumption by 10 TWh is the basis for developing quotas in the proposal for an electricity certifi-

cate trading system. This system started in May 2003. Furthermore, some transitional subsidies, in particular for wind power, were introduced in 2003.

- Name of the instrument: Electricity certificate trading system
- Category: Green certificates/quota obligation
- Applied from - until: May 2003 - ongoing
- Targeted technology: Photovoltaics, wind power, biomass, geothermal energy, wave energy and small-scale hydro (under 1.5 MW, some exceptions exist)
- Objective: To achieve a 16.9% share of RES-E in electricity consumption in 2010
- Specification of the measure: A 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 suppliers will handle the quota, and can charge their customers for the electricity certificates. This charge must be communicated on the electricity bill, and is estimated to be around 0.55 ct/kWh. In the initial phases of the scheme, energy-intensive industries are exempted from the obligation. 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 certificates from producers. This starts at 60 SEK/MWh in 2003 (about 0.66 ct/kWh)⁴⁵.
 - A penalty for non-compliance is set at 175 SEK/MWh (1.93 ct/kWh) in 2003 and 240 SEK/MWh (2.63 ct/kWh) in 2004⁴⁶.

Subsidies specifically for wind power

Wind power cannot yet compete traditional electricity production. Therefore 'transitional subsidies' for wind power production were introduced.

- Name of the instrument: Transitional subsidies/environmental bonus
- Category: Financial stimulation for production
- Applied from - until: Starting 01.01.2003
- Targeted technology: Wind
- Objective: To create conditions for a continued development of wind power production.
- Operational period: Five years
- Specification of the measure: In order to support wind power production under the above described Tradable Green Certificate system, transitional subsidies are proposed by the Swedish government. This bonus is given until 25,000 equivalent full load hours are reached. This transitional subsidy will only be given for a five-year transitional period in which the bonus will be gradually phased out. In 2003 the subsidy will

⁴⁵ These guaranteed prices are: for 2004 SEK 60 (€ 6,6152) per certificate, for 2005 SEK 50 (€ 5,5127) per certificate, for 2006 SEK 40 (€ 4,4101) per certificate, for 2007 SEK 30 (€ 3,3076) per certificate and for 2008 SEK 20 (€ 2,2051) per certificate.

⁴⁶ In general: 150% of the volume weighted average of the certificate price during the 12 month period preceding the last day of submission for compliance with the quota undertaking.

be 1.63 ct/kWh, in 2004 1.3 ct/kWh, in 2005 and 2006 0.65 ct/kWh and in 2007 0.33 ct/kWh.

Other instruments to promote wind power are:

- Name of the instrument: Investment subsidy for setting up plants in different types of locations
Category: Financial stimulation for investment
Applied from - until: 2003 -2008
Targeted technology: Wind onshore & offshore
Objective: To gain knowledge for future expansion of wind power plants.
Operational period: Five years
Specification of the measure: The Swedish government intends to work together with the industry on gaining experience with building wind farms built in 'difficult areas' like sea or mountain locations.
An amount of SEK 350 million (about 38.6 million €) is planned for this measure.

16.4 Country context

16.4.1 Institutional framework

The responsibility for energy policy lies with the Central Government. The Ministry of Industry executes the policy. A public authority, the Swedish National Energy Administration (STEM), was set up in January 1998, with the responsibility for implementing most of the energy policy programmes and co-ordinating the work of restructuring the energy system. In addition, the Administration is also responsible for monitoring developments in the energy and environmental fields and for providing information on the current energy situation.

The basis for the present situation on the Swedish electricity market is the General Electricity Act of 1997 (SFS 1997: 857) and the National Decree of Electricity (1997:863).

- The fundamental idea of the *Electricity Act* is that electricity shall be a product for selling and buying on a market as any other product. It specifies that separate corporate bodies must be established for network and electricity trading operators. Besides this, the Act regulates the conditions under which suppliers of electricity from renewable energy sources have access to the network. Also the responsibility of the national grid is regulated, which is determined to be in the hands of the Swedish National Grid (Svenska Kraftnät).
- The *National Decree of Electricity* (1997:863) regulates the issues and the conditions under which the Network Authority, the Swedish Energy Agency, operates. This agency is responsible for delivery concessions and network concessions, norms and supervising of the network tariffs.

16.4.2 Electricity sector

In Sweden there are seven large electricity producers that have 94 % of the total electricity generation capacity (Website Nord Pool). An important development for the electricity producers on the market is the decision the Swedish government has made in 1991 to phase out nuclear power plants. As a result, one nuclear reactor has already been shut down (Barsebäck I) and a second one will be closed in 2003 (Barsebäck II). With the closure of these plants Sweden will need to import more electricity in the future, or will need to invest in new electricity production capacity.

The electricity consumers are represented by the Swedish Consumer Electricity Bureau, which was established in February 2002. This bureau has the task to deal with complaints and to give advice to customers. It also serves as a complement to local consumer advice bureau's (SGEB, 2002).

In Sweden there are approximately 220 electricity traders in the form of suppliers that are competing in the market. These different parties are Swedish but also Norwegian, Finnish, Danish and German. This is due to the fact that there is the so-called Nord Pool or the Nordic Power Exchange. The Nord Pool is the first international commodity exchange for electricity in the world. It organises trade in standardised physical contracts and also in financial contracts including clearing services to Nordic participants, and provides customer-support in Sweden, Finland, Norway and Denmark. The Nord Pool plays a key role as part of the infrastructure of the Nordic electricity power market. It thereby provides an efficient, publicly known price on electricity (Website Nord Pool).

17. UNITED KINGDOM

17.1 Renewable energy in the United Kingdom

The United Kingdom has an electricity production mix mainly consisting of nuclear energy, gas and coal. Renewable electricity production is only about 2% of total production, but installed capacity of wind and biogas are increasing steadily.

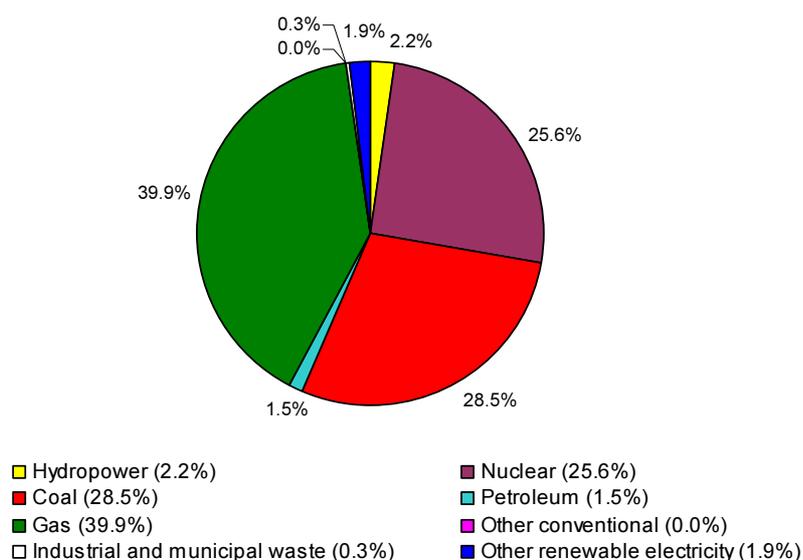


Figure 17.1 *Gross electricity production in 1999 in the United Kingdom*

Source: Eurostat.

Table 17.1 *Installed capacity in the United Kingdom in 1999 [MW]*

United kingdom	1990	1995	1999
Total installed capacity thermal, nuclear, hydro, wind and geothermal	73020	70125	75405
Total thermal supply power stations	57490	52947	58033
Nuclear power stations	11350	12762	12956
Total hydro-electrical production capacity	4170	4216	4265
Hydro plants < 1 MW	-	17	26
Hydro plants ≥ 1 MW and ≤ 10 MW	-	137	151
Hydro plants > 10 MW	-	1273	1299
Wind energy	10	200	151
Geothermal energy	-	-	-
Photovoltaics	0	0	1
Solar thermal	-	-	-
Municipal solid wastes	38	112	227
Wood/wood wastes	0	0	0
Biogas	91	199	434
Industrial wastes	0	0	0

Source: Eurostat.

17.2 Targets and objectives

The UK's Renewable Energy policy objectives and targets are very much related to the Climate Change Programme targets of November 2000. This Programme was written to set out a strategy to achieve the UK's Kyoto targets for reducing the greenhouse gas emissions. One of the means to do so is the stimulation of production of electricity from renewable energy sources.

The proportion of renewable electricity required under the Renewables Obligations will increase between now and 2010. The obligation accounts for around 3% in the first compliance period ending 31 March 2003, rising to about 10.4% in the year ending March 2011. To provide long term security for investors, the Obligation will then continue to apply at a minimum of 10.4% of sales until 2027.

Table 17.2 *share of RES in 2000 and 2010 (targets)*

Targets	[%] RES in 2000	[%] RES in 2010
[%] RES of electricity consumption UK	2.8%	10%
[%] RES of energy consumption UK	13% (end of 2003)	18%

17.3 Policy instruments

Renewable Energy policy in the UK focuses on electricity production. In February 2000, the Government published its conclusions on the new UK policy for renewable energy. The key elements were:

- The Renewables Obligation, which will replace the Non Fossil Fuel Obligation (NFFO), a bidding system which has stimulated renewables deployment since 1989.
- Renewable electricity is exempted from the Climate Change Levy.
- Regional targets for renewable energy are to be combined with a regional strategic planning approach.
- Expansion of the support (RD&D) programme.

Green certificates/quota obligation

The Renewables Obligation is the key component to boost the generation of renewable electricity. This Obligation was implemented on 1st of April 2002 and requires electricity companies to supply an increasing proportion of their production from renewable sources. The renewable electricity produced within the UK will be rewarded with Renewable Obligations Certificates (ROCs). When a producer cannot reach the target, he can buy out the obligation at a price of 30 GBP/MWh (approximately 4.8 ct/kWh). The money that is collected from companies that don't comply with their obligations and have to buy out will be distributed over the companies that have met their obligations. This redistribution will be done in proportion to the number of ROCs that have been presented.

- Name of the instrument: New & Renewables Obligation
Category: Green certificates/quota obligation
Applied from - until: 1st of April 2002 - 2027
Targeted technology: All RES
Objective: To increase the supply for renewables
Specification of the measure: Requires electricity distributors to generate a certain percentage of their production from renewable sources. (10% in 2010). In return they will receive Renewable Obligation Certificates (ROCs), which can be traded domestically. A penalty is set for non-compliance: 30 GBP/MWh (approximately 4.5 ct/kWh). This penalty will be set annually in line with the retail prices.

Fiscal measures

- Name of the instrument: Climate Change Levy (CCL, Statutory Instrument)
Category: Fiscal measures
Applied from - until: 28 July 2000-2010
Targeted technology: All RES except Large hydro power
Objective: Indirect targets are to
 - increase the demand for renewable electricity
 - increase the supply for renewable electricityDirect objective of the CCL is to reduce carbon emissions by taxing the end users of energy sources that created them ('polluter pays principle')
- Specification of the measure: The Government has introduced a system of exemptions that stimulates the demand for new forms of renewable energy. Supply of renewable electricity is exempt from the levy.
 - The supply is made under a contract that contains a renewable source declaration given by the supplier
 - Prescribed conditions are fulfilled
 - The supplier and generator of any renewable source electricity have notified Customs in writing that the conditions imposed under the scheme will be fulfilled.The levy is set on the sales of electricity, coal, natural gas and liquefied petroleum gas to the business and public sectors. The levy is paid via the energy bill. The full rate for electricity of the Levy for 2001 was 0.43p/kWh (approximately 0.63 ct/kWh) The producers will be issued with Levy Exemption Certificates, to prove that the electricity is exempted from the levy.

Investment subsidies

- Name of the instrument: The New Opportunities Fund under National Lottery Act
Category: Investment subsidies
Applied from - until: 1998 - ongoing, yearly adapted
Targeted technology: Biomass (thermal domestic applications), Biomass (Non-Waste): Energy Crops, CHP
Objective: To stimulate the production of electricity from biomass
Specification of the measure: 40% of total investment costs are subsidised, subject to budget availability.
- Name of the instrument: DTI Offshore Wind Scheme under National Lottery Act
Category: Investment subsidies
Applied from - until: 1998 - ongoing, yearly adapted
Targeted technology: Wind offshore
Objective: To stimulate the production of electricity from off-shore wind
Specification of the measure: 40% of total investment costs are subsidised, subject to budget availability, Total Grant per project should not exceed 10 Million GBP (approximately 15 million €)

17.4 Country Context

17.4.1 Institutional framework

The UK legislation can be divided into three main categories:

- Acts of parliament. These primary legislative measures for the UK (sometimes referred to as Statutes) must be passed by both houses of Parliament. They must not, generally, contain anything deemed to be retrospective.
- Statutory instruments. These secondary pieces of legislation are made by the Parliament. The relationship between the two types of legislation can be illustrated by reference to NFFO. The power to make NFFO Orders is given by the Electricity Act 1989, and each individual NFFO Order is made as a Statutory Instrument.
- Other material. The government also issues vast quantities of other material that may be defined as a third tier of legislation. It comprises guidance notes etc. which must be taken into account by decision-making bodies (ENER-IURE).

The Electric Lighting (Clauses) Act 1899 gave individuals the right to operate a generator in parallel with the public electricity networks, but not to export electricity on the network for sale. The 1989 UK electricity act granted any individual/company the right to use public networks to transmit electrical energy to third parties from one location to another. In the 1989 Electricity Act privatised the generation, transmission, distribution and supply business of the General Electricity Generating Board and the twelve Area Boards of England and Wales. Generation was divested in the private companies National Power and PowerGen, which since has been restructured into two companies one of which now has been privatised as British Energy. The National Grid Company was created as well as the Regional Electricity Companies (RECs) who hold the regional Public Electricity Suppliers (PES) licences for distribution and supply.

Within the Electricity act an obligation was placed upon the RECs of England and Wales to purchase a certain percentage of their electricity from non-fossil fuel sources. The aim of this Non-Fossil Fuel Obligation (NFFO) was originally to ensure that there would be a market for the expensive nuclear-generated electricity. The NFFO was later amended to include separate tranches for renewable energy and nuclear energy. The 2000 Utilities Act included amendments to the Electricity Act 1989. In the Utilities Act 2000 a legal obligation is placed on all licensed electricity suppliers to produce evidence that either they have supplied a specified portion of their electricity supplies from renewable energy sources to Great Britain, or that another electricity supplier has done so. Suppliers are required to produce evidence of their compliance with this obligation to the Gas and Electricity Markets Authority by a specified day each year.

17.4.2 Electricity sector

The electricity market in the UK consists of three separate and differently organised markets.

1. The electricity market of England and Wales, with a market opening of 100% since 1990.
2. The electricity market of Scotland, with a market opening of 100% since 1999. Two vertically integrated companies rule this market. The Scottish market is physically linked to the electricity Pool of England and Wales via an inter-connector.
3. The electricity market of Northern Ireland, which has no physical connection to Great Britain. The Market is currently opened up according to the minimum requirements of the EU directive (30.3% in 2000)

The liberalisation process in the UK was the first in Europe. In 1989 the process was started by the Electricity Act. This act denationalised the nationally owned electricity supply industry and created 12 regional electricity companies (RECs). The utilities act of 2000 made the separation of electricity supply and distribution possible.

Mainly the Electricity act (1989), the gas act (1995), the Utilities act (2000), the Climate Change Programme and the New and Renewable energy prospects for the 21st century have developed the electricity markets in the UK. Nowadays climate policy and energy policy is much more linked.

The department that is mainly responsible for the energy policy in the UK, is the department of Trade and Industry (DTI). The regulatory authority is the Ofgem, the Office of the Gas and Electricity Markets (ENER-IUER1).

REFERENCES

Austria

- De Lange, T.J. de. A.L. van Dijk and L.W.M. Beurskens (2002): *European renewable electricity for the Dutch market*, ECN, 2002.
- E-Control (2003): Internet: <http://www.e-control.at>.
- ENER IURE (2001): Report concerning *Electricity in Austria* 19.10.2001.
- ENER IURE (2002a): Report concerning *Financial Measures in Austria* 28.02.2002
- ENER IURE (2002b): Report concerning *Forestry and Agricultural Biomass in Austria*, November 2001
- ENER IURE Database: Internet: <http://www.jrc.es/cfapp/eneriure/Tables/AUTtables.pdf>
- Ökostromgesetz* (2002): Bundesgesetzblatt für die Republik Österreich: *Ökostromgesetz sowie Änderung des Elektrizitätswirtschafts- und -organisationsgesetzes (EIWOG) und das Energieförderungsgesetzes 1979*, 23.08.2002, 149.

Belgium

- AGORES: *RES policy report for Belgium*, Agores website (<http://www.agores.org>) by the Institut Wallon de Developpement economique et social et d'amenagement du territoire ASBL.
- AMPERE (2002): *Hoofdrapport commissie Ampere*, October 2000, Part F: New and Renewable energy sources.
- BEV (2002): *Beleidsbrief Energie 2002*, Minister van Mobiliteit, Openbare werken en Energie in Vlaanderen.
- Decree of 04-06-2002 Ministre de la Region Wallon
- Decree of 16-06-2002 Ministre des affaires Economiques
- Electricity law N39-1337, 29th of April 1999.
- Elsevier (2004): *Tradable green certificates in Flanders (Belgium)*, Verbruggen, A., Energy Policy 32 (January 2004) p. 165-176.
- ENER-IUER1 (2002a): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning fiscal measures in Belgium (30-06-2002).
- ENER-IUER2 (2002b): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning subsidies measures in Belgium (30-06-2002).
- ENER-IUER3 (2002c): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning electricity in Belgium (30-06-2002)
- ENER-IUER4 (2002d): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning planning in Belgium (30-06-2002)
- ENER-IUER5 (1998): *Final report of the ENER-IURE project*. RES' legislation in Belgium (26-10-1998).
- ENSOC (2003): Ensoc weekly, 28 February 2003.
- IEA (2001): *Energy policies of IEA countries. Belgium 2001 review*.
- NOTA (1999): *Beleidsnota Energie 2000-2004*, Steve Steveart.

UNF (2002): *Belgium's third National Communication under the United Nations Framework Convention on Climate Change*, Ministry for Social Affairs, Health and Environment, Federal department of the Environment, April 2002.

Website Electrabel: <http://www.electrabel.be>.

Website José Daras: <http://daras.wallonie.be/communiqués/planenergie.htm>.

Denmark

Connor, P. and Mitchell, C. (2002): *SUSTELNET, a review of four European Regulatory Systems and their impact on the deployment of distributed Generation*, University of Warwick, 2002.

EC DGTREN (2000): *EC DGTREN Country Liberalisation Report*. 2000.

ENER-IURE (2001): *Fiscal measures and grants/subsidies in Denmark*. Report concerning fiscal measures in Denmark. 2001

ENS (2003): Internet: www.ens.dk, Danish Energy Authority.

Lange, T. de, Dijk, A.L. van, Beurskens, L.W.M (2002): *European renewable electricity for the Dutch market*, ECN, 2002.

Ministry EB (2002a): *Liberalisation of the Energy Markets*, Danish Ministry of Economic and Business Affairs, September 2002, www.oem.dk.

Ministry EB (2002b): *Conditions for Growth in Denmark: The Danish Growth Strategy*, Danish Ministry of Economic and Business Affairs, August 2002, www.oem.dk.

Morthorst, P.E. (1999): *Policy Instruments for Regulating the Development of Wind Power in a Liberated Electricity Market*, Risø National Laboratory, Denmark, 1999.

Policy Document (2002): *Agreement between the Government, the Social Democratic Party, The Socialist People's Party, the Social Liberal Party and the Christian People's Party*, 19 June 2002, <http://www.ens.dk>.

Sambeek, E. J.W. van, Vries, H.J. de, Kooijman, H.J.T. (2003): *MEP-vergoeding voor windenergie op land*, ECN, 2003.

Wind power (2003): Internet: www.windpower.org, Danish Wind Industry Association.

Finland

ACT. PLAN (2000): *Action plan for renewable energy sources in Finland, English translation by the Ministry of trade and industry*, publication January 2000.

ENERDATA (2002): *Review of Energy Efficiency CO2 and Price Policies and Measures in EU countries and Norway in 2001*, ENERDATA s.a. - 30/04/2002.

ENER-IURE1 (2002a): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning electricity in Finland, March 2002.

ENER-IURE2 (2002b): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning fiscal measures and subsidies measures in Finland, March 2002.

ENER-IURE3 (2002c): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning bioenergy and agriculture in Finland, March 2002.

ENER-IURE4 (2002d): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning planning and the environment in Finland, March 2002.

ENER-IURE5 (1998): *Final report of the ENER-IURE project. RES' legislation in Finland*, 26-10-1998.

FIN POLICY (2002): Internet: www.agores.org/Publications/EnR/FinlandREPolicy2000.pdf, Leena Grandell, May 2000.

France

BTM Consult (2003): *World Market Update 2002*.

C. de Zoeten-Dartenset (2002): *Shifting the Focus from Nuclear to Renewable Electricity in France*, ECN-R--02-002, September 2002.

ENER - IURE (2001): *Project Phase III: Analysis of the Legislation Regarding Renewable Energy*, 2001.

EU (2002): Sources in the E.U. Member States Report Concerning Electricity in France, 21 May 2002.

Website Ministry of Energy: http://www.industrie.gouv.fr/energie/nouveautes/fle_nouv.htm.

Website Ministry of Energy: http://www.industrie.gouv.fr/energie/renou/fle_ren.htm.

Germany

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (2002): *Entwicklung der Erneubare Energien - Aktueller Sachstand*, Januar 2002.

ENER-IURE Programme (1999): *RES Legislation in Germany* (10-11-1999).

ENER-IURE Programme phase III (2001): *Report concerning electricity in Germany*, Matthias Ruchser, 14-12-2001.

ENER-IURE Programme phase III (2002): *Report concerning bio-energy in Germany*, Matthias Ruchser, 28-01-2002.

ENER-IURE Programme phase III (2002): *Report concerning fiscal measures and subsidies in Germany*, Matthias Ruchser, 30-05-2002.

ENER-IURE Programme phase III (2002): *Report concerning planning in Germany*, Matthias Ruchser, 14-05-2002.

Erfahrungsbericht zum EEG (2002): *Bericht über den Stand der Markteinführung und der Kostenentwicklung von Anlagen zur Erzeugung von Strom aus Erneubare Energien* (Erfahrungsbericht zum EEG), 28-05-2002.

REMAC 2000 Case studies (2002): Germany, May 2002 (draft).

Website Ministry of Economic Affairs: <http://www.bmwi.de>.

Website Ministry of Protection, Food and Agriculture: <http://www.verbraucherministerium.de>.

Website Ministry of Environment: <http://www.bmu.de>.

Greece

Agores (2000): *Policy affecting RES for Greece 2000*, Internet:
<http://www.agores.org/Publications/EnR/GreeceRE2000.pdf>.

Database Policy Watch: *Report on Country Liberalisation Progress of Greece*, by the ECDG for Energy and Transportation.

Delkis (1999): *Greece Action Plan*, Renewable Electricity and Liberalised Markets, Joule-III Project, ICCS/NTUA.

ENER IURE (1998): Database RES Legislation in Greece, 10.26.1998.

ENER IURE (2002a): *Report concerning electricity measures in Greece*, June 2002.

ENER IURE, (2002b): *Report concerning financial measures in Greece*, June 2002.

ENERDATA (2001): *Review of Energy Efficiency CO₂ and Price Policies and Measures in UE countries and Norway in 2001*.

Website Constitution of Greece: <http://www.hri.org/docs/syntagma/artcl50.html#A37>

Website DESMIE: http://www.desmie.gr/content/index.asp?parent_id=321&lang=2

Website EVA: <http://www.eva.wsr.ac.at/enr/cres.htm>

Website Greek Embassy: <http://www.greekembassy.org/general/polity.html>

Ireland

ENER IURE, 2002aENER IURE, *Report concerning electricity in Ireland*, 26.06.2002

ENER IURE, 2002bENER IURE, *Report concerning financial measures in Ireland*, 30.06.2002

Policy Watch (2001): Policy Watch Japan, Second updated report for Ireland, ECN

Website EirGrid: <http://www.eirgrid.com/eirgridportal/DesktopDefault.aspx?tabid=Legal>

Website Ireland: <http://www.ierland.com/index2.html> - choose 'Ierland' and 'algemeen'

Website Landenweb: <http://www.landenweb.com/bevolking.cfm?LandID=34&IERLAND>

Website Europe Enterprise:

http://europa.eu.int/comm/enterprise/enterprise_policy/charter_directory/en/singlemarkt/ireland.htm

Website William Fry: <http://www.williamfry.ie/electricity1.html>

Website Biobase: <http://btgs1.ct.utwente.nl/eeci/archive/biobase/B10675.html>

Italy

ENERDATA 1 s.a. (2001): *Review of Energy Efficiency CO₂ and Price Policies and Measures in EU countries and Norway in 2001* (16-04-2002).

ENER-IUER1 (2002): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning fiscal & subsidies measures in Italy (25-6-2002).

ENER-IUER2 (2001): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning electricity in Italy (15-11-2001).

ENER-IUER3 (2002): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning planning in Italy (24-01-2002).

- ENER-IUER4 (2002): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning agriculture in Italy (June 2002).
- ENER-IUER5 (2001): *Final report of the ENER-IURE project*. RES' legislation in Italy (28-11-2001).
- ESHA (2002): *Discussion paper on Comparison of compensation systems for electricity from renewables*, May 2002.
- WHITE PAPER (1999): *Italian White Paper for the valorisation of renewable energy sources*, Rome, August 1999 by L. Barra et al.

Luxembourg

- ENER-IUER1 (2002): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning RES legislation in Luxembourg (30-04-2002).
- ENER-IUER2 (1998): *Final report of the ENER-IURE project*. RES' legislation in Luxembourg (26-10-1998).
- IEA (2001): *Energy policies of IEA countries*. Luxembourg 2001 review, 2001.
- Website IEA: *Information on energy efficiency policies 2000, 2001 and 2002 in Luxembourg* as found on <http://www.iea.org/pubs/newslett/eneeff/Lux.pdf>.
- UNF (1995): *Rapport National du Luxembourg en vue de la 1^{ie} conférence des parties al la convention-cadre des nations-unies sur les changements climatiques*, Ministère de L'Environnement, Mars 1995.
- Website 2002 strategy summary:
http://www.gouvernement.lu/gouv/fr/act/0203/18goe_berger/18goe_berger.html.
- Wind energy: Internet: <http://www.cegedel.lu/fr/about/vent.html>.

The Netherlands

- Boots, M.G., Schaeffer, G.J., Zoeten, C. de, Mitchell, C., Anderson, T. (CMUR), Morthorst, P.E., Nielsen, L. (RISO), Gual, M., Del Rio, P., Cadenas, A., Hernandez, F. (UAM), Kühn, I., Bräuer, Stronzik, M. (ZEW) (2000): *INTRACERT: inception report: the role of an integrated tradable green certificate system in a liberalising market*, ECN-C--00-085, 2000.
- ECN (2002): Internet: www.energie.nl, Energie markt trends, 2002.
- Eiff, V.L., Sons, E.P., Mol, A.D., et al. (2001): *Eindrapport evaluatieonderzoek Milieu Actieplan 1991-2000*, nov 2001 D5429.
- EZ (1997): Ministerie van Economische Zaken, *Duurzame energie in opmars*, EZ 1997.
- EZ (1999): Ministerie van Economische Zaken, *Duurzame energie in opmars, voortgangsrapportage 1999*, EZ 1999.
- INRA (2002): Press release INRA, August 2002, www.inra.com/press/pr_20nl.htm.
- Joosen, S., Jager, D.de, Ruijgrok (2002): *Duurzame energie in Nederland 2001, Bijdrage aan de energievoorziening 1990-2001*, Novem 2002.
- Novem (2001): *Financieringswijzer Duurzame Energie*, 2001.
- Scheepers, M.J.J. (ed.), Battjes, J.J., Beeldman, M., Boots, M.G., Burger, H., Groenendaal, B.J., Kaal, M.B.T., Raad, A. de, Rijkers, F.A.M., Schaeffer, G.J., Voogt, M.H., Zoeten - Dartenset, C. de (2000): *Energie markt trends 2000*, ECN-P--00-002, 2000.

TK 28 6000 XIII (2002):, *Vaststelling van de begrotingsstaat van het Ministerie van Economische Zaken (XIII) voor het jaar 2003*, Tweede Kamer, vergaderjaar 2002-2003, 28 600 hoofdstuk XIII nr. 2, pp 117-119.

Verbruggen, H., Gielen, A., Brouwer, H., (2002): *Interdepartementaal beleidsonderzoek naar de kosteneffectiviteit van energiesubsidies*, Economisch Statistische Berichten v. 87(4351) p. 211-214, 2002.

Website energiepremie: <http://www.energiepremie.nl>.

Website EPA 2002: <http://www.epadesk.nl>.

Norway

DGE (2003): Internet:

<http://www.dge.pt/main.asp?IdTemas=1&IdSubTemas=1&IdConteudos=791>.

EC (2003): *Commission Staff Working Paper - Second Benchmarking Report on the implementation of the internal electricity and gas market*, 27.04.2003, Brussels.

Electricity generation in Norway, as found on the following websites:

http://odin.dep.no/archive/oedvedlegg/01/01/kap2_012.pdf

<http://odin.dep.no/oed/engelsk/index-n-n-a.html>

http://www.enova.nl/index.mhtml?page_id=36

ENER DATA1 s.a. (2001): *Review of Energy Efficiency CO₂ and Price Policies and Measures in EU countries and Norway in 2001*, page 29-31 (16-04-2002).

Palm et al (2000): *Green heat and power, eco-effective Energy solutions in the 21st Century*, June 2000.

Renewable energy in the European Union and Norway, 7/3/00, Internet:

www.agores.org/Publications/EnR/Norway-2000.pdf.

Report to the Storting No. 29 on Norwegian energy policy, Recommendation from the Ministry of Petroleum and Energy 19 March 1999 as found on

<http://odin.dep.no/archive/oedvedlegg/01/01/Engov011.pdf>

UNF (2002): *Norway's third national communication under the Framework Convention on Climate Change*, Ministry of the environment, June 2002.

Portugal

ENER IURE (2002): *ENER IURE Report concerning Electricity in Portugal*, 27.06.2002.

ENER IURE (2002a): *ENER IURE Report concerning Fiscal Measures in Portugal*, 27.06.2002.

ENER IURE (2002b): *ENER IURE Report concerning Subsidy Measures in Portugal*, 27.06.2002.

ENER IURE database (1998): <http://www.agores.org/Publications/EnerIure/Portugal21.pdf>.

ENER IURE database (2002): <http://www.jrc.es/cfapp/eneriure/Tables/PRTtables.pdf>.

Enzensberger et al (2003): *GRIPPs Final Report*, forthcoming, IIP 2003.

IEA (2000): *Energy policies of IEA Countries - Portugal 2000 Review*, OECD/IEA, 2000.

Website IEA (2000): <http://www.iea.org/new/releases/2000/portug.htm>.

Spain

ENER DATA1 s.a. (2001a) *Review of Energy Efficiency CO₂ and Price Policies and Measures in EU countries and Norway in 2001*, page 38-43, 16-04-2002.

ENER DATA2 s.a. (2001b): *SAVE-ODYSSEE Project on EEI - Final report part 2: Energy efficiency in Europe*, pages 34-37, 23-03-01.

ENER-IUER1 (2001a): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning fiscal measures in Spain (September 2001)

ENER-IUER2 (2001b): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning subsidies measures in Spain (November 2001).

ENER-IUER3 (2001c): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning electricity in Spain (21-06-2001)

ENER-IUER4 (2001d): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning planning in Spain (September 2001)

ENER-IUER5 (2001e): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning agriculture in Spain (September 2001)

ENER-IUER6 (1998): *Final report of the ENER-IURE project*. RES' legislation in Spain (26-10-1998).

ESHA (2002): *Discussion paper on Comparison of compensation systems for electricity from renewables*, May 2002.

Frankl, P. and Menichetti, E. (2003): *Policies and market developments, Spain*, Ecobilancio Italia, 2003.

Frankl, P. and Menichetti, E. (2000): *Policies and market developments, case study Spain*, REMAC 2000, Ecobilancio Italia.

IDEA: *Bolétin del IDEA*, no. 4, pages 126-136 and 154-168.

IEA (2001): *Energy policies of IEA countries*. Spain 2001 review, 2001.

RD 1483/2001 (2002): Real Decreto 1483/2001 por el que se establece la tarifa eléctrica para el 2002.

RD 2818/1998 (1998): Real Decreto 2818/1998, de 23 de diciembre, sobre producción de energía eléctrica por instalaciones abastecidas por recursos o fuentes de energía renovables, residuos y cogeneración.

RD 3490/2000 (2001): Real decreto 3490/2000 por el que se establece la tarifa eléctrica para el 2001.

Website IDAE: <http://www.idae.es/con01/convo06.htm> and
<http://www.idae.es/con01/convo09.htm>

Website APPA: http://www.appa.es/dch/spanish_market.htm

Website ICO: <http://www.ico.es/public/es/parrafo/energiasrenovables.html>

Sweden

ENER IURE (2001a): *ENER IURE Report concerning Electricity in Sweden*, September 2001.

ENER IURE (2001b): *ENER IURE Report concerning Financial Measures in Sweden*, September 2001.

Energie (2001): *Final Report of the project ElGreen*, European Communities, 2001.

European Commission (2002): *Inventory of public aid granted to different energy sources*, Commission Staff Working Paper.

Greenprices (2002): *Advanced plans Sweden for national certificate scheme in 2003*, Internet: www.greenprices.com, cited 19/12/02.

IEA (2002): *Dealing with Climate Change - Policies and Measures in IEA Member Countries*.

Medelius-Bredhe (2002): *The government's perspective*, slides from presentation. Deputy Director General for Energy - Division for Energy and Primary Industries - Ministry of Industry, Employment and Communications, Sweden

RECerT (2000): *Annex 2 - RECerT Country Report - Sweden*.

SGEB (2002): *Co-operation for a secure, efficient and environmentally-friendly energy supply - An agreement between the Social Democratic Party, the Centre Party and the Left Party*, September 2002.

STEM (2001): *The Climate Report 2001*, STEM.

Svenska Kraftnat,(2001): *The Swedish Electricity Market and the Role of Svenska Kraftnät*, November 2001.

Website Agores: <http://www.agores.org/Publications/EnR/SwedenREPolicy2000.pdf>

Website ECB: <http://www.ecb.int>: select 'statistics' and then 'euro foreign exchange reference rates'

Website Nordpool: <http://www.nordpool.no>

Website STEM: <http://www4.stem.se>

United Kingdom

AGORES (2000): EC Altener Programme: UK renewable energy policy information for the agores website (08/05/2000).

CLIMA: *The UK climate Change programme*, Department of the Environment, Transport and the Regions, as found on <http://www.defra.gov.uk/environment/climatechange/cm4913/#docs> chapter 3 and annex B.

DIGEST (2001): *Digest of United Kingdom Energy Statistics* as found on <http://www.dti.gov.uk/epa/dukes.htm> chapter 7 (26 July 2001).

ENER DATA1 s.a. (2002): *Review of Energy Efficiency CO₂ and Price Policies and Measures in EU countries and Norway in 2001*, pages 46-48, 16-04-2002.

ENER-IUER1 (2001a): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning fiscal measures in the UK (November 2001)

ENER-IUER2 (2001b): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning electricity in the UK (September 2001).

ENER-IUER3 (2001c): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning planning in the UK (November 2001).

ENER-IUER4 (2001d): *Analysis of the legislation regarding renewable energy sources in the E.U. Member States*. Report concerning agriculture in the UK (October 2001).

ENER-IUER5 (1998): *Final report of the ENER-IURE project*. RES' legislation in the UK (26-10-1998).

- ESHA (2002): *ESHA Discussion paper on Comparison of compensation systems for electricity from renewables*, May 2002.
- OXERA (2002): *Regional Renewable Energy Assessment*, Oxera Environmental, February 6th 2002.
- REN UK1 (2001): *Renewable Energy in the UK: Building for the Future of the Environment*, as found on: <http://www.cabinet-office.gov.uk/innovation/2001/energy/Renewener.shtml> (November 2001).
- REN UK2 (1999): *New & renewable Energy, prospects for the 21st century*, as found on <http://www.dti.gov.uk/renew/condoc/energy.pdf> (March 1999).
- REN UK3: *New & renewable Energy prospects for the 21st century*. The renewables Obligations Preliminary Consultation, as found on www.dti.gov.uk/renew/ropc.pdf.
- REN UK4: *New & renewable Energy prospects for the 21st century*. The renewables Obligations Statutory Consultation, as found on <http://www.dti.gov.uk/renewable/pdf/energymaster.pdf>.
- SUS (2001): *Forging an Energy Policy for Sustainable Development*, a paper for the Energy Policy Review of the UK government by the Sustainable Development Commission (October 2001).
- TGC (2000): *The implications of tradable green certificates for the UK*, Catherine Mitchell and Teresa Anderson for ETSU project TGC (K/BD/I00218), March 2000.
- TYNALL: *The Renewables Obligation: can it deliver?* Article by A. Smith and J. Watson, as found on http://www.tyndall.ac.uk/publications/briefing_notes/note04.shtml.
- Website on Climate Change Levy: <http://www.legislation.hmso.gov.uk/si/si2001/20010838.htm>

APPENDIX A FEED-IN TARIFFS AUSTRIAN PROVINCES

Source for the data in this annex is <http://www.e-control.at/>

Feed-in tariffs from 2003	[ct/kWh]
Windenergy	7.80
Biomass	
a) Solid Biomass	
< 2 MW	16.00
2 MW - 5 MW	15.00
5 MW -10 MW	13.00
> 10 MW	10.20
b) Waste with high organic content	
SN 17, Tab. 2,	minus 20 %
SN 17, Tab. 1,	minus 35 %
Other Tab. 1 , 2 ÖkoStrGES	2.70
mixed	ratio
c) co-combustion	
Solid Biomass	6.50
SN 17, Tab. 2,	5.00
SN 17, Tab. 1,	4.00
Other Tab. 1 , 2 ÖkoStrGES	3.00
mixed	ratio
Liquid Biomass	
< 200 kW	13.00
> 200 kW	10.00
Biogas from agricultural refuse	
< 100 kW	16.50
100 kW -500 kW	14.50
500 kW - 1 MW	12.50
> 1 MW	10.30
Biogas co-digestion with waste	minus 25 %
Landfill	
<1 MW	6.00
> 1 MW	3.00
Geothermal	7.00
Small hydro	
a) Existing installations	
first 1.000.000 kWh	5.68
next 4.000.000 kWh	4.36
next 10.000.000 kWh	3.63
Next 10.000.000 kWh	3.28
Over 25.000.000 kWh	3.15
b) Improved installations, at least 15% increased production	
first 1.000.000 kWh	5.96
next 4.000.000 kWh	4.58
next 10.000.000 kWh	3.81
next 10.000.000 kWh	3.44
Over 25.000.000 kWh	3.31
c) New installations or at least 50% increased production	
first 1.000.000 kWh	6.25
next 4.000.000 kWh	5.01

Feed-in tariffs from 2003	[ct/kWh]
next 10.000.000 kWh	4.17
next 10.000.000 kWh	3.94
Over 25.000.000 kWh	3.78
Photovoltaics (Up to total Austrian installed capacity of 15 MW)	
< 20 kW _p	60.00
> 20 kW _p	47.00

Feed-in tariffs for installations before 2003

Below the feed-in tariffs for Burgenland, Carinthia (Kärnten), Lower Austria (Niederösterreich), Salzburg, Styria (Steiermark), Tyrol (Tirol), Upper Austria (Oberösterreich), Vienna (Wien), Vorarlberg. The tariffs are valid for 10 years from installation.

Burgenland

Technology	Period	Price ⁴⁷ [ct/kWh]	Lowest Price [ct/kWh]	Highest Price [ct/kWh]
Solid biomass	Winter		6.4	12.2
	Summer		4.8	9.15
Liquid biomass From plant oil	Winter	14.53		
	Summer	12.1		
Liquid biomass From biodiesel	Winter	12.69		
	Summer	10.57		
Liquid biomass From used fat	Winter	7.13		
	Summer	6.06		
Gaseous biomass from agricultural production Share of capacity below 250 kVA	Winter	15.4		
	Summer	13.6		
Gaseous biomass equipped with cofermentation Share of capacity below 250 kVA	Winter	12.32		
	Summer	10.88		
Gaseous biomass from agricultural production Share of capacity above 250 kVA	Winter	12.32		
	Summer	10.88		
Dump or Refusal Gas	Winter	4.52		
	Summer	3.76		
Wind	Winter	8.5		
	Summer	6.2		
Photovoltaic		50.87		
Geothermal	Winter	9.51		
	Summer	7.93		
CHP		5.09		

Carinthia

Technology	Period	Price [ct/kWh]	Lowest Price [ct/kWh]	Highest Price [ct/kWh]
Solid biomass from fine wood Capacity up to 750 kVA		17.45		
Solid biomass from industry refuse Capacity up to 750 kVA		13.10		
Solid biomass from dead wood and refuse Capacity up to 750 kVA		10.54		

⁴⁷ All prices given are minimum prices.

Technology	Period	Price [ct/kWh]	Lowest Price [ct/kWh]	Highest Price [ct/kWh]
Solid biomass from fine wood Capacity from 750 kVA up to 3 MVA		14.5		
Solid biomass from industry refuse Capacity from 750 kVA up to 3 MVA		10.75		
Solid biomass from dead wood and refuse Capacity from 750 kVA up to 3 MVA		8.58		
Solid biomass from fine wood Capacity from 3 MVA up to 10 MVA		12.65		
Solid biomass from industry refuse Capacity from 3 MVA up to 10 MVA		9.48		
Solid biomass from dead wood and refuse Capacity from 3 MVA up to 10 MVA		8.48		
Solid biomass from fine wood Capacity above 10 MVA		10.97		
Solid biomass from industry refuse Capacity above 10 MVA		7.78		
Solid biomass from dead wood and refuse Capacity above 3 MVA		6.69		
Liquid biomass from plant oils and biodiesel		14.5		
Liquid biomass from used fat and refuse		7.27		
Gaseous biomass from agricultural production		16		
Gaseous biomass from agricultural production Dump or Refusal Gas		12.45 9		
Wind		10.75		
Geothermal		8.75		
Photovoltaic Capacity up to 50kW		72.70		
Photovoltaic Capacity above 50 kW		54.5		

Lower Austria

Technology	Period	Price [ct/kWh]	Lowest Price [ct/kWh]	Highest Price [ct/kWh]
Solid or liquid biomass or waste with high biological content (categories < 1, 1-5, 5-10, >10 MW) summer, winter			3.17	14,10
Solid or liquid biomass or waste with high biological content including mixed fuels (categories < 1, 1-5, 5-10, >10 MW) summer, winter			2.54	11,28
Biogas Categories according to installed capacity, old/new, HT, NT			4.6	18,00
Landfill Categories according to installed capacity, HT, NT			4.0	11,60
Wind Categories old, new			6.69	7,8
PV geothermal			50.87	50,87
Combined heat and power Categories according to installed capacity			1.16	5,8
			2.2	6,2

Salzburg

In this Province the minimum prices are partitioned in three parts: Tariff 1 for installation that are already in use for 12 years or more, Tariff 2 for installation that do not fall in the first category of tariffs and do also not fall in the third Tariff. Tariff 3 is called the ‘raised tariff’, which is applied to installation that are judged to be especially high-grade Eco-power systems.

Technology	Tariff	Price [ct/kWh]	Lowest Price [ct/kWh]	Highest Price [ct/kWh]
Solid biomass	I	4.36		
	II: range of 15 categories from (1): ‘until 500 kW’ to (15): ‘above 5000 kW’		(15): 4.84	(1): 7.92
	III: table of 21 by 8 categories from (1): ‘until 500 kW and ’ to (168): ‘above 5000 kW and ’		(168): 167	(1): 15.84
Liquid biomass	I + II	5.89		
Liquid biomass for installations with used oils and fats	III	6.54		
Liquid biomass for installations with plant oils	III: range of 7 categories from (1): ‘until 50 kW’ to (7): ‘from 501 up to 1000 kW’		(7): 9.3	(1): 12.94
Gaseous biomass	I	Market price		
	II: range of 7 categories from (1): ‘until 50 kW’ to (7): ‘from 501 up to 1000 kW’		(7): 4.22	(1): 11.24
	III: range of 7 categories from (1): ‘until 50 kW’ to (7): ‘from 501 up to 1000 kW’		(7): 6.03	(1): 16.06
Dump or Refusal Gas	I + II	5.75		
	III: range of 5 categories from (1): ‘until 50 kW’ to (4): ‘from 401 up to 3000 kW’		(5): 6.03	(1): 10.25
Wind	I	Market price		
	II	7.19		
	III	10.03		
Photovoltaic	I	Market price		
	II	36.64		
	III: range of 3 categories from (1): ‘until 2 kW’ to (3): ‘from 51 kW’		(3): 58.14	(1): 72.67

Styria

Technology	Period	Price [ct/kWh]	Lowest price [ct/kWh]	Highest price [ct/kWh]
Liquid, gaseous biomass and dump or refusal gas Capacity up to 250 kVA	Winter high ⁴⁸	15.4		
	Winter low ⁴⁹	11.4		
	Summer high ⁵⁰	7.7		
	Summer low ⁵¹	6.9		

⁴⁸ Winter is not defined but assumed to be from October until the end of March. High tariff on all days is from 6 a.m. until 10 p.m.

⁴⁹ Winter is not defined but assumed to be from October until the end of March. Low tariff on all days is from 10 p.m. until 6 a.m.

⁵⁰ Summer is not defined but assumed to be from April until the end of September. High tariff is from Monday to Friday from 6 a.m. until 10 p.m. and on Saturday 6 a.m. until 1 p.m.

Technology	Period	Price [ct/kWh]	Lowest price [ct/kWh]	Highest price [ct/kWh]
Liquid, gaseous biomass and dump or refusal gas Capacity from 250 kVA up to 2 MVA	Winter high	13.52		
	Winter low	10.03		
	Summer high	6.76		
	Summer low	6.1		
Liquid, gaseous biomass and dump or refusal gas Capacity from 2 MVA up to 5 MVA	Winter high	12.79		
	Winter low	9.52		
	Summer high	6.4		
	Summer low	5.81		
Liquid, gaseous biomass and dump or refusal gas Capacity from 5 MVA up to 10 MVA	Winter high	11.05		
	Winter low	8.21		
	Summer high	5.52		
	Summer low	5.01		
Liquid, gaseous biomass and dump or refusal gas Capacity above 10 MVA	Winter high	9.96		
	Winter low	7.41		
	Summer high	5.01		
	Summer low	4.51		
Wind	Winter high	11.85		
	Winter low	8.79		
	Summer high	5.96		
	Summer low	5.31		
Geothermal	Winter high	9.88		
	Winter low	7.34		
	Summer high	4.94		
	Summer low	4.43		
Photovoltaic		36.34		

Tirol

In the Province of Tirol there is a basic price of 2.76 ct/kWh and per technology a surcharge is put on that price.

Technology	Period	Price [ct/kWh]	Lowest price [ct/kWh]	Highest price [ct/kWh]
Solid indigenous biomass		5.52		
Solid indigenous biomass from different residues of wood crust under favourable logistic conditions		8.28		
Solid indigenous biomass from different residues of wood crust under unfavourable logistic conditions		11.04		
Liquid biomass produced by an installation with a maximum capacity of 60 kW		11.04		
Liquid biomass produced by an installation with a capacity from 60 kW and higher		8.28		
Gaseous biomass produced by an installation with a maximum capacity of 60 kW		11.04		
Gaseous biomass produced by an installation with a capacity from 60 kW and higher		8.28		

⁵¹ Summer is not defined but assumed to be from April until the end of September. Low tariff is on Monday from midnight (12 p.m.) until 6 a.m., from Monday to Saturday from 10 p.m. until 6 a.m., on Saturday 1 p.m. until midnight (12 p.m.) and on Sunday and fixed holidays from midnight to midnight.

Technology	Period	Price [ct/kWh]	Lowest price [ct/kWh]	Highest price [ct/kWh]
Dump or refusal gas		5.52		
photovoltaic		35.88		
Wind		8.28		
Geothermal		8.28		

Upper Austria

Tarife in cent/kWh	Volleinspeiser			Überschusslieferung		
	Sommer	Winter	Durchschn.	Sommer	Winter	Durchschn.
§ 2 Basispreis I	2.0486	2.5341	2.2914	2.0486	2.5341	2.2914
§ 2 Basispreis II	2.4687	2.9956	2.7325			
§ 3 Ökoanlagen > 3 MW	2.0486	2.5341	2.2914			
§ 4 Ökoanlagen 1 - 3 MW	3.0733	3.8015	3.4374			
§ 5 Ökoanlagen < 1 MW						
	Wind. PV	4.0973	5.0682	4.0973	5.0682	4.5827
	andere	4.9374	5.9911	4.9374	5.9911	5.4643
§ 6 Ökoanlage mit öffent. FW > 3 MW bestimmte Ökoanlagen						
< 3 MW	Wind	8.1946	10.1364	8.1946	10.1364	9.1655
< 50 kW	PV 3.650 ?/kW +	15.3652	19.0061	17.1857	Entspricht ca. 61.77 ct/kWh	
Biomasse Waldhackgut/Stückholz > 30%						
< 500 kW		13.5782	16.4757	15.0266	11.2679	13.9379
< 1 MW		12.3435	14.9779	13.6610	10.2432	12.6705
< 3 MW		11.1095	13.4801	12.2948	9.2193	11.4038
Biomasse SNP						
< 500 kW		11.1095	13.4801	12.2948	9.2193	11.4038
§ 7 < 1 MW		9.8748	11.9823	10.9285	8.1946	10.1364
< 3 MW		8.6408	10.4845	9.5623	7.1706	8.8697
	Biomasse flüssig	12.3435	14.9779	13.6610	10.2432	12.6705
	Biogas					
< 200 kW	neu	9.8748	11.9823	10.9285	8.1946	10.1364
	Erweiterung bestehende	6.6656	8.0878	7.3770	5.5311	6.8421
Geothermie						
< 1 MW	Deponie-Klärgas	6.1721	7.4889	6.8305	5.1220	6.3356
	u.	4.9374	5.9911	5.4643	4.0973	5.0682

Vienna

In this province there is a basic tariff defined for Winter and Summer as well as High and Low. There is a two-split definition of this basic tariff, namely for the inflow of the year production from electricity production installations with a contractual bond over several years and for the overflow delivery from electricity production installations. For the first category the following tariffs are determined:

Winter High tariff ⁵² :	6.5406 ct/kWh
Winter Low tariff ⁵³ :	5.1452 ct/kWh
Summer High tariff ⁵⁴ :	4.0115 ct/kWh
Summer Low tariff ⁵⁵ :	3.5755 ct/kWh

⁵² Winter is defined from October until the end of March. High tariff period is defined from 6 a.m. until 10 p.m.

⁵³ Winter is defined from October until the end of March. Low tariff period is defined from 10 p.m. until 6 a.m.

⁵⁴ Summer is defined from April until the end of September. High tariff is defined from Monday to Friday from 6 a.m. until 10 p.m. and on Saturday 6 a.m. until 1 p.m.

⁵⁵ Summer is defined from April until the end of September. Low tariff is defined from Monday to Friday from 10 p.m., on Monday from midnight (12 p.m.) until 6 a.m., on Saturday from midnight (12 p.m.) until 6 a.m. and from 1 p.m. until midnight (12 p.m.) and on Sunday and fixed holidays from midnight to midnight.

For the second category the following tariffs are determined:

Winter High tariff:	5.5958 ct/kWh
Winter Low tariff:	4.7165 ct/kWh
Summer High tariff:	3.3430 ct/kWh
Summer Low tariff:	2.9796 ct/kWh

For the different electricity production from the different technologies there is a surcharge on the tariffs defined in the first category (I) and the second category (II).

Technology	Category	Period	Price [ct/kWh]	Lowest price [ct/kWh]	Highest price [ct/kWh]
Solid biomass, liquid biomass and geothermal delivered only to the network operator	I	Winter High	12.4271		
	I	Winter Low	8.7498		
Solid biomass, liquid biomass and geothermal delivered partly to the network operator	I	Winter High	11.730		
	I	Winter Low	8.4882		
Solid biomass, liquid biomass and geothermal delivered only <i>or</i> partly to the network operator	I	Summer High	4.0115		
	I	Summer Low	3.5755		
Solid biomass, liquid biomass and geothermal delivered only to the network operator	II	Winter High	10.632		
	II	Winter Low	8.0158		
Solid biomass, liquid biomass and geothermal delivered partly to the network operator	II	Winter High	10.0725		
	II	Winter Low	7.7833		
Solid biomass, liquid biomass and geothermal delivered only <i>or</i> partly to the network operator	II	Summer High	4.0115		
	II	Summer Low	3.5755		
Biogas, dump or refusal gas delivered only to the network operator	I	Winter High	9.1568		
	I	Winter Low	6.9475		
	I	Summer High	5.2179		
Biogas, dump or refusal gas delivered partly to the network operator	I	Summer Low	4.4694		
	I	Winter High	8.8297		
	I	Winter Low	6.6859		
Biogas, dump or refusal gas delivered only to the network operator	I	Summer High	5.0144		
	I	Summer Low	4.2877		
	II	Winter High	7.8341		
Biogas, dump or refusal gas delivered partly to the network operator	II	Winter Low	6.3661		
	II	Summer High	4.3458		
	II	Summer Low	3.7281		
Biogas, dump or refusal gas delivered only to the network operator	II	Winter High	7.5580		
	II	Winter Low	6.1336		
	II	Summer High	4.1787		
Wind delivered only to the network operator	II	Summer Low	3.5775		
	I	Winter High	8.5027		
	I	Winter Low	6.4315		
Wind delivered only to the network operator	I	Summer High	5.2179		
	I	Summer Low	4.4694		
	I	Winter High	7.8490		
Wind delivered partly to the network operator	I	Winter Low	6.1772		

Technology	Category	Period	Price [ct/kWh]	Lowest price [ct/kWh]	Highest price [ct/kWh]
Wind delivered only to the network operator	I	Summer High	4.8109		
	I	Summer Low	4.2877		
	II	Winter High	7.2746		
	II	Winter Low	5.8938		
	II	Summer High	4.3458		
	II	Summer Low	3.7281		
Wind delivered partly to the network operator	II	Winter High	6.7150		
	II	Winter Low	5.6612		
	II	Summer High	4.0115		
	II	Summer Low	3.5755		
Photovoltaic			11.0608		

Vorarlberg

In the Province of Vorarlberg a distinction is made between electricity generated by old installations and new installations. The first will be defined as category I and the second as category II.

Technology	Category	Period	Price [ct/kWh]	Lowest price [ct/kWh]	Highest price [ct/kWh]
Solid biomass from basic fine wood	I		13.08		
	II		15.98		
Solid biomass from basic industrial wood	I		10.9		
	II		11.99		
Solid biomass from basic old wood and residuals	I + II		9.44		
Liquid biomass	I		12.35		
	II		14.53		
Gaseous biomass from installations with a maximum cofermentation share of 1/3	I		11.26		
	II		15.98		
Gaseous biomass from installations with a minimum cofermentation share of 1/3	I		8.72		
	II		12.42		
Dump or refusal gas	I		8.35		
	II		9.01		
Wind	II		10.90		
Photovoltaic	I		50.87		
Photovoltaic with a capacity up to 20 kW	II		72.67		
Photovoltaic with a capacity from 20 up to 50 kW	II		47.31		
Photovoltaic with a capacity above 50 kW	II		36.33		