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Renewable Energy Sources in the New Member States of the EU, Germany and Italy

Report

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1 Introduction

1.1 Background

The EU-Japan Centre aims to stimulate industrial cooperation between the EU and Japan, including in the field of energy. It has therefore set up a New Energy Programme, which is in operation since 1987. Within the context of this programme, exchanges of European and Japanese specialists on renewable energy are organised, and studies on specific topics initiated. Previous studies of the EU Japan Centre were carried out on liberalization of the EU electricity market, EU support policies, waste as an energy source, wind energy and hydrogen.

The study in this report, which CE Environmental Solutions carried out for the Centre, is directed at the development of renewable energy sources (RES) in the new member states of the European Union. This topic is of particular interest to the Centre, as such RES projects can be also carried out by Japanese firms under the Joint Implementation provisions of the Kyoto-protocol. The link of Joint Implementation projects to the European Emission Trading System, which is due to start on 1 January 2005, offers new business opportunities to Japanese firms.

1.2 Goal

This study describes the status of renewable energy in the new member states of the European Union, Germany and Italy. The study also focuses on the European Emission Trading System (ETS), and analyses business opportunities for Japan that arise through RES projects in relation to the emissions trading system.

1.3 Structure of this Report

This report starts with an discussion of EU climate change policies and in particular the EU emissions trade system, which is due to start on January 1st, 2005 (Chapter 2). In Chapter 3 we give an overview of policies and developments in renewable energy in the EU in which we focus on the policy framework, recent developments and expectations. This Chapter is based on more detailed overviews for each individual country, which are given in the annexes. Each country study also contains one typical case study of development of a renewable energy source in that country. Finally, in Chapter 4 overall conclusions of renewable energy developments in the new member states, Germany and Italy is given, focusing on future prospects and chances for investors.

2 Climate Change and Emissions Trade

2.1 EU Climate Change Policies

In March 2000, the European Commission adopted the European Climate Change programme. This programme contains concrete measures in the fields of energy, transport and industry. It also contained proposals for a European Emissions Trading System, in which emission reduction units could be traded by parties within the European Union.

Signing the Kyoto-protocol in 2002, the European Union has committed itself to reducing its greenhouse gas emissions by 8% over the period 2008-2012 as compared to the base year 1990. This commitment is valid for the EU15, but also new member states, with the exception of Malta and Cyprus, have committed themselves to emission reductions between 6 and 8%. Table 1 gives an overview of emission reduction targets and developments so far.

Table 1 Greenhouse gas emission reduction targets and achievements until 2001 (Source: EEA, 2004)

	Base year	Target set for 2010	Change greenhouse gas emissions so far
		%	%
Estonia	1990	-8	-55
Latvia	1990	-8	-61
Lithuania	1990	-8	-54
Poland	1988	-6	-32
Czech republic	1990	-8	-23
Slovakia	1990	-8	-31
Hungary	1986	-6	-18
Slovenia	1986	-8	-0,5
Malta	no target	no target	28
Cyprus	no target	no target	n.a.
Germany	1990	-21	-18
Italy	1990	-6,5	7

Figures Slovenia from 1996, Lithuania 1998, Malta and Hungary 2000

As can be seen from the table, emission reductions in the new member states achieved until 2001 by far exceed the targets set. For most new member states no detailed emission projections until 2010 are available, but it is very likely that none of the new member states will have any problems to achieve its targets.

For Germany and Italy this is not the case. Like most of the previous EU15 member states, emissions have increased substantially. The eastern part of Germany has experienced a sharp decrease of emissions before and after re-unification, hence a large emission reduction target has been set. It is however not sure if the target will be achieved. For Italy, this is even more so. Instead of the decrease of greenhouse gas emissions aimed at, emissions have increased substantially.

2.2 Framework Emissions Trade

A very important part of EU greenhouse gas policies is the Emissions Trade System which will start in 2005. The provisions of this system are outlined in the following key documents:

1. **Directive 2003/87/EC on Greenhouse Gas Emissions Trade.**
2. **Directive 2004/101/EC Joint Implementation / CDM Linking Directive.**
3. **National Allocation Plans of Member States.**

The **Emissions Trade Directive** establishes a scheme for greenhouse gas emission allowance trading within the European Community starting on January 1st, 2005. From that date on:

- Operators of activities regarding energy production, production and processing of ferrous metals, mineral industry and pulp and paper plants have to hold an *emission permit* issued by a competent authority (Art. 4).
- Within four months following the end of a year, an operator should *surrender allowances* equal to the total emissions of the installation in each calendar year to the competent authority (Art. 6).
- Member States have to develop a *National Allocation Plan* stating the total quantity of allowances that it intends to allocate for that period and how it proposes to allocate them (Art. 9). This plan has to fulfil conditions set by the Commission, including being consistent with assessments of actual and project progress in achieving the Kyoto targets set (Annex III).
- For the three year period beginning 1 January 2005 Member States shall allocate at least *95% of the allowances free of charge*. For the five year period beginning 1 January 2008, Member States shall allocate at least 90% of the allowances free of charge (Art. 10).
- Allowances can be *transferred* between the Community and third countries where emissions trading schemes are in force (Art. 12 & 25).
- Operators who not comply with the rules of the Directive have to pay a *penalty* of EUR 40 per tonne of CO_2 equivalent in the first emissions period starting on 1 January 2005, and EUR 100 in the second period starting on 1 January 2008 (Art. 16).
- Each year, Member States shall submit to the Commission a *report* on application of the Directive. The first report shall be sent by 30 June 2005 (Art. 21).
- From 2008, Member States may include *other activities, installations and greenhouse gases* in emissions trading (Art. 24).

The EU emissions trade system is in principle an EU-internal system, which limits trade in emissions permits to installations which are registered in EU member states. However, parties from third countries can take part in the system:

- If they do have one of more factories or industries in an EU Member State and this factory or industry is registered as an 'installation' in the ETS.
- If the third country has an emissions trading system which is recognized by the EU for an exchange of permits.
- Via Joint Implementation (JI) or CDM (Clean Development Mechanism) projects, of which the credits are exchanged for European Emission Trading permits (see below).

The Emissions Trade Directive states that Joint-Implementation and Clean Development Mechanism activities will be included in emissions trading subject to additional provisions to be provided in a separate directive (Art. 30). This is Directive 2004/101/EC, the **JI/CDM Linking Directive**. Main provisions in this Directive are:

- Member States may allow operators to obtain *Emission Reduction Units* (ERU, obtained in Joint Implementation Projects) and *Certified Emission Reductions* (CER, to be obtained in CDM projects) up to a percentage of the allowances for all installations that have to be specified in the National Allocation Plans. Member States have to report every two years on the extent to which 'domestical action actually constitutes a significant element of the efforts undertaken at national level'.
- ERUs and CERs may be *exchanged* for emission credits under the ETS. CERs may be used from 2005 on, ERUs from 2008.
- *Double counting* for JI/CDM activities that lead to emissions reductions in installations under the ETS *should be avoided*.
- ERUs and CERs generated from *nuclear facilities* are excluded from emissions trading. Provisions to allow for ERUs/CERs from *land use, land use change and forestry activities* from 2008 on will be examined.
- Member States that allow for JI/CDM activities in their NAP remain responsible for achieving their national Kyoto goals set.
- Special attention has to be paid to the possible negative environmental impacts of *large-scale hydroelectric projects*.

From 2005, third countries can exchange emission reductions obtained in CDM projects for EU-ETS emission reduction units. From 2008, this is also possible for Joint Implementation projects. Nuclear energy projects are excluded, sink projects until 2008. Large-scale dam projects have to fulfil certain criteria to be eligible.

National Allocation Plans (NAPs) had to be prepared by Member States, according to the Emissions Trading Directive, before 31 March 2004. According to the Commission, National Allocation Plans of Member States should include the following provisions:

- The plan shall contain a *list of installations* covered by the Emissions Trading Directive with the quantities of allowances intended to be allocated to each.
- The quantity of allowances shall be *consistent* with the Kyoto-targets of a Member State and with projected emissions.

– The plan shall *not discriminate* between companies or sectors in such a way as to unduly favour certain undertakings or activities.
– The plan shall contain information on the manner in which *new entrants* will be able to begin participating in the Community scheme in the Member State concerned.
– The plan may accommodate *early action* and shall contain information on the way in which early action is taken into account.
– The plan may contain information on the manner in which the existence of competition from countries or entities outside the Union will be taken into account.

Within three months of notification of a National Allocation Plan, the Commission has to evaluate it and may reject it. Up to 20 October 2004 the Commission had approved 11 National Allocation Plans. Of the countries considered in this report, only Slovenia, Estonia, Latvia and the Slovak Republic had their NAPs approved by 20 October (Table 1). The NAP of Germany was assessed on 7 July 2004, but not yet fully approved by this date. The plans of Spain, Hungary, Lithuania, Cyprus and Malta will be approved by 22 December, according to EU environmental commissioner Stavros Dimas, and disputes with the UK and France over their plans will be solved before the end of 2004 (ENDS, 10/12/04).

Table 2 Approval of National Allocation Plans

7 July 2004	20 October 2004	22 December 2004	Before 31 December 2004	Not yet fully approved by 1 January 2005
Slovenia Denmark Ireland Netherlands Sweden	**Estonia** **Latvia** **Slovak Republic** Belgium Luxemburg Portugal	**Hungary** **Lithuania** **Cyprus** **Malta** Spain	United Kingdom France	**Germany (assessed July)** **Czech Republic** **Italy** **Poland** Austria (assessed July) Finland (assessed October) Greece

The European Commission judges NAPs based on three key criteria:

1 The allocation of emission rights in the NAP should not endanger the Kyoto-target for the member state.
2 The allocation should not be higher than the projected emissions until 2007.
3 The NAP should not allow a member state to change the allocation during the trading period.

Based on these criteria, Estonia, Latvia and the Slovak republic had to reduce the number of allocated emission rights substantially (with 8.1, 5.6 and 14,9 million tonnes CO_2 over the whole trading period respectively) before their plans were approved. The German plan was only conditionally approved in a first round since it allowed for ex-post adjustments during the trading period for companies with emissions of 40% of baseline-emissions or less, as well as for new entrants.

Table 3 gives an overview of the NAPs of the selected countries in this report.

Table 3 NAPs of selected countries

	Total cap until 2007 (Mt/a):	Total number of installations	Approval date
	Mt/a		
Estonia	18.95	43	20-10-2004
Latvia	4.57	95	20-10-2004
Lithuania	14.17	107	22-12-2004
Poland	286.2	945	not yet approved
Czech republic	107.7	400	not yet approved
Slovakia	30.5	209	20-10-2004
Hungary	89.7	300	22-12-2004
Slovenia	8.8	98	7-7-2004
Malta	2.9	2	22-12-2004
Cyprus	1	15	22-12-2004
Germany	499	2,419	not yet fully approved
Italy	240	n.a.	not yet approved

In comparison with these emission reductions obtained already (see table 1), allowances in the ETS are relatively high. It is therefore likely, that the new Member States in the ETS will be net sellers of emission rights within the ETS.

2.3 Emissions Trade - Market Expectations

European emissions trade will start on 1 January 2005. The trading system is intended to reduce greenhouse gas emissions, and will have to be judged in the first place on achievement of this environmental target. However, the trading system in potential also represents a huge market with potential financial benefits to clever investors. A few general concepts will be briefly outlined here.

The total number of emissions rights issued within the ETS for the period 2005 to 2007 will be around 2,1 Gt (www.pointcarbon.com). Multiplied by the present market price of around € 8.50 per tonne CO_2, a market of € 18 billion evolves.

Through exchanging credits obtained in world-wide CDM projects from 2005, and JI projects from 2008, third countries like Japan can take part in this market. In the new member states, JI projects can be carried out in the field of renewable energy. Hence, through stimulating RES developments in the new member states of the EU via JI projects, third countries can obtain emission reduction units and exchange these for credits within the EU-ETS. Profits can be made as long as the JI emission reductions are obtained at a lower price than the market price within the EU-ETS.

However, some important restrictions apply to RES projects in the new member states under Joint Implementation (Evolution Markets, 2003):

- The *acquis communautaire* should be taken into account when establishing baselines for project activities. Member states still have to fulfil the conditions set out in the Accession Treaties. Hence, JI projects can only be realised if they come on top of the conditions outlined there.
- The ETS directive contains a provision to avoid double counting of emission reductions. Therefore emission reductions obtained from JI projects will have to come on top of those obtained within the ETS (*additionality*). RES projects that use displacement of fossil fuels from the grid as a project motivation in that sense are not additional, as they replace emissions from installations under the ETS. However, according to Evolution Markets, 'there might be room for discussions about whether renewable energy projects, which add additional capacity to the grid to meet higher electricity demand and therefore displace future fossil fuel capacity, would also fall under this regulation'.

According to the JI/CDM linking directive, exchange of credits obtained from JI/CDM projects is also only allowed up to a certain percentage of the allocation to all installations in a country, to be specified in the NAP of each country. This might also provide limits to the number of JI projects that can be carried out in each member state.

Third countries have to take care about the restrictions that might apply when carrying out JI projects in new member states. Projects have to be additional to the ETS, and come on top of the obligations for achieving the acquis communautaire.

3 Renewable Energy Sources

3.1 EU Framework

As a first step towards a strategy for renewable energy the Commission adopted a Green Paper entitled 'Energy for the future: renewable sources of energy' in 1996. This discussion paper set out a range of ideas presented for public discussion and debate. The results of these discussions were included in the White Paper with the same title [COM (97) 599 final]. In the White Paper the EU recognized that renewable energy sources (RES) are essential to tackle climate change, not only within the EU, but all over the world. The most important point in the White Paper was to set out a strategy to double the share of renewable energies in gross domestic energy consumption in the European Union (EU15) by 2010 from 6% to 12%, including a timetable of actions to achieve this objective in the form of an Action Plan.

In the Green Paper on the Security of Energy Supply [COM (2000) 769] it is addressed that the EU imports 50% of its energy requirements and this will rise to 70% within the next 20 to 30 years if no measures are taken. This Green Paper confirmed the 12% RES target for 2010. The Green Paper also sets the objective of 20% substitution of conventional fuels by alternative fuels in the road transport sector by the year 2020.

This official set of proposals was used as vehicle for the development of two directives which constitute the most important legislative framework of EU renewable energies policies. These are:

1. **The 'RES-E Directive' 2001/77/EC.**
2. **The 'Biofuels Directive' 2003/30/EC.**

1 **Directive 2001/77/EC** on the promotion of electricity produced from renewable energy sources in the internal electricity market is aimed to establish a framework to increase the share of renewables electricity from 14% to 22% of gross electricity consumption by 2010 within the EU15.
  Other objectives are to double the share of renewable energy from 6 to 12 % of gross energy consumption in Europe by 2010 and to further comply with the commitments made by the EU under the 1997 Kyoto-protocol on reducing greenhouse gas emissions.
  The EU's ten new Member States are also subject to the requirements of Directive 2001/77/EC on electricity from renewable energy sources. National indicative targets for the share of electricity from renewable energy in each new Member State are set out in the Accession Treaties. Taken together, these mean that the collective target for the EU25 is to reach a share of 21% of renewables electricity in 2010.

EU Targets
EU15: 12% RES of gross domestic energy consumption by 2010.
EU15: 22% of renewables electricity (RES-E) of gross electricity consumption by 2010.
EU25: 21% of renewables electricity (RES-E) of gross electricity consumption by 2010.

The RES-E Directive provides for a broad definition of renewable energy. It includes hydro power (large and small), biomass (solids, biofuels, landfill gas, sewage treatment plant gas and biogas) wind, solar (PV, heat, thermal electric), geothermal, wave and, tidal energy. General waste incineration has been excluded but the biodegradable fraction of waste can be considered as renewable. Furthermore, large hydropower (more than 10 MW) is also included. It has been tacitly agreed that large hydro will count for meeting the targets but will not be eligible for support measures.
The European targets are transformed into targets for the Member States as described in table 4.

Table 4 RES-E targets for 2010 and actual figures in 1997 and 2002 [EU COM, 366 final, 2004]

Country	Base year production RES-E % 1997*	Production RES-E % 2002	Target RES-E % 2010
Austria	70	68	78.1
Belgium	1.1	1.4	6.0
Denmark	8.7	20	29.0
Germany	4.5	8.1	12.5
Greece	8.6	5.8	20.1
Spain	19.5	12.6	29.4
France	15.5	14.4	21.0
Ireland	3.6	5.1	13.2
Italy	16.0	16.8	25.0
Luxembourg	2.1	2.2	5.7
Netherlands	1.8	3.4	9.0
Portugal	38.5	21.8	39.0
Finland	24.7	24.7	31.5
Sweden	49.1	46	60.0
United Kingdom	1.7	2.8	10.0

	Base year production RES-E % 1999*		
Cyprus	0.05	0	6
Czech Republic	3.8	3.9	8
Estonia	0.2	0.2	5.1
Hungary	0.7	0.6	3.8
Latvia	42.4	48	49.3
Lithuania	3.3	4.6	7
Malta	0	0	5
Poland	1.6	2.0	7.5
Slovenia	29.9	30.4	33.6
Slovakia	17.9	20.2	31
EU-25	**12.9****	**n.a.**	**21**

* The reference value on the national production are based on national production of RES-E divided by the gross national electricity consumption. For the EU15, the reference year is 1997, for the EU10 this is 1999/2000.

** 1997 figure.

It is important to note that the directive does not prescribe a harmonised European support scheme (Art. 4). The member states are obliged to fulfil their own clearly specified national targets, which vary greatly. The grid access issue (Art. 7) is another important point of the directive. Concerning the issue of the high costs of grid connection, the directive requires member states to take the necessary measures to grant access to the transmission and distribution of electricity from renewable energy sources. Member States have to give priority access to renewable energy sources. All over Europe, network operators will be obliged to set up transparent cost calculations for distribution and the fees have to be non-discriminatory. A further provision is that the grid capacity is no longer a reason not to give access. The grid operators have to reinforce their grid if necessary for the connection.

The grid operator can only deny the grid access with regards to the maintenance of the reliability and safety of the grid. Moreover, the directive addresses the particular problem of lengthy and difficult administrative procedures (Article 6) that potential generators of renewable energies must respect in many member states. It requires them to review their existing legislative and regulatory frameworks in order to speed up authorisation procedures.

In short the objectives set by the EU for the Member States are:

- To reduce the obstacles to increasing production.
- To rationalise and speed up administrative procedures.
- To ensure objective, transparent and non-discriminatory rules.
- To take account of the characteristics of renewable technologies.

The directive also provides for a system concerning the guarantee of origin (Article 5) of renewable energies, which will increase transparency while facilitating consumer choice.
The Directive requires a first progress report during 2004 for the EU15. This has been produced (COM(2004)366). For the new Member States the official first progress report is due in 2006.

2 **Directive 2003/30/EC** on biofuels and other renewable fuels for transport aims at promoting the use of biofuels or other renewable fuels to replace diesel or petrol for transport purposes. In this way the Directive contributes to objectives such as meeting climate change commitments, environmentally friendly security of supply and promoting renewable energy sources. According to the Directive, national targets have to be set. As a reference value 2% on the basis of energy content, of all petrol and diesel for transport by 31 December 2005. For December 2010 the reference value is increased to a value of 5.75%.

EU targets on biofuels
EU25: 2% of all petrol and diesel for transport (on the basis of energy content) by 31 december 2005
EU25: 5.75% of all petrol and diesel for transport (on the basis of energy content) by 31 december 2010.

In 2002 the market share of biofuels in the EU15 in 2002 was 0.6% of the petrol and diesel market. Especially France and Czech Republic are active with both a percentage of 1.3% of biofuels. Following the energy taxation directive, Member States may exempt biofuels from fuel taxes or apply a lower rate of tax. As of March 2004 7 Member States have partly or completely detaxed biofuels: Austria, France, Germany, Italy, Spain, Sweden and the United Kingdom.

3 **Other Directives.** There are more legal instruments adopted or in the stage of adoption. These are mostly directed towards improving energy efficiency. Examples are the building directive on energy performance of buildings (2002/91/EC) and the directive on promotion of cogeneration (2004/8/EC). These instruments do not directly apply to renewable energy and therefore are further discussed in this report. They can however help in achieving the RES-E and renewables target by reducing gross national electricity and energy consumption.

3.2 Achievements so far and prospects

3.2.1 Overview

Since 1997 the EU has been working towards the general target of an increase to 12% in renewable energy's share of gross inland energy consumption. For the EU25 the share of renewable energy was 5.8% in 2000 [EU COM (2004) 366 final].

Electricity generation by using renewable energy accounted for 13.8% in 2000 for the EU25. The target for the EU25 is 21%.
Both percentages as part of other resources are summarized in Figure 1 and 2.

Figure 1 Gross inland energy consumption by fuel, EU25, 2000

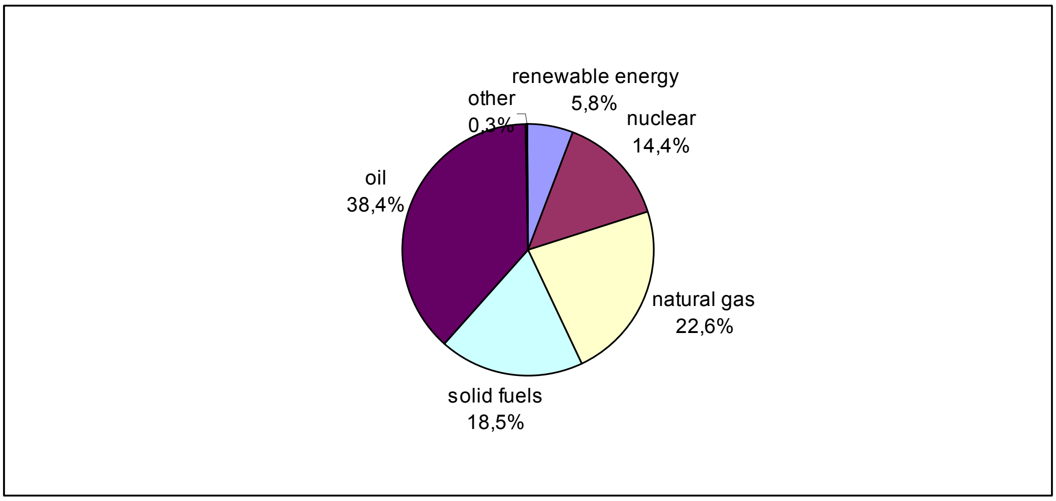
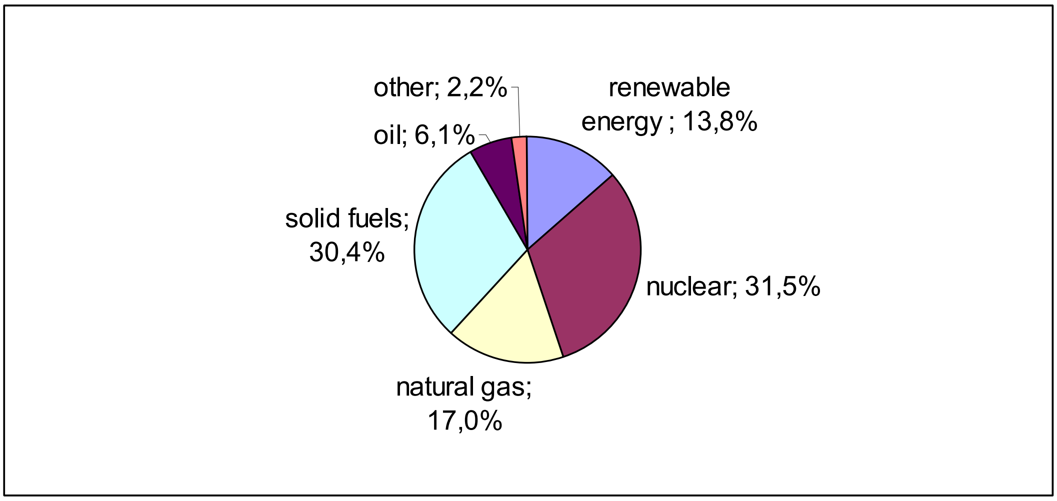


Figure 2 Electricity generation by fuel, EU25, 2000



The target adopted by each Member State is consistent with the national reference value as described by the Directive 2001/77/EC. If Member States meet these national targets, the overall share of renewable electricity in the EU25 will achieve the target of about 21% in 2010. Unfortunately the national policies, measures and achievements reported by Member States provide a less optimistic picture. Under current measures the 2010 target will not be achieved under current policies and measures, even under a scenario that builds in reductions in total electricity demand as a result of new energy efficiency measures. Currently implemented policies will probably result in a share of between 18% and 19% in 2010 for the EU15.

The main reason why the target of the RES-E directive is not being achieved is because the production of electricity from biomass has not been as high as initially previewed.

Over 40% of the primary energy consumption in Europe is used for heating buildings, for domestic hot water production and for heating in industrial processes. The markets for renewable heating sources (biomass, solar thermal, geothermal) therefore have a substantial potential for growth, and could replace substantial amounts of the fossil fuels and electricity, which are currently used for heating purposes. The cooling sector is steadily increasing. Renewable energy in heating has grown slowly over the last seven years. There is no legislation in place addressing renewable heat production. It is still a sector dominated by traditional biomass use and a new mechanism is needed to deliver the necessary contribution to achieve the objective of a 12% share in renewables and to develop the sound potential that exists in the new Member States.
Although progress towards meeting the targets has begun, the 2010 target of 12% will not be achieved under current policies and measures:

- If present trends continue in heating and if Member States implement the national plans they have put in place in electricity and fulfil the requirements of the biofuels directive in transport, the share will reach 9% in 2010.
- In addition if Member States fulfil in full the requirements of the directive on electricity from renewable energy sources, the share will reach 10%.
- Fulfilment of the 12% target for 2010 will require a step change in national policies towards the use of renewable energy in heating.

3.2.2 Country contributions

Relating the targets for the individual countries to the RES-E production levels in 2002 (see table 4) it appears that from the EU15, countries like Denmark and Germany are well on track to achieve their targets. Denmark has increased its share of electricity from renewable sources from 8.9% in 1997 to 20% in 2002, where the 2010 target is set at 29%. Germany has increased its share of electricity from 4.5% in 1997 to 8% in 2002 with a national target of 12.5%. For both countries wind power has the largest contribution but the use of other renewable energy sources showed a significant increase as well.

Other countries that are well on track but where this is less obvious through their percentage of electricity from renewables are Spain and Finland. They both suffered from a decline in hydro-energy in 2002 due to less favourable weather conditions but Spain showed a more than 68% yearly growth in wind power and Finland increased the use of biowaste with a yearly percentage of 109%.

3.2.3 Renewable energy sources

In 1997 the Commission expected that 68% of the growth in electricity from renewable energy sources would come from biomass, 24% could come from wind power and 8% from a mixture of hydro, geothermal and photovoltaic power.

The two technologies that can be expected to deliver most of the increase in electricity from renewable sources for 2010 are wind and biomass.

Hydro

The EU15 is using nearly all its large hydro potential. In the new Member States – particularly in Slovenia, Hungary and Lithuania – there is still an important potential to increase hydro energy generation [EU COM2004(366)].

Wind

Installed capacity grew a 23% in 2003 to a total of more than 28 GW. Germany, Spain and Denmark contribute 84% of total EU15 wind power capacity. The White Paper target of 40 GW installed wind power will clearly be exceeded. It is expected that in 2010 75 GW could be installed, including 10 GW offshore. However the final result for 2010 will depend on the efforts of Member States where wind energy has not yet taken off. The experience of the three leading countries show that successful expansion of wind power benefits from:

- An attractive long-term financial framework.
- Removal of administrative barriers through the implementation of uniform planning procedures and licensing systems.
- Guarantee of a fair grid access and non-discriminatory tariffs.

Biomass for electricity

The strong growth in wind power means that it is expected to contribute 50% of the growth needed to achieve the target set in the Directive. The target will only be achieved if biomass contributes the remaining 40%. This will require biomass electricity to grow by 18% a year – compared with a rate of only 7% a year over the past 7 years. This progress is well behind the expected growth. In most of the new Member States there is an important potential for the use of biomass for both electricity and heat generation. This is particular true for the widely unexploited potential for electricity generation from biomass in Hungary, the Czech Republic, Slovakia, Latvia, Lithuania and Estonia. In 2001 the EU15 used about 56 Mtoe of biomass for energy purposes. Achieving the Union’s renewable energy targets for 2010 would need approximately 74 Mtoe more – 32 Mtoe for electricity generation, about 18 in the form of biofuels and 24 for heating (total 130 Mtoe).

Biogas fulfils a minor contribution in producing RES electricity. Biogas has the dual advantage of eliminating pollution while producing energy at the same time. The expected contribution of 15 Mtoe (for both electricity and heat application) by 2010 is not on track with the 2002 2.8 Mtoe production.

Photovoltaics

Although PV output is still small, its EU growth rate curve quite exactly mirrors that of wind power, with a delay of approximately 12 years. European installed PV capacity doubled between 2001 and 2003, Germany accounting for more than 70% of the total. However, PV also doubled in Spain and Austria.

Geothermal for electricity

Electricity from the heat of the earth is very much depending on geographical circumstances and therefore only available in Italy, Greece, France and Austria. The expected contribution is low due to a low expected growth potential. The White Paper predicts an installed capacity of 1 GW only in 2010.

RES heat

There are some national success stories in woody biomass and solar heat (Germany, Greece, Cyprus and Austria). Geothermal heating is growing at a good speed. The overall contribution of geothermal and solar heat is expected to be limited. The biggest contribution is necessary and expected from the application of biomass for heat.

Table 5 Heat targets for achieving the 12% RES target, the base-line in 1997 and the contributions so far [EU COM, 366, 2004]

REST Heat potential	1997	2002 results	2010 heat contribution to 12% target
EU-15	38,7 Mtoe	43,3 Mtoe	72
Biomass	38,04	42	66
Geothermal	0,4	0,8	4
Solar thermal	0,26	0,5	2

3.3 Removal of barriers

In addition to the requirements for national indicative targets, the Directive lays down practical requirements for Member States in four areas. These are designed to ensure stable investment conditions for electricity from renewable energy. These include:

- Implementation of attractive support schemes.
- Removal of administrative barriers.
- Guarantee of fair grid access.
- Issuing of a guarantee of origin.

Member States continue to develop their own national mix of support schemes to stimulate renewable electricity. They will be treated to more extend further on. The implementation of renewable energy is often blocked by complex licensing procedures, poor integration in regional and local planning and obscure grid-connection procedures. Not every country has solved these barriers to a satisfactory level. In table x an overview on the status is being presented. To ensure the origin of electricity produced from renewable energy as such, guarantees of origin shall be implemented in an accurate and reliable way, this also facilitates trade amongst Member States.

Support schemes used by Member States take the form of feed-in tariffs, quota obligations in combinations with green certificate system and tendering/bidding systems. Complementary mechanisms often in place are investment subsidies and fiscal measures. In table x the main characteristics for each Member State are summarized.

Table 6 Barriers and supporting mechanisms for RES

	Administrative barriers	Grid barriers	Feed-in tariffs	Quota obligations/green certificates	Tendering/bidding	Subsidies	Fiscal measures
Austria	☺**	😐	•			•	
Belgium	😐	😐	•	•		•	
Denmark	☺	☺	•	(•)*			
Germany	☺	☺	•			•	•
Greece	☹	☹	•			•	
Spain	☺	☺	•				
France	☹	☹	•		•		
Ireland	☺	☹	•		•		
Italy	n.a.	n.a.		•		•	•
Luxembourg	n.a.	n.a.	•			•	
Netherlands	☹	☺	•				•
Portugal	☹	☹	•			•	•
Finland	☺	☺				•	•
Sweden	☺	☺		•		•	•
United Kingdom	😐	😐		•		•	•
Cyprus	n.a.	n.a.	•			•	•
Czech Republic	☹	☺	•				•
Estonia	☺	☹	•				•
Hungary	☹	☹	•			•	
Latvia	☹	☺	•			•	
Lithuania	☺	☺	•				
Malta	n.a.	n.a.					•
Poland	☹	☹		•		•	
Slovenia	☹	☹	•				•
Slovakia	☹	☺				•	

*A green certificate market has been announced but not implemented so far.

**☺ = good conditions, 😐 = medium conditions, ☹ = insufficient/strong barriers

3.4 RES Analysis

Country studies, case studies and overall developments described in this Chapter lead us to the following general conclusions regarding RES development:

- The overall EU25 target of 21% RES-E will not be achieved through current policies, 18 to 19% is the presently estimated figure.
- Individual RES-E targets for all countries, including the new member states, are unlikely to be met. Exemptions are Germany and Denmark.
- Countries like Germany and Denmark are ahead of the rest through the application of advantageous feed-in tariffs and additional funding for a substantial period of time.
- Most of the Member States, and in particular the new member states, have recently changed or implemented supporting mechanisms and the effect has still to prove.
- Especially new Member States still face the burden of limited grid access and tedious administrative procedures.
- The success of the implementation of wind power with 28 GW installed of the targeted 40 GW, largely originates from countries like Germany, Denmark and Spain. Especially new Member States have practically no wind power installed yet. It is expected that wind power in 2010 will have grown to 75 GW.
- The achievement of the 21% RES E target is largely depending on the increase in using biomass for electricity generation. The potential and possibilities especially apply to the new Member States.
- The achievement of the overall target of 12% renewables in 2010 is largely depending on the increase in renewable heat and especially the application of biomass. Possibilities are especially advantageous in the new Member States.
- Feed-in tariff systems can be a successful supporting mechanism if the contribution is covers the costs and price security is guaranteed for a substantial length of time (10 to 15 years) to ensure an adequate rate of return on investments.
- To be successful, quota systems need a working green certificate market and an effective penalty system.

4 Conclusions

In this chapter, previous analyses of the European emissions trading system (Chapter 2) and the status of renewable energy sources in the new member states, Germany and Italy (Chapter 3, Annexes and Case-studies) are combined in an analysis which takes as a primary focus business opportunities for third countries (Japan) to invest in renewables in the new member states.

4.1 Emissions Trade and RES in the New Member States

Through the JI/CDM linking directive, the European emissions trading system is open for emission reductions obtained in JI and CDM projects. Credits obtained in these projects can be exchanged for emission units in the European trading system. Hence, if credits in JI/CDM projects are obtained for a lower price per tonne CO_2 than the market price in the European trading system, a net benefit can be obtained. CDM credits can be exchanged from 2005, JI credits from 2008.

For potential investors outside the EU, hence the question arises if they should invest in JI projects within the European Community (particularly in the new member states), in JI projects outside the European Community (e.g., Russia) or in CDM projects (developing countries). Options for JI projects in the new member states can be found in particular, but not exclusively, in renewable energy projects.

Comparing renewable energy JI projects in the new member states to JI/CDM projects outside the community, advantages and disadvantages of the former can be found:

Positive for JI/RES projects in the new member states as compared to JI/CDM outside the community is, that the investment climate in the new member states for RES is relatively stable as compared to other countries where JI/CDM options exist. Also, within the EU a clear political intention exists to stimulate RES. Targets are set and stimulation mechanisms are in force for the years to come. Thirdly, still a huge technical potential for RES investments in the new member states exists.

On the other hand, RES investments within the new member states are likely to be overall more expensive than JI/CDM projects outside the EU, thus reducing the net benefits to be obtained. Because of the huge technical investment potential in RES in the new member states, however, for many individual projects still high benefits may be obtained. This is particularly valid in the first trading period, in which there will be much ‘low hanging fruit’. The interpretation of additionality to the trading system and to the achievement of the acquis communautaire of JI projects may influence investment opportunities.

JI renewable energy projects in the new member states as compared to JI/CDM outside the EU		
+	:	Relatively stable investment climate
	:	Political stimulation of RES on EU level
	:	Financial stimulation of RES depending on Member State
-	:	Investments overall likely to be more expensive
	:	Insecurity about additionality of JI projects

4.2 Selected Case Studies

In the overview per country in the appendices, investment potentials in RES per country and individual source are listed. It shows that there is still a huge investment potential in renewable energy sources in the new member states. Forests, agricultural lands and windy areas where RES development could take place are abundant in the new member states. Also, in some countries hydro development still offers a substantial potential. Whereas due to the RES-E Directive most attention at present is paid to developments in electricity, also heat and in particular conversion of existing heat systems to renewable heat systems is a promising option. In addition, in some countries geothermal sources can be further developed.

Biomass development can be divided into development of biogas electricity, solid biomass, grid-connected heat development and non-grid connected heat development. Solid biomass development, as well as (grid and non-grid connected) biomass heat are in most countries the most promising options. In Cyprus, Malta, Slovakia and Poland also biogas development is seen as a promising option.

Large wind potentials exist in almost all new member states. In countries with a coast-line, also off-shore wind energy potentials exist. Only in Hungary, Slovakia and Slovenia, potentials for wind energy development are seen as more limited due to geographical circumstances or other RES sources which are dominant. The latter is the case in Slovenia, where hydro is the predominant RES source. In Latvia and Lithuania also still substantial investment potentials in hydro exist, primarily in new small-scale hydro and replacement of existing hydro installations.

Geothermal heat development is limited to a few countries with specific geological circumstances. These are Hungary, Germany, Italy as well as (to a lesser extent) Slovakia and Slovenia. Only in Cyprus and Germany a solar heat market so far has developed, though in other new member states (predominantly the Southern ones) also substantial potentials exist. Solar pv potentials are limited to a few Southern new member states, as well as Germany.

Table 7 Selected RES case studies

Estonia	Wind energy
Latvia	Biomass
Lithuania	Hydro energy
Poland	Biomass heat
Czech Republic	Biomass heat
Slovakia	Biomass heat
Hungary	Geothermal
Slovenia	Hydro energy
Malta	Photovoltaics
Cyprus	Solar thermal
Germany	Wind energy
Italy	Overall RES – "sustainable islands"

Table 7 lists the selected RES case studies per country. The case-studies are outlined in the annexes. The case studies are selected to reflect the overall development of one promising RES in each country, or one typical example of a RES development in a country.

The cases also offer an insight into typical barriers as well as chances for further RES development in the new member states, Germany and Italy. Overall analysis of the case studies as well as the country information provided in this report leads us to the following main chances and barriers for further RES development in the new member states:

Main barriers for RES in the new member states

- Administrative hurdles.
- Grid access.
- Limited political support in some individual member states.
- European Emission Trade.

Main chances for RES in the new member states

- Technical potential.
- EU political support.
- Relatively stable investment climate.
- Stimulation mechanisms per member state.
- European Emission Trade.
- JI projects.

Barriers to further RES development in the new member states have already been discussed in Chapter 2. They consist in particular of administrative hurdles, grid access problems and limited political support in some member states. Also, the insecurity about particular provisions and further development of the European emission trade system might provide a hurdle to RES development.

However, there are also large investment opportunities for RES projects in the new member states. The technical potential is huge and the challenge for investors right now is to identify the best investment opportunities. This holds for

JI projects as well as for RES projects that fall directly under the European emission trade system. The European emission trade system offers chances for RES projects within and outside the European Union.

A particular benefit of RES projects in the new member states is that they fall under the jurisdiction of the European Union. That means in general a potentially relatively stable investment climate as compared to many other countries. Furthermore, it guarantees political support for RES on an EU level in the coming years. And finally, depending on the individual member state, also individual support mechanisms for RES are in place which provide help to make investments more attractive.

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Renewable Energy Sources in the New Member States of the EU, Germany and Italy

Annexes

Report

Delft, February 2005

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A Germany

Key factors

- German energy policy at present is directed at a phase-out of nuclear energy over the mid-term.
- The RES market is mature. Wind energy, PV and solar thermal have grown very rapidly over the last decade.
- Developments have been stimulated by high feed-in tariffs from the Renewable Energy Act.
- Barriers become visible: grid capacity, technical problems and costs are main hurdles to overcome for further RES development.

A.1 Overall Energy Situation

Figure 3 Germany – shares of TPES 2001

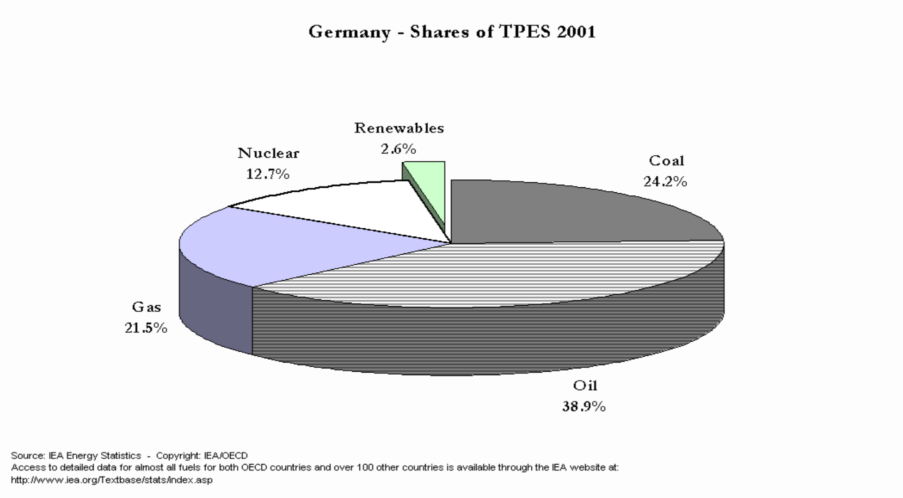
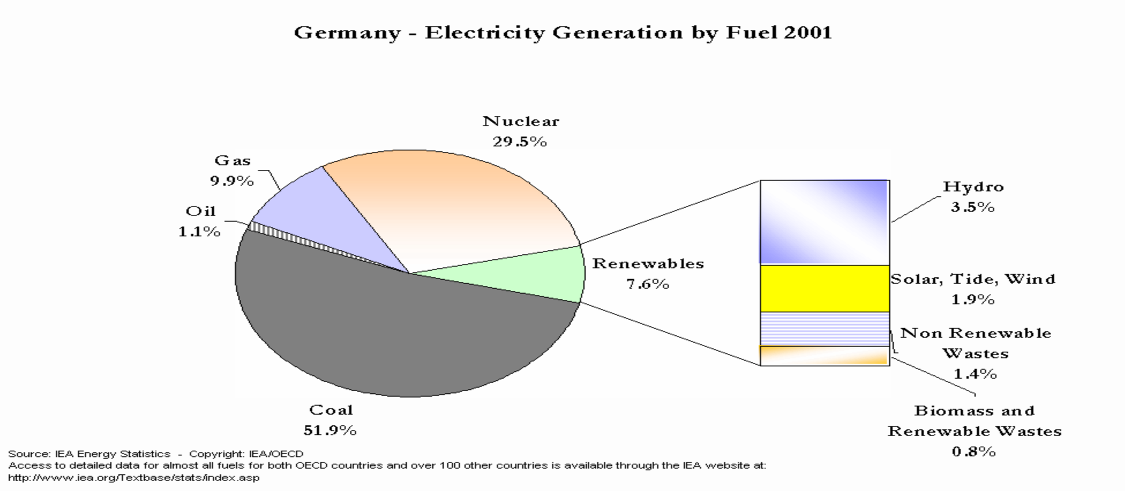


Figure 4 Germany – Electricity generation by fuel 2001



A.2 Climate Change Policies

Base year	1990
Target set for 2010 (%)	-21%
Greenhouse gas emissions in base year (Mt CO_2 eq.)	1216
Greenhouse gas emissions in 2001 (Mt CO_2 eq.)	994
Change so far (%)	-18%

Projections CO_2 emissions

Base year CO_2 emissions (Mt):	1,014
Projection 2010 with measures (Mt):	862
Projection 2010 with additional measures (Mt):	-15

National Allocation Plan

Total number of installations	2,419
Total cap until 2007 (Mt/a)	6,500
Approval date	Partially approved on 7 July 2004
Link	http://www.bmu.de/en/1024/js/download/nap_en/

A.3 RES Policies

Current Penetration of RES

The developments in renewable electricity production have been very dynamic in Germany over the recent years. In absolute figures wind energy showed the strongest growth reaching the combined generation potential of large and small hydropower at the end of 2003 of about 25 TWh. The actual generation of wind energy in 2003 was lower at about 18.5 TWh due to a wind year that was 16% below average as well as due to the fact that most wind turbines are installed at the end of the year. About 50% of the European wind energy capacity is installed in Germany. Hydropower has the second-largest RES-E share, but it has not been showing any significant development over the last five years. Biomass electricity, including the biodegradable fraction of municipal waste, is the third most important RES-E source with about 6.2 TWh of electricity production in 2002. Strong growth rates have also been achieved in the area of photovoltaics, reaching an installed capacity of 258 MW and a generation potential of about 190 GWh in 2002 and about 260 GWh in 2003.

In the heat sector the growth was less rapid than in the electricity sector although solar thermal collectors and heat pumps have attracted sizeable investment especially from private households. A total collector area of about 5 million m^2 was installed by the end of 2002. Biomass heating is largely dominated by wood and wood-waste applications in households and a growing share of biogas, accounting for about 13% of the biomass heat consumption by the end of 2001. The production of heat from wood in households remained quite constant over recent years.

The biofuel sector bas been growing very rapidly over the last 10 years, showing a doubling of production every two years. The existing biofuel mix is based almost entirely on biodiesel produced from rapeseed.

Background

The stability of political support has stimulated continuous and high levels of growth especially in the case of wind energy, PV and solar thermal installations over the past decade. But the sectors of liquid biofuels, heat pumps and to a lesser extent biomass electricity, and biomass heat have also shown relevant growth rates. From 1 August 2004 new feed-in tariffs are proposed that lower the tariffs for wind on-shore, increase tariffs for biomass electricity, geothermal electricity and introduce a feed-in tariff for the refurbishment of large hydro. Overall energy policies aim at a phase-out of nuclear energy.

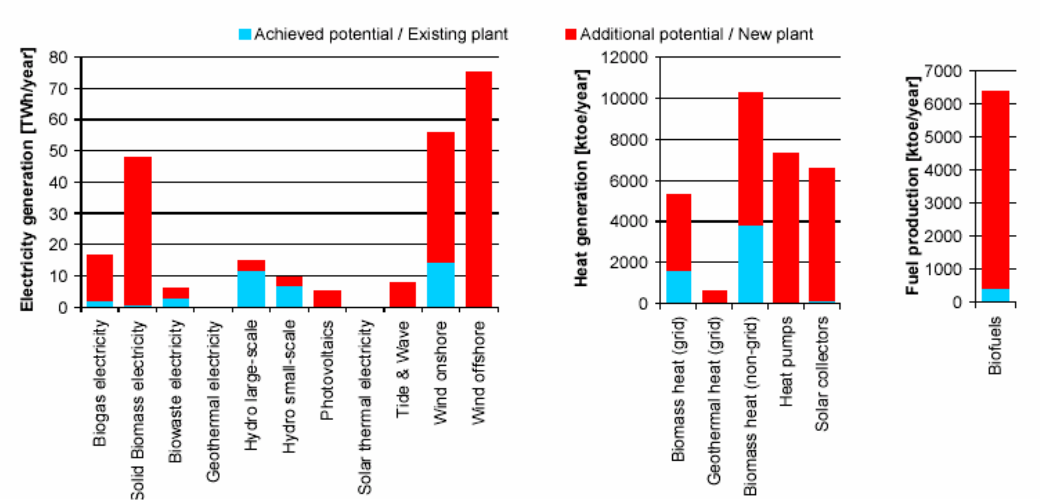
RES targets

The RES-E target to be achieved by Germany in 2010 is 12.5% of gross electricity consumption (in 2020 10% of total energy consumption and 20% of electricity consumption).

Status of the renewable energy market

The renewable energy market in Germany is mature and showing large growth rates even at high penetration rates. Biomass might be considered as the only source that is significantly lagging behind expectations. Main future potentials lie particularly in wind offshore and solid biomass:

Figure 5 Germany – Mid term potentials for RES



Partially exploited potentials and limited grid capacity in the northern parts of Germany are currently hampering the growth of onshore wind energy for much of the market. Offshore wind energy is developing more slowly than expected due to high costs and unsolved technical problems (long distance from land and deep water). Biomass development is slower than expected due to fuel price uncertainty and high infrastructure costs. Most of the low-cost potentials (wood wastes) have already been exploited. The new renewable energy act from 1 August 2004 will have a major impact on wind, biomass and large hydropower. The current relatively high feed-in tariffs combined with reasonable investment subsidies and loans have generated a considerable RES market. The termination of the 100 000 roofs programme would have led to a significant slowdown of PV development, however this is now being compensated by higher feed-in tariffs as from in January 2004.

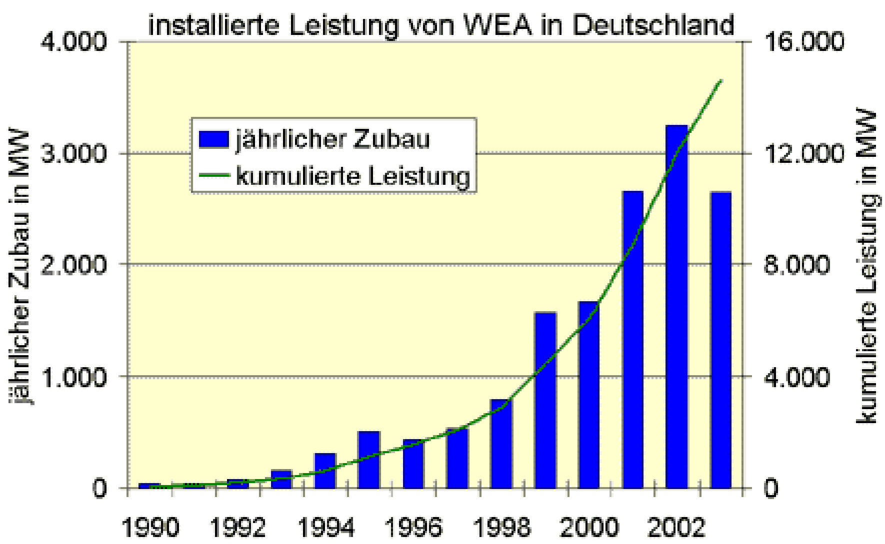
Main supporting policies

Main supporting policy are the feed-in tariffs provided by the Renewable Energy Act. From 1 August 2004, feed-in tariffs to be paid for solar and wind onshore are lowered, and for wind offshore, geothermal, biomass increased.

A.4 Case Study: Wind Energy in Germany

About half of European wind energy generation capacity is installed in Germany. Developments have been very rapid in the last decade. From 1994 to 2004, installed capacity increased from 643 MW to 15,327 MW. The largest growth so far has been achieved in 2002, with 3.247 MW installed in one year. In 2004, new built capacity decreased to 718 MW (www.windenergie.de).

Figure 6 Installed wind energy capacity in Germany



Source: Bundesverband Windenergie website 2004

Most capacity is installed in the northern federal states, where average wind speeds are highest. Here the issue of grid capacity is most urgent. Disputes about which costs for grid expansions, and who has to bear costs are still going on (www.wind-energie.de).
Success factors for the rapid development of wind energy have been, according to the European Environment Agency (2001) political, legislative, fiscal, financial, administrative, technological and social. National and regional political support,

tax exemptions, subsidies and low interest loans, planning guidance for wind energy development areas, a strong and expanding wind energy industry and citizen environmental awareness are mentioned as factors that contributed to the success.

However, main single success factor for wind energy development in Germany is the (financial) incentive of the Feed-in Law, later replaced by the Renewable Energies Law. It obliged grid operators to buy electricity produced from renewables at premium feed-in tariffs, thus providing a secure environment for investments in wind energy.

Recently, wind power development in Germany has been criticized by the German magazine ‘Der Spiegel’ (2004). According to the article, further wind energy development is not sensible: many citizens complain against new turbines, it costs too much money, too many reserve capacity is needed as a back-up for wind energy, the grid has to be adapted. The conclusions of the article, however, have been attacked in turn by several organisations, e.g. BWI and Eurosolar. According to these organisations, the articles conclusions are not well researched (www.wind-energie.de).

B Italy

Key factors
- Relatively favourable certificate prices up to 8.4 €ct/kWh.
- Certificates are issued only for plants producing more than 50 MWh per year.
- The major problem with developing new production capacity seems to be problems in obtaining authorisation at local level and the high cost of grid connection.
- The carbon tax is relatively high, which offers competition benefits for renewables.

B.1 Overall energy situation

Figure 7 Italy - shares of TPES 2001

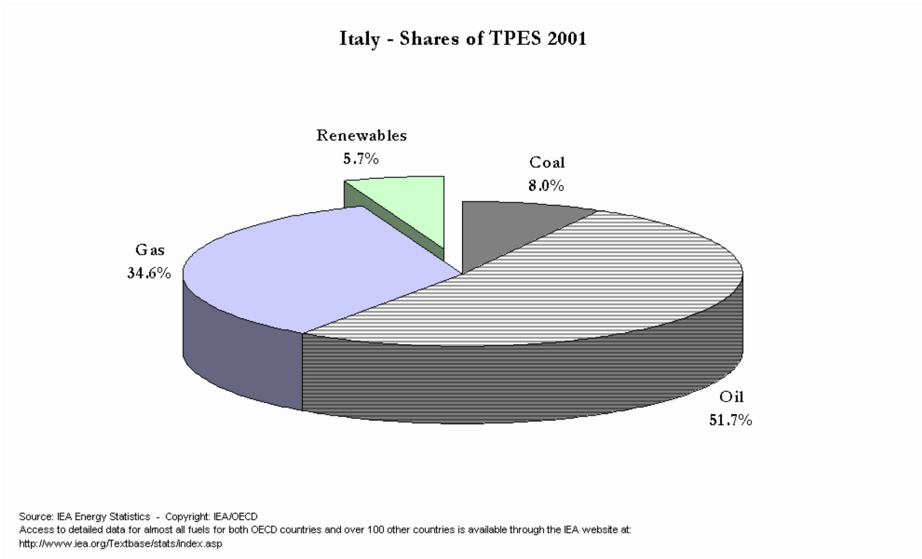
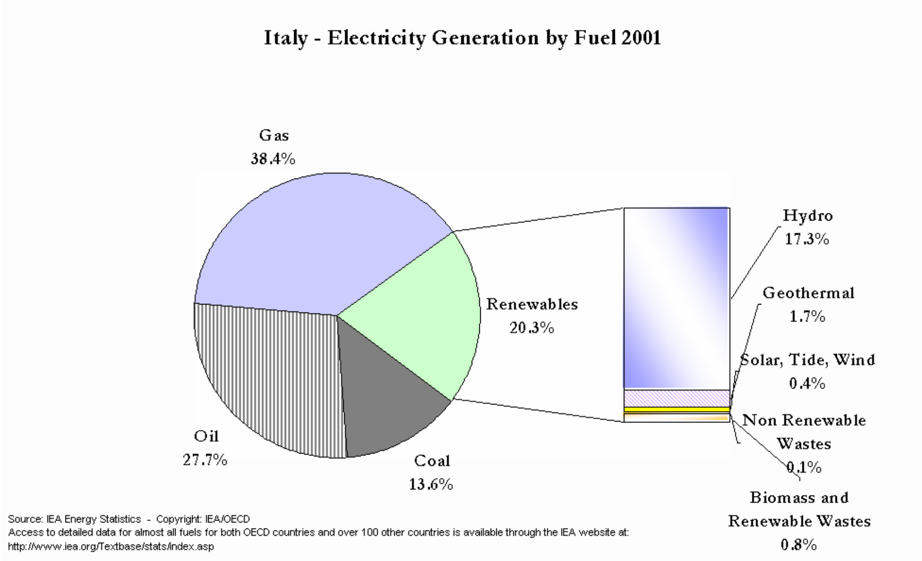


Figure 8 Italy - electricity generation by fuel 2001



B.2 Climate Change Policies

Greenhouse gas emissions targets and achievements

Base year	1990
Target set for 2010 (%)	-6.5
Greenhouse gas emissions in base year (Mt CO_2 eq.)	258.1
Greenhouse gas emissions in 2000 (Mt CO_2 eq.)	275
Change so far (%)	+6.5

Projections CO_2 emissions

Base year CO_2 emissions (Mt):	210.2
Projection 2010 with measures (Mt):	279.8
Projection 2010 with additional measures (Mt):	258.1

National Allocation Plan

Total number of installations	n.a.
Total cap until 2007 (Mt/a)	240
% NAP for new entrants	n.a.
Approval date	n.a.
Link	http://www.minambiente.it/Sito/settori_azione/pia/att/pna_c02/docs/italian_NAP.pdf

B.3 RES Policies

Current penetration of RES

The share of renewables in electricity supply is 16,8%. Hydropower represents around 85 – 90% of Italy's RES-E production, with a total production of 41 TWh of both small-scale and large-scale hydropower stations in 2001. Geothermal electricity is the second most important RES-E source, representing 8% of the RES-E production. Worth mentioning is also the strong growth of the installed wind power capacity, with a factor of 270 in the period from 1990-2002, up to 785 MWe in 2002. In absolute terms the Italian wind market is however still small in size. Installed PV capacity grew by 600% in the same period, up to an installed capacity of 23 MWp in 2002. According to the total electricity demand the share of RES electricity in Italy increased slightly from 16% in 1997 to 16.8% in 2002.

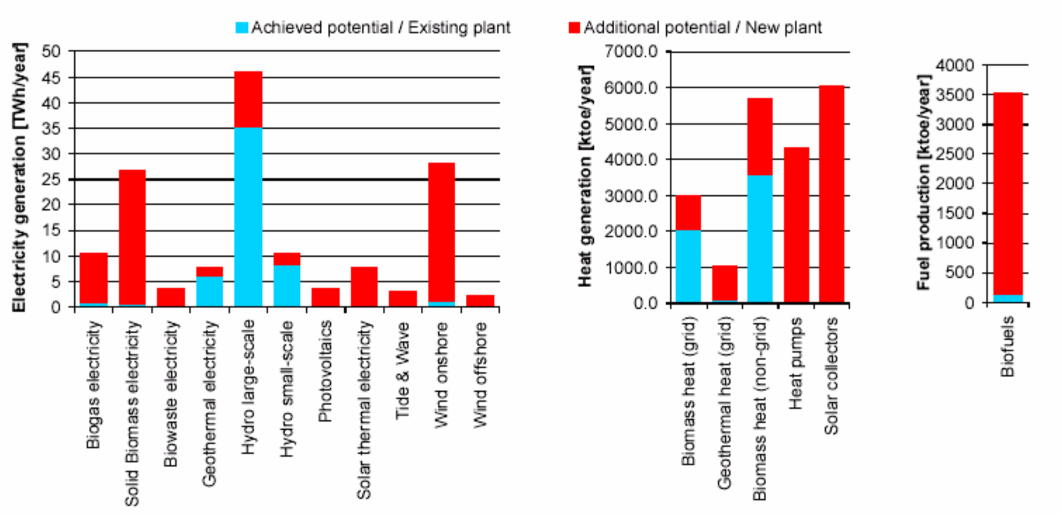
Background

The Italian RES policy is an integral part of CO_2 reduction policies. In 2001 the main support program CIP6 was replaced by a green certificate system with binding targets. Certificates are issued for plants commissioned after April 1 1999 and only for the first 8 years of operation. The certificate system's overall target of 2% was not reached in the first full year of operation. Decree 387 of December 2003 that implements the EU Renewable Electricity Directive increased the target set for 2004-2006 by 0.35% per year.

RES target
The RES-E target to be achieved in 2010 is 25% for Italy.

Status of the renewable energy market
Obligatory demand for producers and importers. The GRTN, Italy's Independent System Operator, may sell certificates produced at eligible RES-E plants under the former CIP6 support scheme at a fixed price and only if the market is short to prevent excessively high prices on the market. Voluntary demand for green electricity may be included in the certificate system. The implementation of the Guarantee of Origin will make the voluntary market more transparent and open.

Figure 9 Italy - Mid-term potentials for RES



Main supporting policies
Certificate system with mandatory demand.
Carbon dioxide tax with exemption for RES (biofuels).
Funds for specific technologies and/or municipalities.

Case study: Sustainable Islands Programma
A programme for the diffusion of renewable energies has been launched in Italy as part of the European Take Off Campaign in order to achieve the target of doubling the renewable energy diffusion by 2010. The expected results are a greater sensitization towards these less polluting forms of energy, more rapid concentration of different funds in this area, accelerated establishment of new rules for local electric producers and finally reduction of the gap between the culture of the Authorities in defense of landscape and the approach of the installers of renewable energy technologies.
Italian archipelagos (Venetian, Tuscany, La Maddalena, Ponza, Campania, Eolean, Aegadi, Pelagie, Tremiti) have several characteristics in common. In most of the islands reserved areas have been established in the last few years and many others will be introduced soon.

All the islands have a strong tourist character: population in summer is 1.5 to 10 times higher than in winter. This huge tourist movement entails big problems in terms of water, wastes, energy and mobility management.

As regard energy production, most of the small Islands produce their own electricity locally with diesel generators. Generators are usually oversized to take into account the overpopulation in summer. In this scenario, generators are used inefficiently because their use is inconstant. Furthermore, management, maintenance costs and mortgages are higher than in the case of continuous operation.

In the last 20 years there have been several attempts to introduce renewable energies in Italian small islands, with limited results. Rather then a problem of funding, the reasons has been the combination of two important obstacles: the regulatory framework for the production and distribution of electricity and the obstacles posed by authoritiesthat defend the landscape.The Ministry of Environment has decided to launch a sustainable energy program for the small islands to try to overcome these obstacles and foster the large scale diffusion of renewable sources of energy.

Island utilities are quite reluctant to change the existing situation for several reasons:

1 They work in a monopolist condition.
2 The extra cost of local energy production is totally covered by the government.

For the realisation of the programme a Protocol has been signed by the former Minister of Environment and the Association of small islands, ANCIM.

The first operational step toward the application of the Protocol has been the launching of a public tender for the local administration of Small Island to submit energy and mobility plans.

The programme has been remarkably successful: 30 islands initially showed an interest in the initiative, and 12 actually went on to submit feasibility studies in energy field, while a further 7 islands submitted studies in the area of sustainable mobility.

All the projects place considerable emphasis on solar thermal energy (both for the production of heat and of electricity) and wind energy, while the contribution of energy saving measures reducing the consumption of electricity from fossil fuels is very reduced (only 5%), which suggests that this is an area on which greater emphasis needs to be placed in the future.

After a careful analysis of the projects submitted, taking into account both the selection criteria established by the technical committee and the funds available, five projects were selected for funding: Pantelleria, Ventolene, Gorgona, Giblio and Panarea. By the end of 2002, the second stage of the programme will have been implemented and these islands will need to translate their preliminary studies into executive plans (to be completed no later than January 2005).

C Estonia

Key Factors
– Estonian energy supply is dominated by the domestic energy source oil shale, a coal product. The country accounts for 70% of the world production of oil shale. Production takes place mainly in two oil shale power plants owned by state-owned 'Eesti Energia'. The production has strong negative environmental impacts and will be reduced in coming years; – The decrease in greenhouse gas emissions so far (-55%) is much higher than the target set (-8%). – The CO_2 allocation in the NAP (18,95 Mt/a until 2007) is high in relation to the projected emissions (6,9 – 8,6 Mt/a in 2010). – The RES target set (5,1% in 2010) is high in relation to present RES penetration (0,2%). – Mid-term potentials for RES exist in particular for solid biomass, tide & wave, wind onshore and biomass heat (non-grid + grid). – New electricity act with higher feed-in tariff provides an incentive for RES.

C.1 Overall Energy Situation

Figure 10 Estonia – shares of TPES 2001

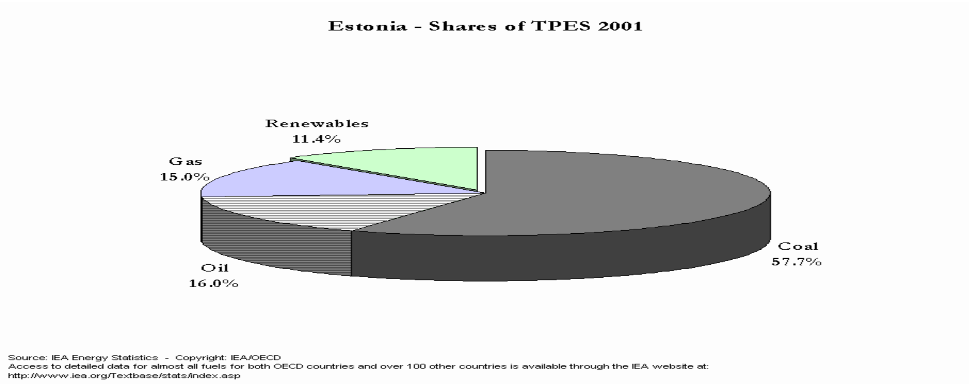
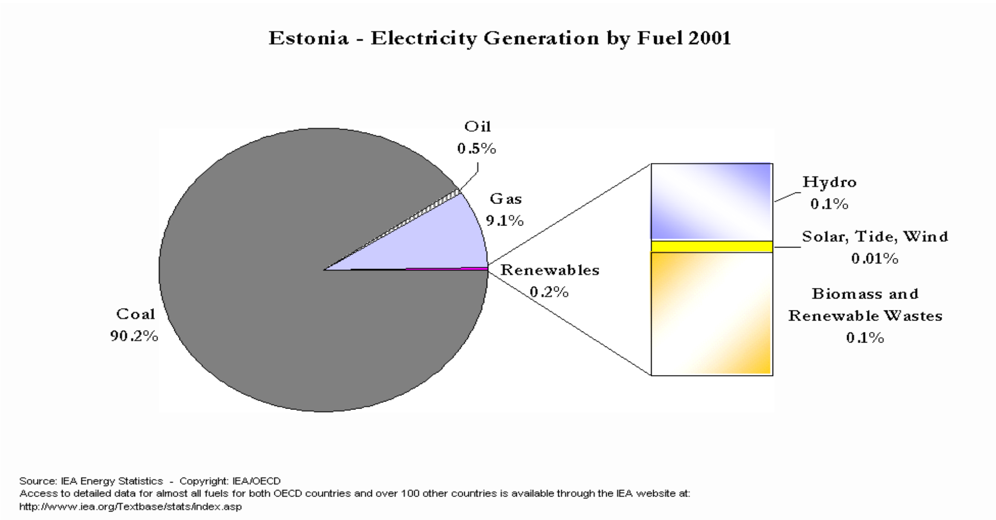


Figure 11 Estonia – electricity generation by fuel 2001



C.2 Climate Change Policies

Greenhouse gas emissions targets and achievements

Base year	1990
Target set for 2010 (%)	-8
Greenhouse gas emissions in base year (Mt CO_2 eq.)	43.5
Greenhouse gas emissions in 2001 (Mt CO_2 eq.)	19.4
Change so far (%)	-55.4

Projections CO_2 emissions

Base year CO_2 emissions (Mt):	31.8
Projection 2010 with measures (Mt):	8.64
Projection 2010 with additional measures (Mt):	6.91

National Allocation Plan

Total number of installations	43
Total cap until 2007 (Mt/a)	18.95
Approval date	20-10-2004
Link	http://www.envir.ee/valisohukaitse/RJK.pdf

C.3 RES Policies

Current penetration of RES

The share of renewables in electricity supply is 0.2%, because of the huge and cheap supply of electricity from oil shale. This source dominates the Estonian electricity production. Currently total installed wind power capacity amonts to 2.2 MW. Several projects are under development. In Estonia, at present only one 1.2 MW hydro plant exists. The utilization of solar energy in Estonia has no noticeable spreading both for electricity production and heat supply.

The current penetration of biomass is not exactly known but very small. The area occupied by forests constitutes 22 thousand km^2 that exceeds a half of the country territory, thus forest residue presents the highest biomass potential.

Background

Estonia has one of the lowest penetration of RES in the region with an extended oils-shale based energy production employing 10,000 people in this relatively small country. Production of oil shale has negative environmental impacts and will be reduced as a result of the EU membership in the coming years.

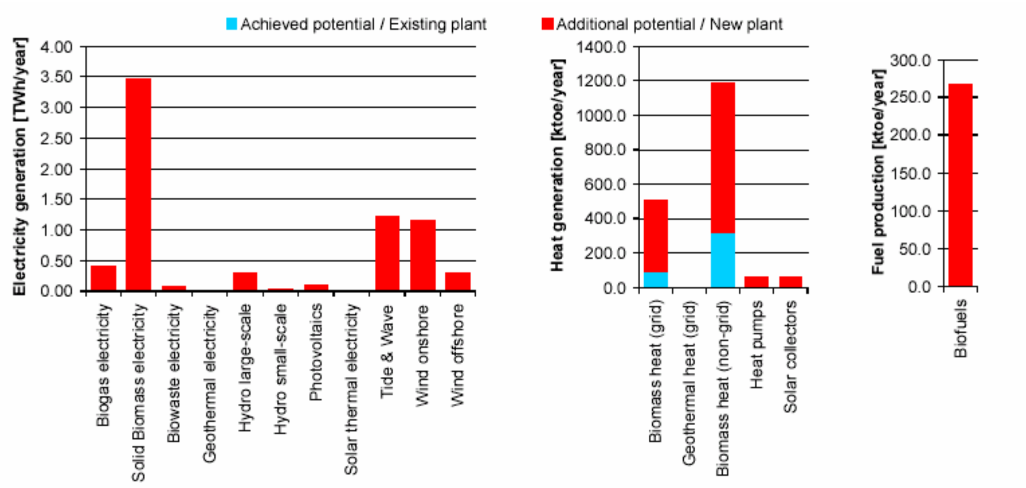
RES target

The RES-E target to be achieved in 2010 is 5.1% for Estonia.

Status of the renewable energy market

There are low opportunities for solar and geothermal. However there is considerable potential in biomass, wind and tidal and wave energy due to the favourable physical conditions (long coast line, low population density). Mid-term potentials for RES as assessed by the European Commission (SEC 547) are given below.

Figure 12 Estonia – Mid-term potentials for RES



Main supporting policies

Electricity Market Act (EMA): electricity price for renewable energy 1.8 times the residential price, so the price for renewable energy is: 5.2 €ct/kWh. This price is paid for 7 years for biomass and hydro and for 12 years for wind. The EMA has come into force on July 2003. Sales Tax Act: 0% VAT for renewable energies.

C.4 Case Study: Wind Energy in Estonia

Wind energy development in Estonia is in its very beginnings. However, a considerable potential exists.

Based on wind speeds measured, the area suited for wind energy in Estonia is large: the archipelago, a 2 km wide stripe on the west coast and a 20 km stripe on the north coast have suitable wind conditions. The total estimated potential for wind energy development in Estonia is calculated to be 924 GWh/a (BEF, 2003).

Figure 13 Estonia

Source: UNEP Grid Arendal website

This considerable technical potential contrasts sharply with developments so far. Historically, wind mills were used in Estonia. These lost their function with electrification. During the Soviet era the development of wind energy was not stimulated. Hence, new developments started only at the end of the 1980s. At the Vätta Peninsula, Saaremaa a large wind energy project was tested. Soviet made wind turbines with a total capacity of 346 kW were erected. However, due to poor quality of the turbines the wind farm soon stopped its activities [BEF, 2003].

In 1997, the first modern turbines in Estonia were erected. In 2002 more turbines were connected to the grid. At present, there are 5 units connected with a total capacity of 2180 kW. Three of these are Enercon E-40 turbines, with a capacity of 600 kW each.

Table 8 Wind Energy in Estonia

Site	Launched	Turbine	Capacity (kW)
Hiiumaa, Tahkuna peninsula	1997	Genwin	150
Saaremaa, Sõrve peninsula	2002	Vestas V-27 (second hand unit)	230
Continental Estonia, Virtsu peninsula	2002	Enercon E-40	3 x 600

Source: Estonian Wind Power Association

Based on projects developed until 2003, it is estimated that about 50 new turbines will be erected until 2010, increasing the installed capacity from 2 MW at present to 50 to 100 MW in that year.

In order to realise the potential, however, wind energy has to be made attractive to investors. The new electricity market act provides incentives, but according to WWF (2004) a higher incentive still would be needed. Another barrier to further development of wind energy is the limited access to the grid due to the shortage of grid capacity in some areas, and the lacking of any grid in some of the most suitable areas for wind energy development. In addition, the suitable sites for wind energy are also valuable for nature protection and recreation, thus creating conflicts between different interests.

D Latvia

Key Factors – Latvia depends to a large extent (65-70%) on imports of primary energy sources from Russia; – Emission reductions so far (-61%) are much higher than the target set for 2010 (-8%); – The CO_2 allocation in the NAP (4,57 Mt/a until 2007) is high in relation to the projected emissions (0,4 Mt/a in 2010); – RES are an important way to reduce energy dependency from Russia. A RES target of 49% has been set (as compared to 42% in the base year). Hydro energy is the predominant RES source in Latvia so far. Solid biomass and non-grid connected biomass heat production are promising for the future; – Mid-term potentialsfor RES exist in particular for solid biomass and non-grid connected biomass heat production; – RES are supported by a favourable feed-in tariff. Obstacle to future RES development might be the plan to construct an underseas cable from Finland as well as the quota for RES set by the regulator.

D.1 Overall Energy Situation

Figure 14 Latvia – shares of TPES 2001

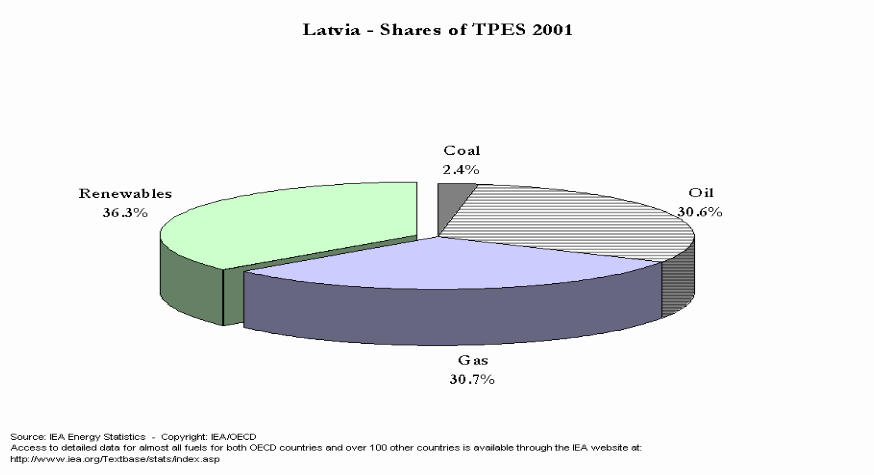
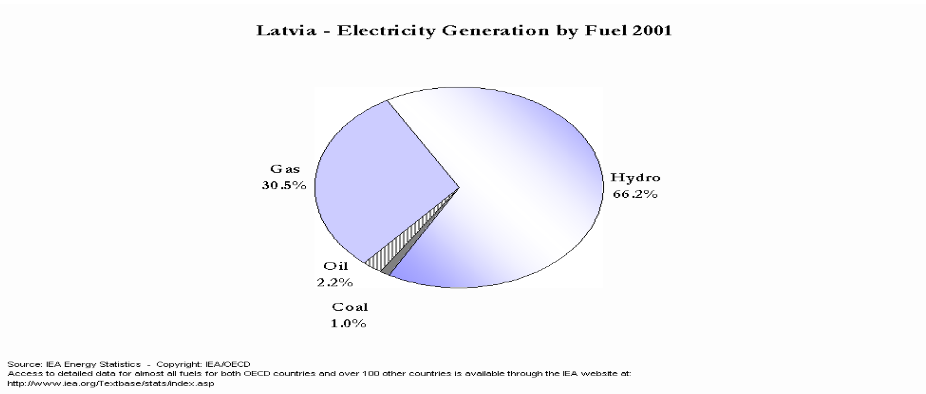


Figure 15 Latvia – electricity generation by fuel 2001



D.2 Climate Change Policies

Base year	1990
Target set for 2010 (%)	-8%
Greenhouse gas emissions in base year (Mt CO_2 eq.)	29
Greenhouse gas emissions in 2001 (Mt CO_2 eq.)	11.4
Change so far (%)	-61%

Projections CO_2 emissions

Base year CO_2 emissions (Mt):	22.4
Projection 2010 with measures (Mt):	0,4
Projection 2010 with additional measures (Mt):	n.a.

National Allocation Plan

Total number of installations	95
Total cap until 2007 (Mt/a)	4.57
Approval date	20 October 2004
Link	http://www.vidm.gov.lv/vide/doc/L270rik.htm

D.3 RES Policies

Current Penetration of RES

The hydroelectric facilities provide about 75% of electric generation in Latvia, however, the supply reliability is complicated due to frozen rivers during very low winter temperatures. Total installed wind energy capacity in Latvia is currently very small (about 22.8 MW). Regarding heat production, biomass energy is mainly used as firewood in small and, as a rule, low-efficient boilers in the private household utilities. Solar energy is practically not used for heat production.

Background

Imported energy resources account for 65-70% of the total energy consumption in the primary energy resource balance of Latvia. Therefore the primary reason for supporting renewable resources in energy generation is security of supply and creation of new jobs. Wood and wind are the most prioritized from renewable energy resources for use in electricity generation.

RES targets

The RES-E target to be achieved in 2010 is 49.3% for Latvia.

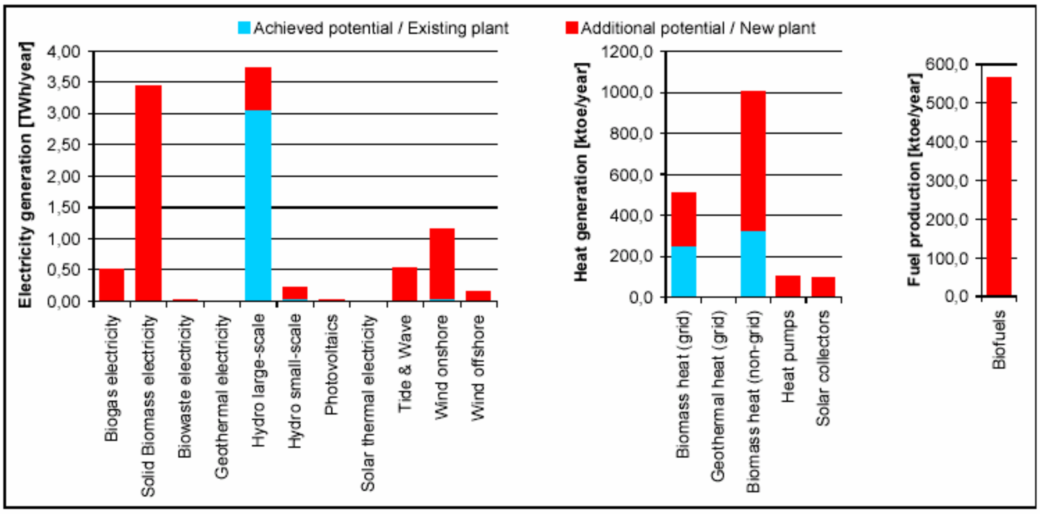
Status of the renewable energy market

From 1996 to 2002, Latvia experienced significant growth in renewable energy projects as developers took advantage of the so-called double tariff, phased out the 1st January 2003. Latvia had a unique feed-in tariff, which was double the average electricity price for a period of eight years after grid connection for wind and small hydro power plants (less than 2 MW). Annual production at small hydropower plants increased from 2.5 to 30 GWh, while output from windpower plants built during the last three years increased to about 50 GWh.

The plan to build an undersea cable from Finland to import cheap energy may jeopardize RES development. The political support of RES has decreased in Latvia since January 2003. The cheap production of electricity from large-hydro and the low regional import electricity prices are obstacles for further RES development.

Main RES production capacity realised so far is hydro. For the future, particularly solid biomass electricity and non-grid connected biomass heat production are seen by the EU (SEC 547) as promising options:

Figure 16 Latvia – Mid-term potentials for RES



Main supporting policies

Law on Energy: With the amendment adopted in 2001 that phased out the so-called double tariff by 1st January 2003, regulations fixing the total capacity for installation and specific volumes for next year are annually published (quota). The annual purchase tariff for small hydro power as well as for power plants using waste or biogas is set at the average electricity sales tariff, while tariffs for wind power plants are approved on a case-by-case basis by the regulator.

Other issues

Long-term loans on favourable conditions for projects in private and public sectors.

Owners of buildings and other facilities have the right to choose the most cost-efficient type of energy supply.

D.4 Case Study: Biomass in Latvia

Latvia's predominant RES source is hydro-energy. However, most of the options for hydro-energy already are used. Main potentials for the future lie in biomass development. For instance, the potential for electricity production from solid biomass is estimated to be about 3.50 TWh / year, whereas at the moment no electricity from these sources is produced [EC, 2004].

Biomass development in Latvia so far consists of wood-based fuels, straw, biodegradable waste and peat. As 44% of the territory of Latvia is covered with forests, in particular wood-based fuels may provide good perspectives. The total stock of wood is estimated to be 544 million m^3. At present, 11 million m^3 of wood are felled each year, whilst the natural increment is 13 million m^3 per year [BEF, 2003]. Areas most rich in forests are the Ventspils, Talsi and Aizkraukle districts.

Figure 17 Latvia

Source: [UNEP, Grid-Arendal, 1998]

Wood-based fuels at present are mainly used for heat generation in centralized boiler houses. There are about 400 of such boiler houses, with a total capacity of more than 270 MW. Also, many households use firewood for heating. Electricity production from wood-based fuels is not developed yet.

Table 9 Heat production from wood-based fuel in Latvia

Production of heat in households (PJ)	20
Production of heat in boiler houses (TJ)	4
Number of boiler houses	400 (270 MW)

Source: [BEF, 2003]

Care has to be taken that with development of future potentials for biomass energy production, felling rates in future will not exceed natural increment. Therefore, in particular the use of forest residues, waste wood and brush wood are examined. Also, options for energy crops in the form of fast growing trees are examined.

A separate purchase tariff for CHP based on wood-based fuels has been established [Reiche, 2003]. However, so far no such plants operate.

E Lithuania

Key Factors

- Nuclear energy in Lithuania, which so far has a large share in total primary energy supply, is to be outfased by 2009. A first of two reactors has to be decommissioned by 2005.
- The coming years, Lithuania has to switch from nuclear to the development of other indigenous resources. RES are envisaged to play an important role here. RES target is 7%.
- Present reductions in CO_2 emissions (-57%) are far higher than the target set (-8%).
- The largest RES source in Lithuania at present is hydro. Further development of hydro is still a good option for the mid-term. Other potentials exist in particular for biomass.
- Feed-in tariffs support RES development in Lithuania.

E.1 Overall Energy Situation

Figure 18 Lithuania – shares of TPES 2001

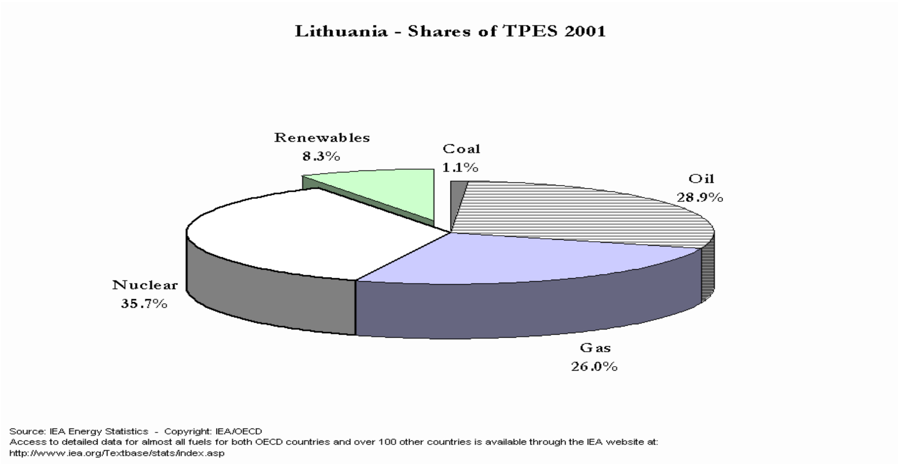
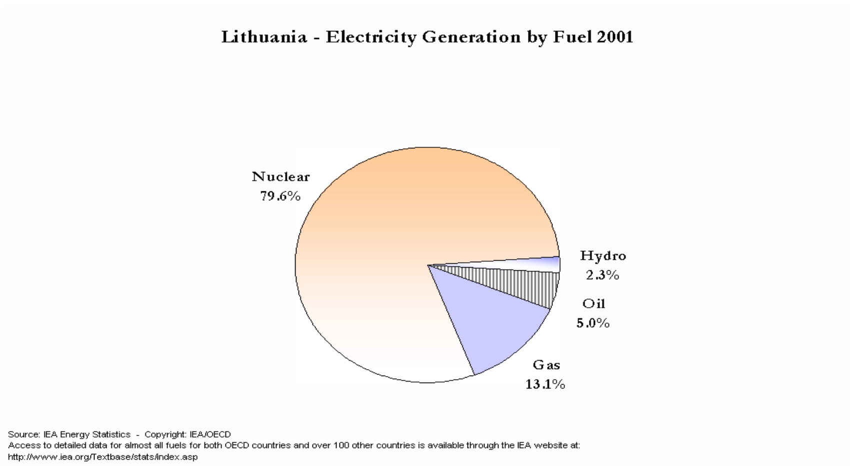


Figure 19 Lithuania – electricity generation by fuel 2001



E.2 Climate Change Policies

Base year	1990
Target set for 2010 (%)	-8%
Greenhouse gas emissions in base year (Mt CO_2 eq.)	51.5
Greenhouse gas emissions in 2001 (Mt CO_2 eq.)	23.9
Change so far (%)	-57%

Projections CO_2 emissions

Base year CO_2 emissions (Mt):	39.5
Projection 2010 with measures (Mt):	n.a
Projection 2010 with additional measures (Mt):	n.a

National Allocation Plan

Total number of installations	107
Total cap until 2007 (Mt/a)	14.17
Approval date	Not yet approved
Link	http://www.am.lt/EN/VI/files/0.463723001083578603.pdf

E.3 RES Policies

Current Penetration of RES

Large hydro installed capacity was to 112 MW; small hydro to 15 MW. Recently the pump- storage plant Kruonis with 800 MW has been put into service. No wind turbines operate in Lithuania, only a 4 MW demonstration wind project is on the drawing board for a site at Butinge on the Baltic Sea coast.

Recently solar energy has been utilized for hot water supply, space heating of premises and drying of agricultural production. Among the biomass energy sources wood was used in Lithuania for space heating of individual houses by burning in stoves with small efficiency. In 1994 waste wood and specially prepared wood chips were started to be used burning them in district heating boilers with higher capacity (> 1 MW). Now the totally installed capacity of such combustion wood boilers achieves around 120 MW. In accordance with the statistic data of 1998 the consumption of wood fuel was equivalent to 571 ktoe. The using of straw fuel in Lithuania was started since 1996. The total installed capacity of straw-fired boilers makes up about 5 MW. Approximately 7,500 t of straw is burned annually in these boilers. This amount is equivalent to 2.5 ktoe of primary energy. There are 6 individual geothermal plants with the total capacity of 114 kW. The construction of Vydmantai geothermal plant in Kretinga region has recently started. 41 MW geothermal plant is build in Klaipeda. In the year 2002 this power plant was not yet working in its full capacity, however produced 180,000 kWh thermal energy.

There is no biofuel production in Lithuania.

Background

Lithuania has the highest dependence on nuclear power in its electricity supply of any country in the world, supplied by a single nuclear plant, Ignalina. However, the first of two reactors should be decommissioned in 2005 and the second in 2009. The decommissioning of the nuclear power plant Lithuania should prevent turning back towards fossil fuels as the main source for the electricity production. One of the strategic objectives in the Energy Strategy, 2002 is to strive for a share of renewable energy resources of up to 12% in the total primary energy balance by 2010.

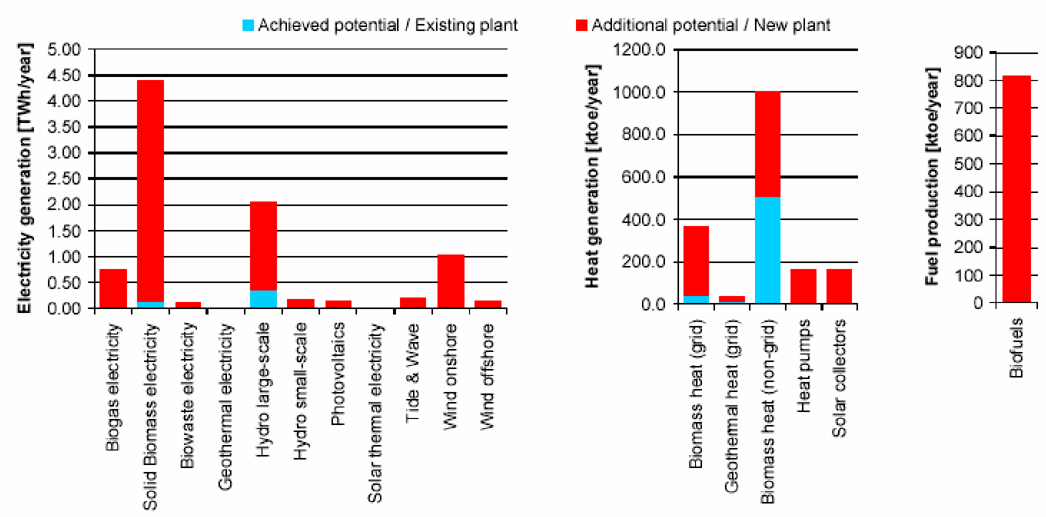
RES targets

The RES-E target to be achieved in 2010 is 7% for Lithuania.

Status of the renewable energy market

Especially biomass supply is growing (wood and straw-firing boilers). There is still an important hydro potential. A big investment has been made in 2002 in geothermal energy. Although Lithuania has a good wind potential, there is no development of this energy up to now.

Figure 20 Lithuania – Mid-term potentials for RES



Main supporting policies

Resolution No. 1474 of 5 December 2001: Procedure for promotion of purchasing of electricity generated from renewable and waste energy sources. Average energy prices since February 2002: Hydro: 6.9 €c/kWh, Wind: 7.5 €c/kWh, Biomass 6.9 €c/kWh.

There are feed in tariffs since February 2002 with no guaranteed time. There exist delays in supporting secondary legislation (biofuel).

E.4 Hydro-energy in Lithuania

As Lithuania's nuclear power plant will be closed in the years to come, the Lithuanian energy sector will go through great changes. This makes that there is also considerable potential for renewable energy sources. Solid biomass electricity is one promising option, but there is also a considerable potential for hydro-energy projects in Lithuania.

Figure 21 Lithuania

Source: [UNEP Grid Arendal 1997]

In particular large scale hydro is seen as a promising option by the EC (2004). However, according to WWF (2004), small hydro power offers a significant potential as well, in particular in the area of reconstructing and renovating existing plants and adding small hydropower plants to water management projects.

In 1992, a pumped storage power plant (Kruonis) was erected in Lithuania. It comprises four 200 MW units and is used as a way of using excess power of the Ignalina nuclear power plant. With the reduced capacity at Ignalina, however, no further increase in capacity at Kruonis is expected in the near future (www.lei.lt).

Apart from this, there is one large-scale HPP in Lithuania, on the Nemunas river. It has a total capacity of 100 MW. Presently, there are proposals under discussion for the construction of two large-scale HPPs: one on the Nemunas River and the second on the Neris river [BEF, 2003]:

- Nemunas River HPP has been subject of an Environmental Impact Assessment. Planned capacity is 100 MW. The exact date of construction is not set yet.
- Neris River HPP is very controversial. This river is the only large river in Lithuania without a dam. The proposed new dam will block upstream fish migration. A soon implementation of the project does not seem likely.

There are at present 49 small scale HPPs in Lithuania with a total capacity of 15 MW. Options are examined to re-construct previously abandoned HPPs, as well as to construct new HPPs. There are some 130 abandoned small-scale HPPs which still can be reconstructed (www.saule.lms.lt).

F Poland

Key factors

- Coal-fired power and cogeneration plants dominate electricity generation in Poland. However, more than half of the capacity was built in the 1970's and significant investment in new generation and modernization of existing generation is required. Ninety seven percent of all electricity in Poland is produced from coal.
- Poland requires that electric utilities maintain a renewable energy portfolio of at least 2.4 percent in 2001, 2.5% in 2002; 2.65% in 2003, etc and has established a target of 7.5% of primary energy production from renewable sources by 2010 and 14% by 2020. However, these targets have not yet been enforced, discouraging large scale renewable development. The key resource for achieving the target is likely to be biomass, mainly forestry and agricultural residues and energy crops
- With a 40% share, Poland is the largest GHG emission producer in the acceding and candidate countries region.
- Poland's installed generation capacity exceeds domestic demand by approximately 30 percent, and some of the excess electricity is exported to neighbouring countries.

F.1 Overall energy situation

Figure 22 Poland – shares of TPES 2001

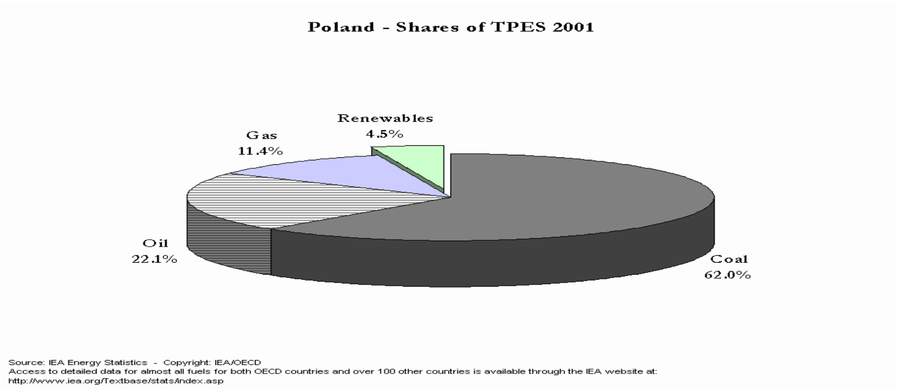
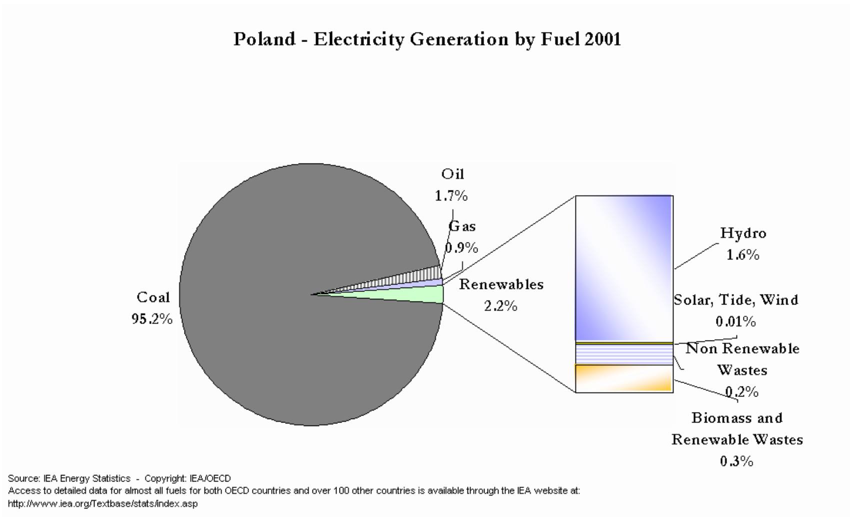


Figure 23 Poland – electricity generation by fuel 2001



F.2 Climate Change Policies

Greenhouse gas emissions targets and achievements

Base year	1988
Target set for 2010 (%)	-6
Greenhouse gas emissions in base year (Mt CO_2 eq.)	565.3
Greenhouse gas emissions in 2001 (Mt CO_2 eq.)	382.8
Change so far (%)	-32.3

Projections CO_2 emissions

Base year CO_2 emissions (Mt):	442.9
Projection 2010 with measures (Mt):	
Projection 2010 with additional measures (Mt):	

National Allocation Plan

Total number of installations	43
Total cap until 2007 (Mt/a)	21.6
% NAP for new entrants	3
Approval date	n.a.
Link	http://www.mos.gov.pl/mos/publikac/national_allocation/KPRU_english10.09.04doUE.pdf

F.3 RES Policies

Current penetration of RES

The share of renewables in electricity supply is 2.0%. The total installed capacity of large hydro-electric power stations is around 630 MW, and of the small ones 160 MW. At the beginning of 2003, 57 MW wind capacity were installed. In Poland 30% of the land surface is economically suitable for wind turbine applications, 5% very favourable. Poland has a good technical potential for wind energy development and local manufacturing. Photovoltaic cells are virtually not used in Poland.

In solar thermal applications, both liquid and air solar collectors are used in a few areas in Poland. The total number of air collectors is estimated at 50-60 units, and their surface area at 6,000 m^2. Around 1,000 solar installations for the heating of usable water have been installed in Poland with the total surface area of the collectors exceeding 10,000 m^2. Biomass covers over 98% of renewable energy production. Biomass is considered to be the most promising of renewable energy in Poland. Current installed capacity using geothermal energy is approximately 68.5 MWt, of which 26.2 MWt is from heat pumps, which collectively generate 0.02 Mtoe of energy on an annual basis.

Background

The Polish power generation sector, with a total installed capacity of more than 33,000 MW, is the largest in central and Eastern Europe. Projections show that domestic demand for electricity will grow by 50% in the next 20 years. Currently, Poland's installed generation capacity exceeds domestic demand by approximately 30%, and some of the excess electricity is exported to neighbouring countries. Poland's total primary energy consumption of almost 100 million toe (ton of energy equivalent) in 1998 ranks it number one among central and Eastern Europe countries. However, Poland is an inefficient energy consumer, since up to 30% of all electrical energy generated is lost. Ninety seven percent of all electricity in Poland is produced from coal. Almost all power plants in Poland are coal fired: 55% are hard coal fired and 42% are lignite (the remaining 3% are hydro power plants). The dominance of coal as the major energy carrier results in a great deal of environment pollution.

For the last several years, the Polish electrical power sector has been deep in the process of modernization and refurbishment in order to create an economically efficient industry capable of securing national energy requirements in a free market economy. Its modernization needs for the period of 1990 - 2005 were estimated at USD 50 billion to satisfy stricter ecological standards. Out of this amount, USD 15 billion is needed for modernization of existing power plants. A substantial portion of the modernization cost will be covered by the income generated from privatizing power enterprises.

Coal-fired power and CHP plants dominate electricity generation in Poland. 60% of the installations is more than 15 years old and 40% more than 20 years old. Significant investment in new generation and modernization of existing generation is required to make the Polish electricity industry competitive with western European markets.

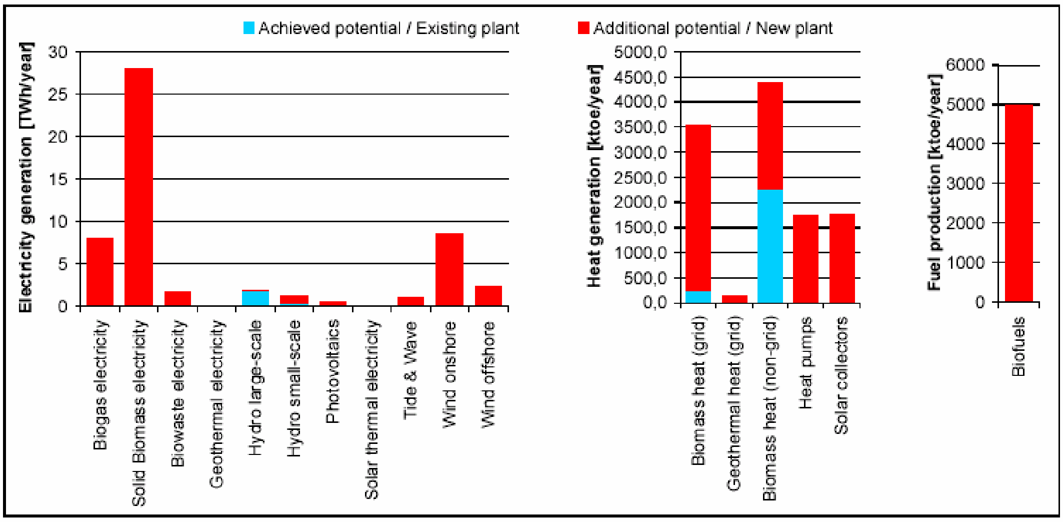
RES target

The RES-E and primary energy target to be achieved in 2010 is 7.5% for Poland.

Status of the renewable energy market

Biomass covers more than 98% of renewable energy production. Biomass is considered to be the most promising renewable energy in Poland, for both electricity and thermal energy production. This is because of the abundant potential of straw and wood resources in Poland and maturity of this technology. At present there are 200 ha energy crops grown and estimations indicate that 1.5 million ha of arable land is available for energy crops. Polish hydro power has chances for development as neither the big hydro power plants are fully used (due to antiquated equipment) nor the small plants. There is also a considerable wind energy potential with developments in recent years.

Figure 24 Poland - Mid-term potentials for RES



Main supporting policies

Although targets set for the development of renewable energy sources are ambitious, Poland is not on the way to meet them, as neither the existing obligation mechanism nor the current proposal for a Renewable Energy Act seems effective in promoting new projects. There is a need to strengthen the existing Quota Obligation System by defining penalties and by introducing a Green Certificates System, and to create a dedicated renewable energy fund. The regulations concerning connection to the grid should also be urgently reviewed. Finally, to facilitate the siting renewable energy projects, there is a need to develop planning guidance at national and regionale level and reserve land for renewable energy projects in local and regional spatial planning documents. There are environmental funds on all levels of administration supporting development of RES with grants or soft loans as well as an organisation called ECOFUND that support environmental protection projects, including RES. In addition, low interest credits are available from banks when the money is used for environmental projects.

F.4 Case Study Utilization of biomass from municipal green areas for heating purposes

Biomass is not only beginning to play an important role in fulfilling Poland's energy needs, but will continue to do so easily until 2020.

The areas in which there appears to be the most development in recent years has been energy generation from fuelwood, forestry residues, agricultural residues and surpluses. These have taken the form of individual and industrial heating plants, district heating and even CHP plants, in where biomass is replacing or reducing the use of coal. Considering the age and the decreased efficiency of many of the existing plants due to age or lack of maintenance, rehabilitation and conversion to a biomass boiler may be a possible alternative.

In addition, bio-fuels (i.e. bio-ethanol, bio-diesel) is also an area that appears to be developing, especially for the agriculture community. It has been a political priority of the Polish government to develop the use of bio-fuels. In 2001, approximately 209 tons of bio-fuel was utilized for heating.

The biomass sector is maturing quite rapidly with many local private sector organizations such as FUWI Elbag, ZAR, Energoinvest, Uniwex-AJ, ABM-Solid, and Skanska-Budexpol, supplying a variety of biomass boilers and turn-key installations. In addition the Polish Biomass Association (POLBIOM) has been actively performing research about the feasibility of such projects as well as new possible uses for biomass. However, most notable in the field of RES for Poland is the EC Baltic Renewable Energy Center, which has performed extensive research on the topic.

The replacement of two old coal-fired boilers with a high efficient bioiler burning wood chips obtained as waste from the management of the city green areas started in 1998 in Poland. The project comprised a pilot project under the Joint Implementation mechanism of Kyoto. It was a cooperation project between the Dutch Government (main financing body) and the Polish Government. Actors involved were:

- Biomass Technology Group BV (BTG) from the Netherlands (coordinator).
- KARA Energy Systems from the Netherlands (boiler supplier).
- EC Baltic Renewable Energy Centre/Instsitue for Building Mechanization and Electrification of Agriculture (EC BREC/IBMER) from Poland (local coordination).
- Municipal Company of Communal Management of Jelenia Gora (partner and local investor).

The project was commissioned in 2000. Since then monitoring for JI purposed has been continued.

It was estimated that within the direct neighbourhood of Jelenia Gora the potential of waste wood from green areas maintenance to be utilized for energy purposes is a 700 m^3. The entire technical potential is 2,540- m^3. This provides a possibility for energy production in the boilers of 350 and 1,250 kW respectively.

The objective was to replace two coal-fired oilers with a capacity of 256 kW each and efficiencies below 50%. These were operated by the Municpal Waste Disposal Company and located at a local complex of greenhouses, operated by this company. The investment was realized within the frameworks of Joint Implementation (JI) where The Netherlands was donor country.
The projected resulted in the installation of a automatic wood chips fired boiler of 350 kW.
Total investment costs amounted up to € 220,000 and 220 tonnes of coal were saved.
The project also resulted in abandonment of the storage of 385 tones of waste wood at the landfill, thus reducing greenhouse gases emission from the decay of organic material.

There is an estimated carbon dioxide reduction in 15 years of 21 thousand tones of CO_2 equivalent.

G Czech Republic

Key factors

- The significant excess of generated electricity is a major barrier for renewable electricity development for at least another decade.
- The Czech Republic as many other central European countries has a good supply of cheap coal and lignite based energy.
- In 2001 biofuels already amounted up to 1,3% of all automotive fuels.
- The existing supporting mechanism of feed-in tariffs introduced in 2002, will be changed in the near future to a mixed system of quota and feed-in tariffs.

G.1 Overall energy situation

Figure 25 Czech Republic – shares of TPES 2001

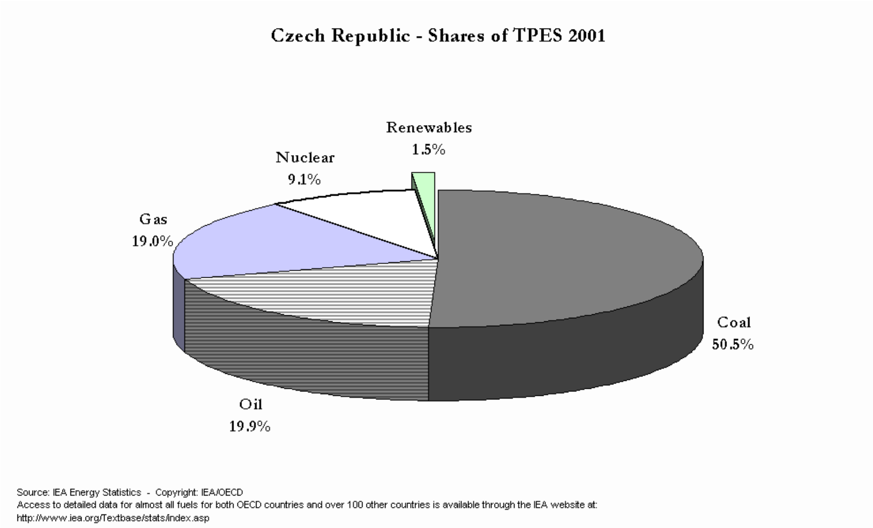
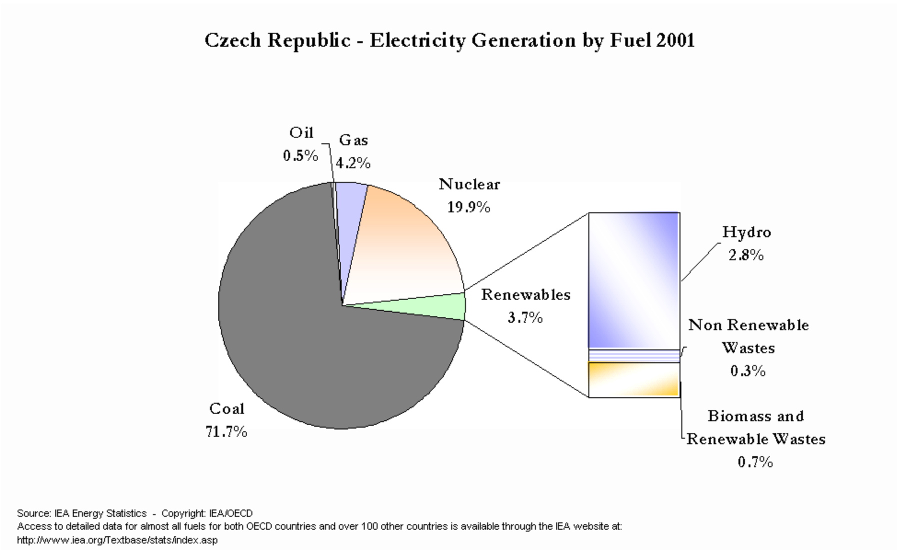


Figure 26 Czech Republic – electricity generation by fuel 2001



G.2 Climate Change Policies

Greenhouse gas emissions targets and achievements

Base year	1990
Target set for 2010 (%)	-8
Greenhouse gas emissions in base year (Mt CO_2 eq.)	192.1
Greenhouse gas emissions in 2001 (Mt CO_2 eq.)	148
Change so far (%)	-23

Projections CO_2 emissions

Base year CO_2 emissions (Mt):	164
Projection 2010 with measures (Mt):	125.9
Projection 2010 with additional measures (Mt):	107.1

National Allocation Plan

Total number of installations	
Total cap until 2007 (Mt/a)	
% NAP for new entrants	
Approval date	n.a.
Link	

G.3 RES Policies

Current penetration of RES

The share of renewables in electricity supply is 3.9%. Hydropower and biomass are for the moment the only two renewables contributing to RES electricity. Wind energy potential is for the moment nearly unexploited (around 8 MW currently installed). The utilisation of photovoltaic systems is also very limited.
In 1999 about 1.6 million tons of dry biomass were used for energy purposes. Other renewable resources of thermal energy were much less significant. The total production of heat from biomass grew from 358 Mtoe in 1997 to 432 Mtoe in 2001. Energy recovery of biogas exploitations has started in the recent years. Even though this shows a great shift in a five-year period, it is only 10% of the real potential of biomass. Geothermal heat is utilised for domestic and swimming pool heating as well as for some small industries. Moreover about 380 geothermal heat pumps have been installed until 2002. In 2002 there were 100,000 m^2 of solar collectors in operation.

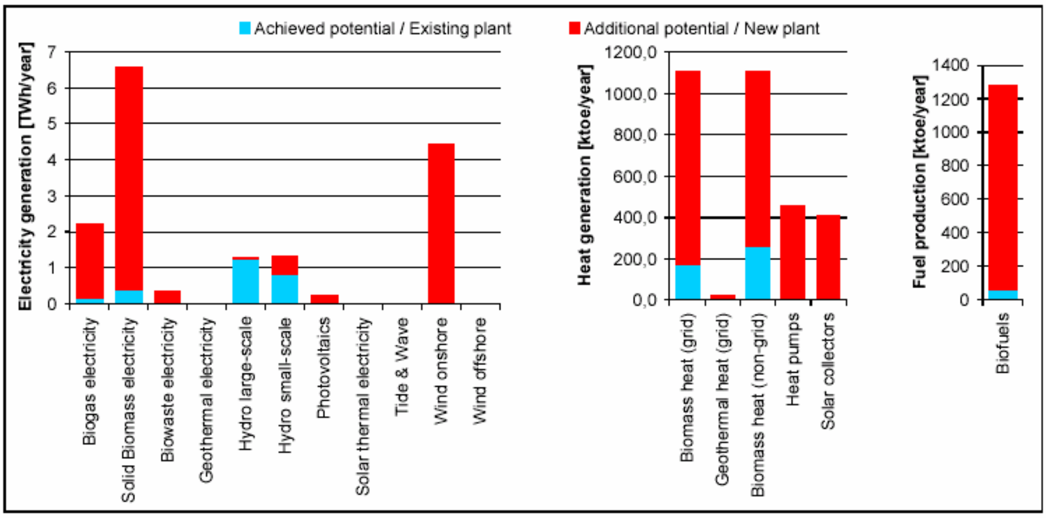
Background

The Czech Republic as many other central European countries has a good supply of cheap coal and lignite based energy. However there have been serious efforts made to increase the share of renewable with own windmill design, numerous solar thermal installations, biomass and an extended system of small hydro.

RES target
The RES-E target to be achieved in 2010 is 8% for the Czech Republic.

Status of the renewable energy market
There is a poor reputation of wind energy caused by premature sales of prototypes to clients. Biomass and hydro are far the most utilised renewables. Research work and studies have shown that biomass is the best exploitable renewable resource in the Czech Republic. Only one-tenth of the potential is currently being used. The production of MERO, the base component for producing 'biodiesel' makes up a large portion of the biomass utilization.
Although statistical data are insufficient and not complete, the low temperature heat market shows to be the most important market for biomass. About 2/3 of bioenergy are consumed by households for that purpose, the rest in industry. More than 1.2 million dwellings are heated by coal, coke and briquettes (as compared to only 49.000 heated with biomass). This offers a challenging possibility for introducing biomass into this market.
Another chance for biomass are the already existing district heating plants (about 50% of all houses are heated by district heat) mainly those fuelled with coal. Only about one third of them (based on the power installed) is equipped with cogeneration, leaving (theoretically) some 10.000 MW of district heat to be switched from coal to biomass.
Geothermal is mainly utilised for balneological and swimming purposes. The existing overcapacity on electricity production has historically hampered the development of renewables. A new Renewable Energy Act is being prepared and should enter into force the first half of 2004.
The Energy Regulatory Office role for setting prices is unclear. This has resulted in large market uncertainty and investors and financiers have consequently held back on new RES-E investments. The present structure of the power production system is a result of the abundant and cheap supply of coal and especially of lignite. In general there is a lack of capital.

Figure 27 Czech Republic - Mid-term potentials for RES



Main supporting policies

The main supporting policies in the Czech Republic are:

Minimum feed-in-tariffs annually adjusted. Minimum prices for 2003:

Wind onshore:	9.6 € ct/kWh
Geothermal:	9.6 € ct/kWh
Biomass and biogas:	8 € ct/kWh
Small Hydro:	5 € ct/kWh
PV:	19.2 € ct/kWh

Tax incentives:There is an exemption from property tax for five years for conversion of building heating systems from solid fuel to renewable energy. Also there is a tax relief up to five years (concerning income and property) for investment in renewable energy. The import duty on renewable-energy-equipment is reduced.

Low VAT rate (5% instead of 22%) for small facilities (hydropower: 0.1 MW, wind: 0.075 MW, all solar and biomass units).

Reduced VAT rate of 5% paid by final consumer of biomass fuel and heat. Exemption from excise duty for biodiesel fuel.

G.4 Case Study: Clean district heating in Jindrichuv Hradec

Jindrichuv Hradec is a small town near the border with Austria. The city has two major residential areaswith two separate district heating systems which have been built and expanded gradually since the 1970s.

Both systems are primarily based on steam, which is produced in two boiler houses, mainly heavy and light fuel oil supplemented partly by natural gas. Their combined heat supply amounts up to 200 TJ annually mainly for households (around 15.000 inhabitants) and in a smaller part to a number of other commercial and public institutions and buildings.

Due to their age, the heat distribution networks are nowadays very inefficient and distribution losses reach as much as 40% of heat plant output. Therefore, a plan for the reconstruction of both systems has been worked out.

The project comprised reconstruction of the primary distribution network from steam to hot water. Steam/hot-water heat exchange stations will be reconstructed to hot water or substituted to hot water or substituted by compact heat exchangers installed right in the consumers' houses.

Reconstruction will include replacement of an old boiler plant burning heavy oil with a new boiler house with a hot-water boiler burning biomass and complemented by a gas boiler for peeking. The biomass boiler will have the installed capacity of 6 MW and most of the fuel will be covered by wood waste from a local wood-processing facility (saw mill). In the other plant three new hot-water boilers burning natural gas with the total heat capacity of 30MWth will be installed instead of the existing steam-based ones.

A co-generation unit will be installed in the boiler house to cover its own demand for electricity. A solar heating system will be implemented for water heating in 2 swimming pools. The district heating system will then supply heat demands not covered by solar energy.

The measures in DH 1:

– Hot-water boiler house on biomass (6 MWth) with an auxiliary and stand-by gas fired unit of the same capacity.
– Reconstruction of the primary steam-based heating network to hot water.
– Reconstruction of 6 heat exchange stations.
– Installation of 49 in-house compact heat exchangers.

Measures in DH 2:

– Natural gas water boiler house of 30 (3 x 10) MWth.
– Installation of a co-generation unity with a capacity of 150 kWe.
– Installation of thermosolar panels with the area of 160 m^2.
– Reconstruction of the primary steam-based heating network to hot water with a total length of 5,049 m.
– Reconstruction of 9 heat exchange stations.
– Installation of 86 in-house compact heat exchangers.

Table 10 Project investment costs

DH System	Investment costs (thousand EURO)
DH 1	1421
Of which biomass boiler house	920
DH 2	1917
Total	3338

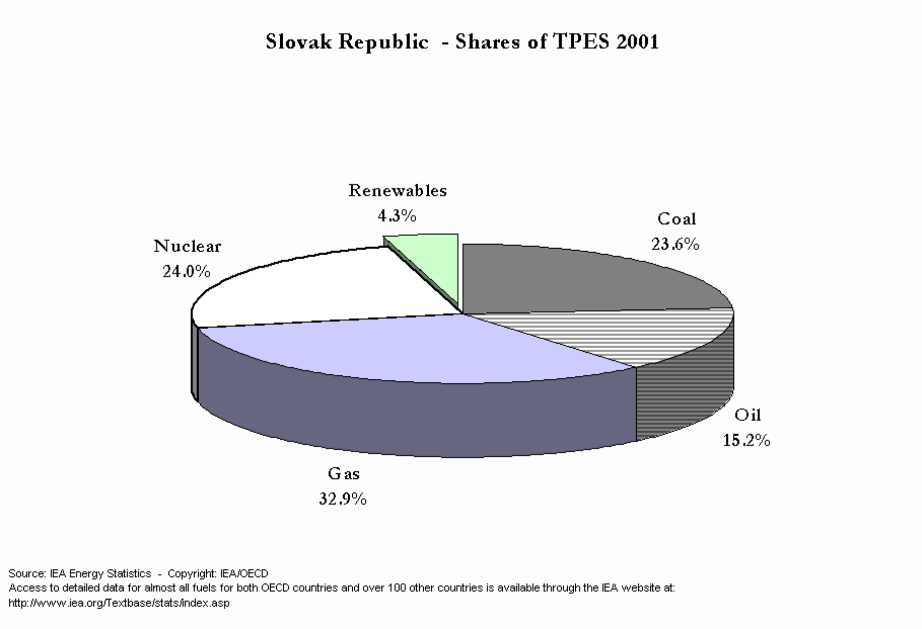
The emissions of sulphur dioxide, nitrogen oxides, and fly ash will decrease by as much as 86% and carbon dioxide emissions will decrease by more than 20%.
The 70% subsidy from PHARE CBC Programme allows a decrease in the current level of heat price from €13/GJ to €11.6/GJ, the internal rate of return of the remaining 30% investment is 12%.

H Slovakia

Key factors
– Low RES feed-in tariff of 3 €ct/kWh.
– Current low energy prices.
– An extended development of the hydro potential is going on.
– The government does not recognise opportunity in wind and solar.
– The government support only biomass investments in remote, mountainous, rural areas.

H.1 Overall energy situation

Figure 28 Slovakia - shares of TPES 2001



H.2 Climate Change Policies

Greenhouse gas emissions targets and achievements

Base year	1990
Target set for 2010 (%)	-8
Greenhouse gas emissions in base year (Mt CO_2 eq.)	72.2
Greenhouse gas emissions in 2001 (Mt CO_2 eq.)	50.1
Change so far (%)	-30.6

Projections CO_2 emissions

Base year CO_2 emissions (Mt):	57.2
Projection 2010 with measures (Mt):	
Projection 2010 with additional measures (Mt):	

National Allocation Plan

Total number of installations	209
Total cap until 2007 (Mt/a)	30,5
% NAP for new entrants	2
Approval date	20-10-2004
Link	http://www.enviro.gov.sk/minis/ovzdusie/narodny_alokacny_plan/nap_eng.doc

H.3 RES Policies

Current penetration of RES

The share of renewables in electricity supply is 20.2%. With the exception of the hydro power the share of the renewable energy sources did not grow significantly in the last decade in Slovakia. Only the hydroelectric capacity has grown significantly in the first half of the 1990s, due to the building of the Gabcikovo hydro power plant with a capacity of 720 MWe on the Danube. As of 1999, Slovakia had approximately 2,500 MWe of installed hydroelectric capacity. It is expected that 300 MWe of small hydro capacity may be needed from a large number of smaller facilities. There are currently approximately 180 small hydropower plants with the total installed capacity of more than 60 MW in operation in Slovakia. There are no large scale wind turbines up to now. There are installed 40 pairs of photovoltaic panels to 400 kV transmission line poles between Slovakia and Poland since 1998. Geothermal waters in the Slovak Republic are being utilised on 35 locations offering an aggregate heating capacity of 75 MW and generation of 0.05 Mtoe to heat structures, swimming pools, greenhouses (at the town of Galanta it heats 1,240 flats and a hospital). In present, biomass provides only 0.2 % (0.1 Mtoe) of energy, although biomass represents the largest potential of renewable energy of Slovakia.

Background

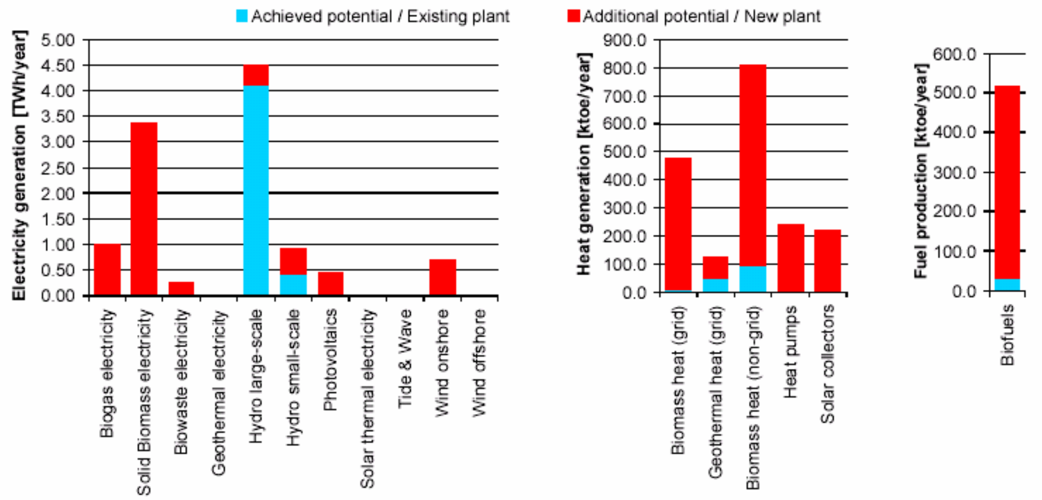
RES target

The RES-E target to be achieved in 2010 is 31% for Slovakia.

Status of the renewable energy market

There is no specific support for wind and solar energy. A very small portion of the biomass potential is used and the government's priority is to use this source only in remote, mountainous, rural areas, where natural gas is not available. For small hydro there is an extended development programme with 250 selected sites for building small-hydro. Geothermal is extendedly used for bathing purposes.

Figure 29 Slovakia - Mid-term potentials for RES



Main supporting policies

Since April 2003, a new support scheme has been introduced whereby construction or reconstruction of renewable energy projects is eligible for support up to € 100.000. The amount of support depends on the site where the renewable energy facility is placed. Projects in regions with the lower GDP per capita receive higher support. This programme could be quite attractive for renewable energy operators but it is not clear what is the total budget allocated. The feed-in tariffs set by the distributing companies are at the level of 3 €ct/kWh.

Case Study: Wood chips fired heating plant

Main sources of biomass within Slovakia are:

- Industrial wood residues in the north and central part.
- Forestry wood residues in the north and central part.
- Straw and other agricultural residues in south-west and east.
- Rapeseed (for liquid bio-fuels).
- Wet biomass like animal manure and sewage sludge (for biogas production).

A clear market for bio-energy is still lacking the Slovak Republic. However, biomass energy will become increasingly competitive in the coming years, prices for natural gas and electricity will rise to international market levels. Moreover, fossil fuels, especially brown coal, will be significantly charged with environmental taxes.

Central Slovakia is a highly forested region with about 45% of its area covered by forests. Wood exploitation is well developed: many forestry and wood processing companies are represented in the region. The massive introduction of cheap brown coal hampered the utilization of wood residues for energy purposes for a long period. Currently there is a growing interest in the use of wood and other biomass residues in the region.

A project was initiated by the Dutch company BTG Biomass Technology Group and the Technical University in Zvolen. In the Zvolen region, 55 private wood companies are listed.

A boiler was installed at the School Forest Enterprise (SFE) Technical University in Zvolen. Total investment costs are about € 450,000. The boiler has a capacity of 605 kWth and is fired by clean wood residues from sawmills owned by the SFE. The special furnace design ensures that woody biofuel burns in an environmentally sound way.

The biofuel-fired boiler replaced three old brown-coal fired boilers with low efficiency.

I Hungary

Key Factors
– Hungary is highly dependent on energy imports (70%).
– Emission reductions obtained so far (-18%) are higher than reduction target (-6%).
– RES penetration in Hungary so far is small (0,9%).
– There is no coordinated national action for RES penetration. There is an insufficient investment climate, although various funds are available.

I.1 Overall Energy Situation

Figure 30 Hungary – shares of TPES 2001

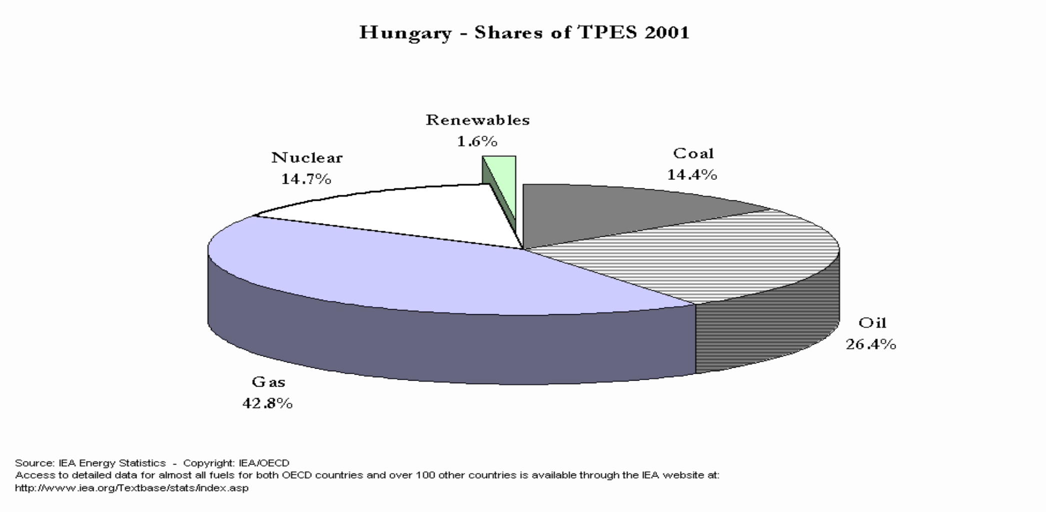
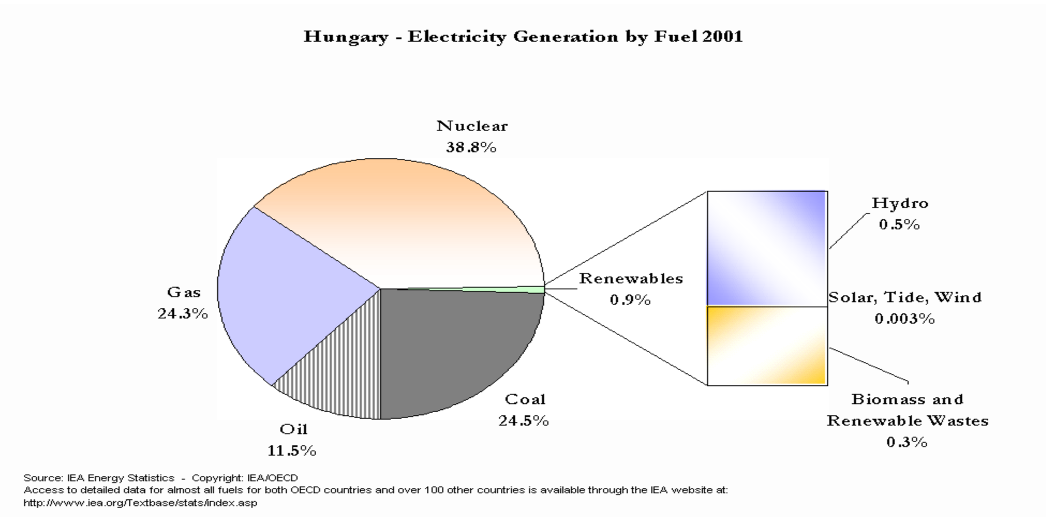


Figure 31 Hungary – electricity generation by fuel 2001



I.2 Climate Change Policies

Base year	1986
Target set for 2010 (%)	-6%
Greenhouse gas emissions in base year (Mt CO_2 eq.)	103
Greenhouse gas emissions in 2001 (Mt CO_2 eq.)	84
Change so far (%)	-18%

Projections CO_2 emissions

Base year CO_2 emissions (Mt):	83.7
Projection 2010 with measures (Mt):	n.a.
Projection 2010 with additional measures (Mt):	n.a.

National Allocation Plan

Total number of installations	300
Total cap until 2007 (Mt/a)	89.7
Approval date	Not yet approved
Link	http://www.kvvm.hu/szakmai/klima/EUETS.htm

I.3 RES Policies

Current Penetration of RES

The penetration of the renewable energy sources in the Hungarian primary energy production is relatively small, 3.6 per cent. The share of RES in electricity production is even lower, 0.6 per cent. However due to the building of large hydropower plants in the 1970s on the Tisza river and several small hydro power plants (built in 1930-60) the hydropower has a notable share among the renewable sources. The capacity of the three largest hydropower plants is 43.8 MWe. They provide about 200 GWh of electricity annually. The installed hydro power capacity has been not increased in the last 30 years and further penetration of the hydropower - excluding the refurbishment of the old plants - is unlikely as it faces opposition. Photovoltaic applications have been implemented on an experimental basis in the telecommunications and other sectors, but this technology has not yet reached wide scale of commercialization in Hungary. Wind energy has for the moment a symbolic representation (2 MW).

Biomass accounts for the largest share of Hungary's renewable energy consumption. Currently fuel wood combustion is the primary use of biomass. Forestry wastes and sawmill by-products are currently burnt in furnaces to provide heat for the forestry industry or briquetted for retail sale. Nearly 40 percent of the round wood production is used for energy purposes. Consumption of biomass heat in 2001 amounted to 302 Mtoe mainly based in solid biomass uses. One of the largest exploited renewable energy resources in Hungary is geothermal energy with approximately 350 MW of installed capacity for heat generation. The geothermal energy and thermal water is used mainly for balneological purposes and for heating of the bath facilities. In the last 10 years there were several projects completed in the south-eastern part of Hungary for district heating and greenhouse heating. The penetration of heat pumps is proceeding only slowly - however there are several residential and office buildings heated with this technology - because of the high investment costs and that it is relatively unknown. Limited use of solar energy for water and space heating has been observed, based on flat plat collectors.

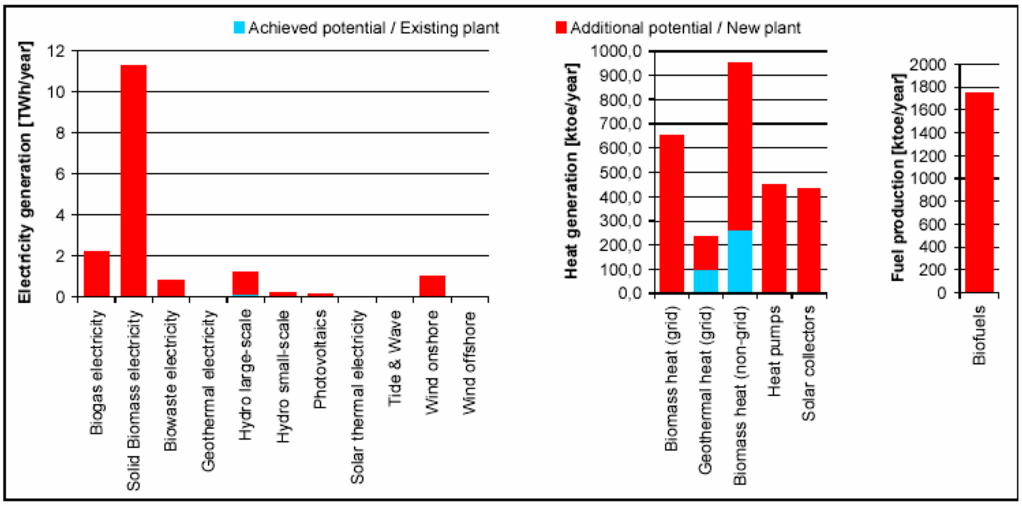
A National Biodiesel Programme has been launched some years ago with some pilot factories started but due to discontinuous support, the programme has not given any important results.

Background
Hungary is net importer of energy. 70% of the total energy demand of Hungary is covered by import. The energy policy does not include significant actions towards renewable energy sources.

RES targets
The RES-E target to be achieved in 2010 is 3.6% for Hungary.

Status of the renewable energy market
There would be good opportunities for biomass, solar, geothermal and some wind energy development, although the investment climate was not favourable until now and only very few investment has taken place with different multilateral funding. Mid term potentials are given below.

Figure 32 Hungary – Mid-term potentials for RES



Main supporting policies
Ministerial Decree 56/2002: Guaranteed feed in tariff (on indefinite term), beginning in January 2003, all energy generated from renewable energy resources must be purchased between 6 and 6,8 € cents/kWh, not technology specific.

I.4 Case Study: Geothermal heat in Hungary

Hungary has the most significant reserve of geothermal heat among Eastern Europan countries. The terrestrial heat in the country is an average 90-100 mW/m^2, which is the double or triple the continental average (Reiche, 2003). The temperature of the water stratum at 2,400 m depth is 110-130 degrees Celcius, the geological resource is estimated to be 2,500 km^2.

The current utilisation of geothermal heat is mainly the direct extensive exploitation of thermal water. In 2002 there were 835 thermal wells in operation with an output of 100 million m^3, which is 270,000 toe. Applications are balneology, agriculture (heating in horticulture and livestock husbandry) and district heating.

Figure 33 Hungary

In the mid-1990's, the Hungarian Oil and Gas Company (MOL) began a programme to promote the development of geothermal energy. Three pilot projects have been studied, two of which involve cascaded use of geothermal heat for electricity production and subsequent direct applications (www.worldenergy.org).

In total 0,26 PJ of geothermal heat are used at present, whereas the potential of geothermal heat in Hungary is 63 PJ per year (Reiche, 2003). The enthalpy of the geothermal heat is generally too low for electricity generation, but there are some exceptions. At Fábiánsebestyén there is a projected 65 MW capacity geothermal power plant with re-injection technology.

However, so far investments in geothermal heat are low, as governmental support nor general investment climate are very favourable (EC, 2004).

J Slovenia

Key factors

- Hydropower supplies about one-third of Slovenia's electricity generating capacity. However, many of the smaller hydro plants are very old (pre-World War II) and will need to be refurbished to remain operational.
- Small hydropower has been supported by feed-in tariffs since the mid-80's.
- The 2010 RES-E target (33,6%) is not ambitious related to the achievement of 30,4% in 2002.

J.1 Overall energy situation

Figure 34 Slovenia – shares of TPES 2001

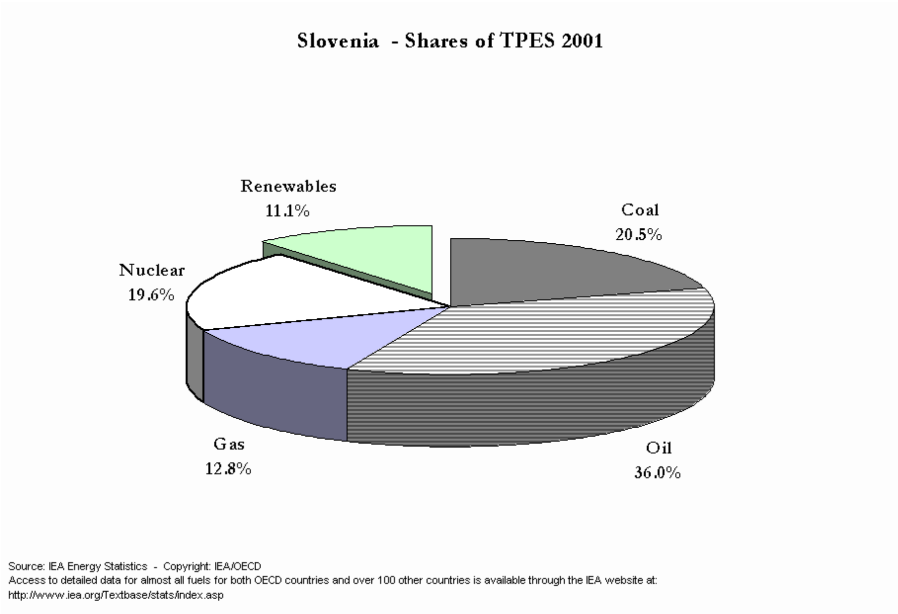
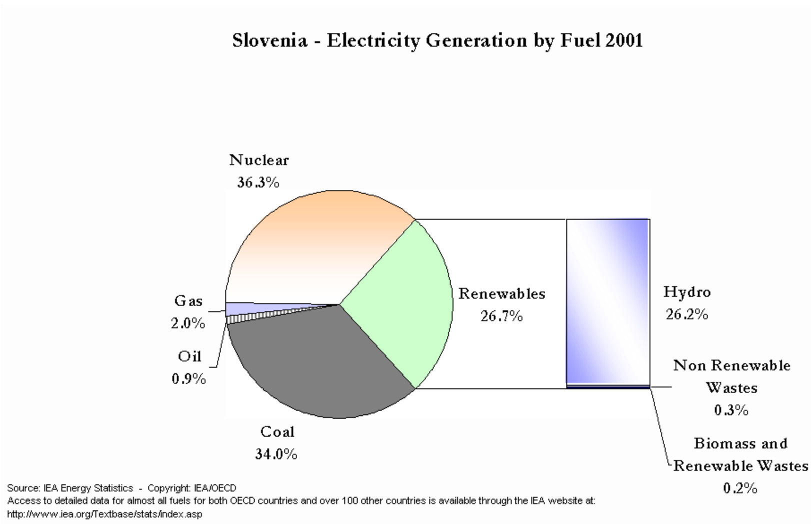


Figure 35 Slovenia – electricity generation by fuel 2001



J.2 Climate Change Policies

Greenhouse gas emissions targets and achievements

Base year	1990
Target set for 2010 (%)	-8
Greenhouse gas emissions in base year (Mt CO_2 eq.)	72.2
Greenhouse gas emissions in 2001 (Mt CO_2 eq.)	50.1
Change so far (%)	-30.6

Projections CO_2 emissions

Base year CO_2 emissions (Mt):	57.2
Projection 2010 with measures (Mt):	
Projection 2010 with additional measures (Mt):	

National Allocation Plan

Total number of installations	209
Total cap until 2007 (Mt/a)	30.5
% NAP for new entrants	2
Approval date	20-10-2004
Link	http://www.enviro.gov.sk/minis/ovzdusie/narodny_alokacny_plan/nap_eng.doc

J.3 RES Policies

Current penetration of RES

The share of renewable energies in Slovenia's energy sector is constant since the beginning of the '90ies and is around 30%. The mostly utilised renewable energy source in Slovenia is hydro-power. The share of hydropower in renewables for electricity production is almost 99%, the remaining 1% is from biomass (mostly CJP based on wood, landfill gas and water treatment gas).
It supplies about one-third of Slovenia's electricity generation (3300 GWh/year). Besides the larger hydroelectric generating units, there are approximately 40 very small hydro units with less than 500 GWh/year electricity generated. There are no wind power plants installed in Slovenia. The photovoltaic peak power installed is very low - about 100 kWp. Photovoltaic applications have been implemented on an experimental basis in the telecommunications and other sectors. Biomass has a minimal penetration in electricity production. Biomass, solar and geothermal installations have just a minimal share in the heat production. Wood is an important fuel for space heating, particularly in the residential sector. Forest residues supply about 359 MWth. The existing capacity of geothermal resources in Slovenia amount to about 103 MW of heat plant providing heat to health spas, agriculture and institutions.

Background

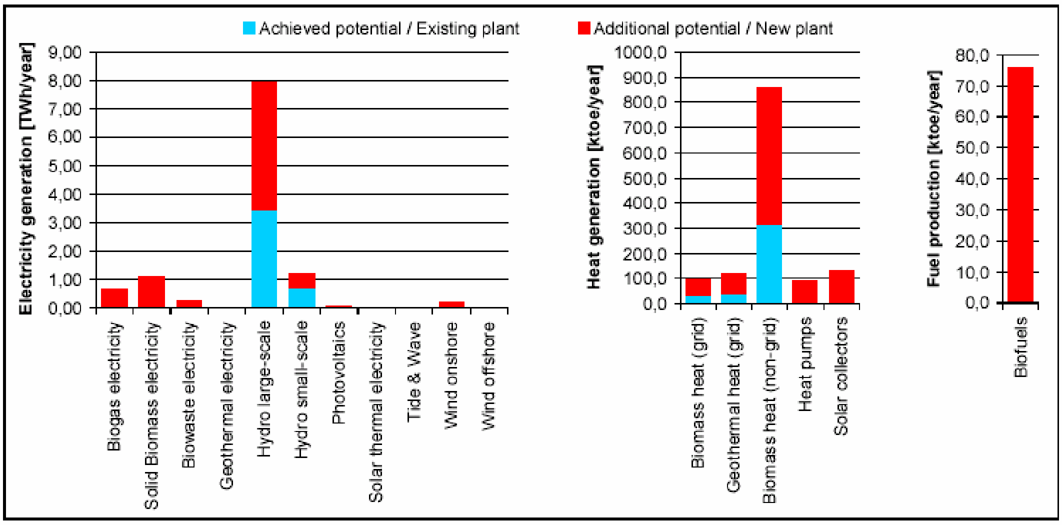
Slovenia has few resources of oil and gas. Imports of these fuels make up over half of the total primary energy supply. There are brown coal resources in the

country, which account for 95% of coal consumption. Coal is of major importance for Slovenia for both heating and electricity generation. Slovenia is moving towards the use of gas. The gas distribution system is expanding rapidly, and Slovenia is in a good position to benefit from being a transit country for various gas pipe lines.
The new Energy Act substituting the Act on Energy Economy from 1986 was promulgated in September1999. It gives priority to efficient use of energy and renewable energy sources over supplying from non- renewable sources. According to the law, a national energy programme shall be drawn up every five years. The programme shall promote investing into renewable energy sources and efficient use of energy. Hydropower supplies about one-third of Slovenia's electricity generating capacity. However, many of the smaller hydro plants are very old (pre-World War II) and will need to be refurbished to remain operational. The supporting policy through feed-in tariffs is hampered by the required approval of about 15 separate authorities to authorise the operation of renewable energy production facilities.

RES target
The RES-E target to be achieved in 2010 is 33.6% for Slovenia.

Status of the renewable energy market
Renovation of hydropower plants will increase the efficiency of these units, and could add as much as 150 MWe in generating capacity. Refurbishment of existing small scale hydropower as well as increasing the capacity of the large-scale units is part of the Government's renewable energy strategy.

Figure 36 Slovenia – Mid-term potentials for RES



Main supporting policies

Feed-in tariff:

Hydro up to 1 MW: 6.11 €c/kWh; Hydro 1 to 10 MW: 5.89 €c/kWh Biomass up to 1 MW: 6.98 €c/kWh; Biomass above 1MW: 6.76 €c/kWh Wind up to 1 MW: 6.33 €c/kWh; Wind above 1 MW: 6.11 €c/kWh Geothermal: 6.11 €c/kWh

Solar up to 36 kW: 27.85 €c/kWh; Solar above 36 kW: 6.11 €c/kWh

CO_2 tax introduced in 1996 amounts to 15 €/t CO_2.

A feed-in tariff system is the main policy instrument for the support of electricity production from renewables. All small power plants (up to 10 MW0 have been supported by feed-in tariffs since the mid-80's, from early 2002 a new system of feed-in tariffs has been in operation based on priority dispatch of qualified production. Network operations are obliged to conclude long-term feed-in contracts with renewable power producers also called qualified producers (QPs). The main obstacle for the flow of investments to the renewables sector is the unclear and complex administrative procedure for getting the status of Qualified Producers, a precondition for eligibility to the feed-in system. Approval of about 15 separate authorities is required.

Case study: Building a small hydro power installation in Slovenia, Mozirje

In 2000 the hydropower capacity was about 764 MW for large hydroelectric (> 10 MW) and 61 MW for small hydroelectric. The main source of hydroelectric power is the Drava River. There are eight large hydroelectric plants totaling a power capacity of about 600 MWe, other important rivers are the Soca and the Sava. Besides these larger electric generating units, there are approximately 40 very small units along the Sava and Soca rivers.

Renovation of the small units will increase the efficiency and could add as much as 150 MWe in generating capacity. Refurbishment of existing small scale hydropower, as well as increasing the capacity of the large-scale units, are part of the Government's renewable energy strategy. The Slovene Government would also like to develop another five hydro sites alng the Sava River, which could add about another 200 MWe of new hydro capacity to the system by 2010.

The potential of hydro power in Slovenia amounts up to 2000 MWe, of which 250 MWe is the potential for small hydro power.

The renovation of a badly damaged dam provided the opportunity to install a small hydro power station. A study proved that in this way the small wood company could be supplied with electricity and water. The installed capacity was about 468 kWe and this would produce about 2.4 GWh yearly. The flow was about 13 m^3/s. The project was mainly financed through the feed-in tariff. There was a small additional governmental subsidy of € 30,000, about 2% of the total investment of about 1,6 Million Euro.

The environmental impact is minimal.

K Malta

Key factors
– Energy utilisation in Malta is characterised by a total dependence on imported petroleum products and fossil fuels, low efficiency utilisation and no penetration of alternative sources. – Malta (like Cyprus) is individually not an Annex 1 party to the Kyoto Protocol with quantified emission limitation commitments. It has a formal status of 'developing country'. Malta is as a Member State of the EU bound by the obligations set out in European legislation. – Malta cannot (being an Annex 1 party) participate in JI projects but only in CDM projects. The complexity of CDM and Malta's limited energy consumption indicates that this approach is unlikely to be viable at the present time.

K.1 Overall energy situation

Figure 37 Malta – shares of TPES 2001

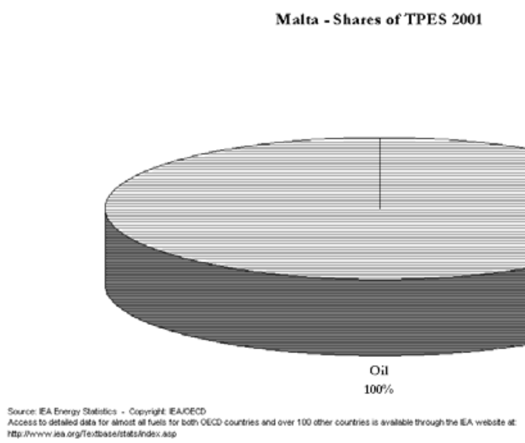
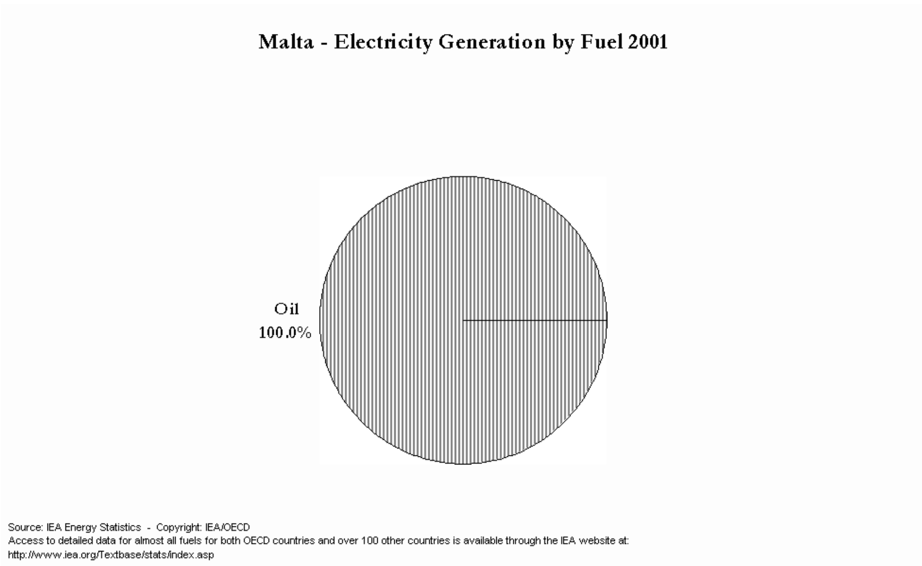


Figure 38 Malta – electricity generation by fuel 2001



K.2 Climate Change Policies

Greenhouse gas emissions targets and achievements

Base year	1990
Target set for 2010 (%)	No target
Greenhouse gas emissions in base year (Mt CO_2 eq.)	22.2
Greenhouse gas emissions in 2001 (Mt CO_2 eq.)	28.5
Change so far (%)	28.4

Projections CO_2 emissions

Base year CO_2 emissions (Mt):	
Projection 2010 with measures (Mt):	
Projection 2010 with additional measures (Mt):	

National Allocation Plan

Total number of installations	2
Total cap until 2007 (Mt/a)	2.9
% NAP for new entrants	25
Approval date	n.a.
Link	http://europa.eu.int/comm/environment/climat/pdf/malta.pdf

K.3 RES Policies

Current penetration of RES

The penetration of the renewable energies in Malta is practically zero. Photovoltaic applications in Malta that were so far restricted to research and demonstration systems will soon be available for everyone to install, according to the regulations to be set by the Malta Resources Authority.

Background

Malta currently has virtually no renewable energy. The electiricity generation takes place at two power stations (Marsa and Delimara). The total intstalled generating capacity is 582 MW, of which 272 MW are at Marsa Power Station and 304 MW are at Delimara Power Station. The electricity generation plant is based on steam power plant using heavy fuel oil and gas turbines using gas-oil. During 1999/2000 1,901,562 MWh were generated and heavy fuel oil consumption was 467,772 Mtons while gas oil consumption was 69,020 Mtons.

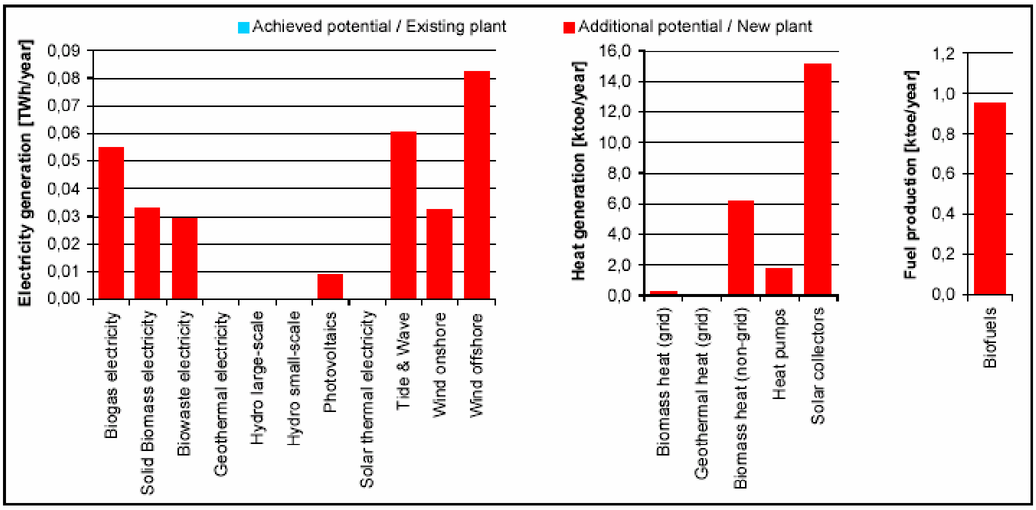
RES target

The RES-E target to be achieved in 2010 is 5% for Malta.

Status of the renewable energy market

No commercial utilisation of renewable energy. The Institute of Energy Technology and others have undertaken pilot projects and studies to assess the potential and applicability of renewable sources, mainly wind and solar power.

Figure 39 Malta – Mid-term potentials for RES



Main supporting policies

A strategy is now being formulated on a strategy for renewable energy for Malta. The first step has been taken by publication of the Consultation Paper on the Development of a strategy for the exploitation of renewable energy sources for electricity generation in April 2002. In this document it is concluded that the most obvious sources for Malta are wind and sun.

Formal legislation has come into force on April 30th 2004. This Malta Resources Authority Act on Promotion of electricity produced from renewable energy sources regulations. The purpose of these regulations is to promote the contribution of renewable energy sources to electricity production in Malta and to create a basis for future development thereof. Part of it is a report submitted by the competent authority (Malta Resources Authority, MRA) to the Minister identifying national indicative targets for future consumption of electricity produced from renewable energy sources. The report may also propose measures to be taken to achieve these national indicative targets. First report is due 27 June 2005. The national indicative target shall be 5% electricity produced from renewable energy sources by 2010.

Current supporting mechanism constitutes 5% VAT (instead of 15%) on solar applications.

Case study: Photovoltaics

Research has taken place on both options and activities in the past have mostly been around the application of photovoltaics.

Research and application of photovoltaic systems in Malta started in 1992. Research has taken place at the Institute for Energy Technology, being part of the University of Malta. Research on PV started in July 1993 with the testing of a 1.2 kWp stand-alone PV system with battery storage, used for lighting purposes.

Since the utility's electric network covers almost every corner of Malta, the Institute also tested a 1.8 kWp grid-connected PV system.

The first residential 1.5 kWp system was installed in May 2002 at Madliena.

The first industrial 3 kW PV system was installed at Baxter Ltd, in August 2002. Performance on all systems have been monitored by the Institute of Energy Technology.

Apart from the Institute, activities are being stimulated through the Malta Resources Authority and Enemalta Corporation.

L Cyprus

Key Factors
– Cyprus is virtually totally dependent on imported fossil fuels;
– No emission reduction targets have been set, however Cyprus has prepared a National Allocation Plan;
– Solar collectors are the only substantially developed RES in Cyprus, although there is a potential for other sources as well;
– A RES target of 6% has been set.

L.1 Overall Energy Situation

Figure 40 Cyprus – shares of TPES 2001

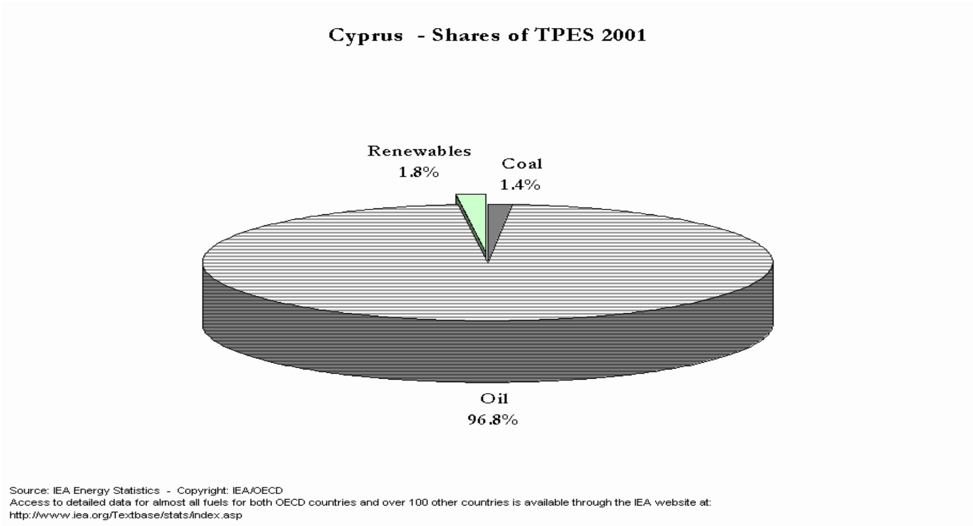
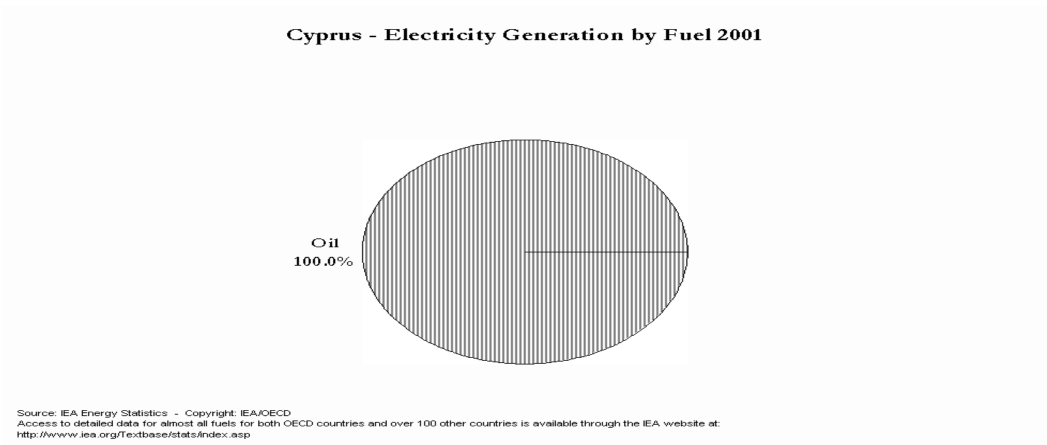


Figure 41 Cyprus – electricity generation by fuel 2001



L.2 Climate Change Policies

Base year	n.a.
Target set for 2010 (%)	n.a.
Greenhouse gas emissions in base year (Mt CO_2 eq.)	n.a.
Greenhouse gas emissions in 2001 (Mt CO_2 eq.)	n.a.
Change so far (%)	n.a.

Projections CO_2 emissions

Base year CO_2 emissions (Mt):	n.a.
Projection 2010 with measures (Mt):	n.a.
Projection 2010 with additional measures (Mt):	n.a.

National Allocation Plan

Total number of installations	15
Total cap until 2007 (Mt/a)	1
Approval date	Not yet approved
Link	http://europa.eu.int/comm/environment/climat/pdf/cyprus.pdf

L.3 RES Policies

Current Penetration of RES

Virtually all electricity in Cyprus (around 97%) is produced with imported oil and diesel. There is very small amount of electricity from renewable energy, either solar, small-hydro or biomass. Wind is not used up to now for electricity generation.

However, the total energy consumption is slightly different. 3.6% energy is provided by solar thermal. At the moment 92% of all houses and 50% of the hotels have installed solar water heaters. Cyprus has more solar collectors per capita installed than any other country in the world.

There is no biofuel production in Cyprus.

Background

Cyprus is almost totally dependent on oil imports for its energy supply accounting almost all primary energy supply. The burden of cost of energy imports on the economy of Cyprus is considerable.

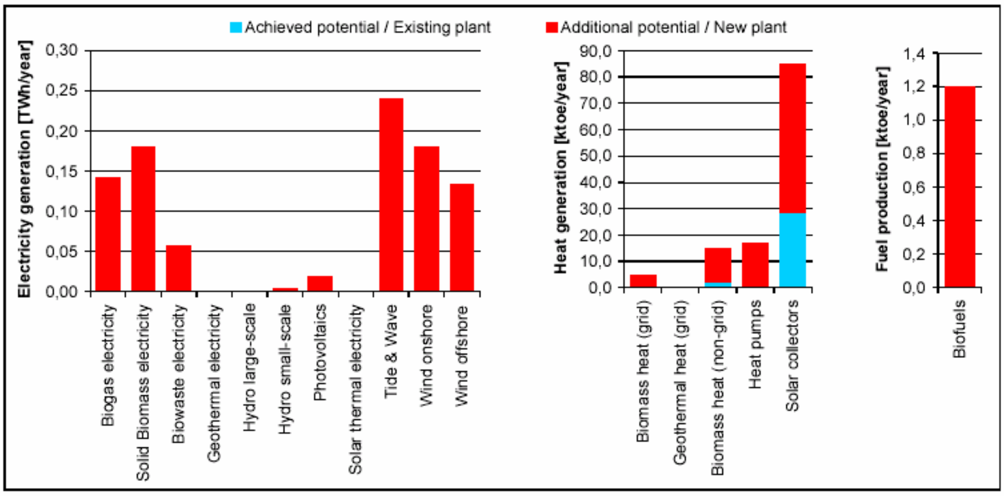
RES targets

The RES-E target to be achieved in 2010 is 6% for Cyprus.

Status of the renewable energy market

Cyprus plans full liberalisation of the electricity market to achieve until 2005. There is no electricity import or export. Almost all energy is produced from imported oil and diesel. The Electricity Authority of Cyprus (EAC) plans to invest in a new fossil fuel power plant, which would lead to an excess capacity for the next few years, being a major barrier for renewable development. Solar thermal energy is the major available renewable energy in Cyprus, and it is traditionally used by hotels and households for thermal purposes. The Government has recently adopted the 'New Grant Scheme For Energy Conservation and the Promotion of the Utilization of Renewable Energy Sources' effective from 2003 to 2007. Main mid-term potentials are given below. Solar collectors so far are the main RES.

Figure 42 Cyprus – Mid-term potentials for RES



Main supporting policies

The 'New Grant Scheme For Energy Conservation and the Promotion of the Utilization of Renewable Energy Sources' provides financial incentives in the form of governmental grants (30-40% of investments) for investments in wind energy systems, solar thermal, PV, biomass, landfill and sewage waste using RES. There is a fixed purchase price for RES by EAC which is 6.3 € cents/kWh (3.7 cyp. cent/kWh). In addition to that EAC pays a special premium depending on the technology used from a Special Fund, financed by a levy on electricity consumption. The feed-in tariffs are as follows:

Wind: first five years: 9.2 €ct/kWh (5.4 cyp. cent), for the next 10 years: 4,8 €ct /kWh to 9.2 €cents/kWh (2.8 to 5.4 cyp. cent/kWh) according to the mean annual wind speed. Biomass, landfill and sewage: 6,3 € cents/kWh (3.7 cyp. cent/kWh)

PV up to 5 kW: 20.4 €ct/kWh (12 cyp. cent/kWh).

L.4 Case Study: Solar Collectors in Cyprus

At the moment, around 92% of all houses in Cyprus and 50% of hotels have installed solar water heaters, an estimated total of 190,000 units which produce 336,000 MWh of solar thermal energy per year (Applied Energy Centre 2000 cited in Reiche, 2003). This energy is used for the production of hot water.

Solar water heaters are particularly attractive for hotels because their consumption peaks in the summer correspond to the time when solar collectors achieve their maximum energy output. Cyprus has more solar collectors per capita installed than any other country in the world.

Figure 43 Cyprus

Solar water heaters were first produced in about 1960. Their progress in the first six years was rather slow. This is attributed to the rather faulty design (leakages, low efficiency, etc.) and to their rather high cost. With further developments in the construction of collectors (so that most technical problems were eliminated), and with the rationalization of production (so that costs if not decreasing at least remained constant), more and more units were installed. The results of these efforts were that by mid-1974 about 24,000 units of a total glazed solar collector area of 72,000 square metres were in operation. This figure means that roughly 20% of the population covered their hot water needs through the use of solar water heaters; the solar energy utilized at that time represented about 1% of the total energy requirements of Cyprus (www.solar.demokritos.gr/market/cyprus.doc).

At present, there are about ten major and twenty minor manufacturers of solar water heaters in Cyprus, employing a total of about 300 employees and producing about 10,000 units per year, compared to 4,000 units per year prior to 1974. The water heaters are used in houses, hotels and clinics. Exports are occasional and in very small numbers. They are estimated to be, on the average, 200 systems per year (600 m^2/year). Imports are made mainly from Greece, Israel and Australia, and amount to about 700 systems per year (2,000 square metres solar collector area per year).

Main obstacle to further RES development according to [Reiche, 2003] has been the previously limited support from Government. New power plants to be built and plans to construct underwater electricity cables to the island are likely to lead to overcapacity in the future. However, now grants and fixed purchase prices are provided, which might stimulate further development.

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