

Renewable Energy Action Plan

Policy Action Plan for Promotion of
Renewable Energy
in the Czech Republic to 2010

August 1999

Prepared for the World Bank, the Ministry of Industry and Trade, and
the Ministry of Environment of the Czech Republic

SRC International CS s.r.o.
Netherlands Energy Research Foundation ECN
March Consulting s.r.o.
SEVEn
RAEN s.r.o.
DHV AIB
DHV CR s.r.o.
Foundation for Economic Research SEO

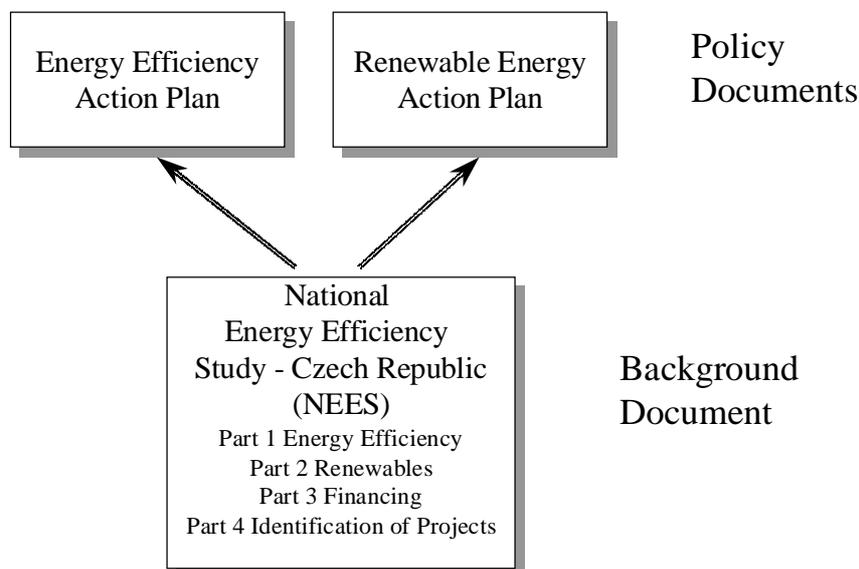
FOREWORD

Energy efficiency and renewable energy production contribute to the three major goals of the national energy policy of the Czech Republic: overall competitiveness, security of supply; and environmental protection. Therefore, the Czech government promotes these two sustainable options. The Energy Policy White Paper, which is being developed at the time of writing (June 1999), will provide the general framework for the future role of energy efficiency and renewable energy in the Czech Republic. However, in addition, it is necessary to develop specific policies.

The National Energy Efficiency Study aimed to support the Czech government in the formulation of energy efficiency and renewable energy policy. The Dutch government, the Czech Ministry of Industry and Trade, the Czech Ministry of Environment, and the World Bank supported the study. The project consortium consisted of the following Czech and Dutch institutes: SRC International CS s.r.o., March Consulting s.r.o., SEVEN, RAEN, Netherlands Energy Research Foundation ECN, DHV AIB and DHV Czech Republic, and the Foundation for Economic Research SEO of the University of Amsterdam. The project is carried out by the Netherlands Energy Research Foundation ECN under number 7.7209.

The National Energy Efficiency Study has resulted in the following documents:

1. The *Renewable Energy Action Plan* (this report) addresses renewable energy production. The *Energy Efficiency Action Plan* focuses on the promotion of energy efficiency in end-use (separate report; ECN-C--99-065). These two Action Plans provide policy makers in the Czech government with information on potentials, targets, budgets and recommended policy instruments. The core of the Action Plans is the list of concrete policy actions, ready for implementation.
2. The *National Energy Efficiency Study NEES* (separate report; ECN-C--99-063). This report is the background document to the two Action Plans. It contains detailed information on options and measures, potentials, barriers and policy instruments for energy efficiency and renewables. The main part is a detailed outline for a new energy efficiency and renewable policy. Also, it includes recommendations for financing schemes to overcome the investment constraints in the Czech Republic. Finally, a list of concrete projects is included to support project identification.



ABBREVIATIONS

AIJ / JI	Activities Implemented Jointly / Joint Implementation
CEA	Czech Energy Agency
EE	Energy Efficiency
EIA	Environmental Impact Assessment
EKIS	Energy Consulting and Information Centre of CEA
EMAS	Eco Management and Audit Scheme
EPC	Energy Performance Contracting
ESCO	Energy Service Company
ESF	Energy Savings Fund (Phare)
EU	European Union
LTA	Long Term Agreement
M&T	Monitoring and Targeting
MIT	Ministry of Industry and Trade
MoA	Ministry of Agriculture
MoE	Ministry of Environment
MoF	Ministry of Finance
MW	Megawatt
NEES	National Energy Efficiency Study
NGO	Non Governmental Organisation
PBP	Payback Period
RD&D	Research, Development and Demonstration
RE	Renewable Energy
RES	Renewable Energy Sources
SEF	State Environmental Fund
SME	Small and Medium-sized Enterprises
TPER	Total Primary Energy Requirement

CONTENTS

1.	THE POTENTIAL OF RENEWABLE ENERGY	5
2.	POLICY TARGETS AND PRIORITIES	6
2.1	The target for renewables	6
2.2	Comparison with other targets	6
2.3	Priorities in renewable energy options	8
3.	RENEWABLE ENERGY POLICY	9
3.1	Introduction	9
3.2	Policy framework	9
3.3	National Energy Agency	10
3.4	Capacity building for policy development and implementation	11
3.5	Renewable energy statistics and monitoring	11
3.6	Joint Implementation	12
4.	IMPROVING THE COMPETITIVENESS OF RENEWABLES	13
4.1	Energy pricing, energy taxation and emission levies	13
4.2	The price of renewable electricity	14
4.3	Cost of grid connection and reinforcement	16
4.4	Market for biomass fuels	17
4.5	Research, development and demonstration	17
5.	PROMOTING MARKET PENETRATION	19
5.1	Raising awareness	19
5.2	Education	19
5.3	Fiscal measures	20
5.4	Promoting Czech industry	20
6.	REMOVING ADMINISTRATIVE BARRIERS	22
6.1	General issues	22
6.2	Spatial integration and planning	22
6.3	Waste management policy	23
7.	FINANCING OF RENEWABLE ENERGY PROJECTS	24
8.	SUMMARY OF ACTIONS	25
9.	REQUIRED STATE BUDGET	29
10.	IMPACTS OF THE ACTION PLAN	31
10.1	Economic impacts	31
10.2	Social impacts	31
10.3	Environmental impacts	32

1. THE POTENTIAL OF RENEWABLE ENERGY

The current share of renewable energy production in the Czech Republic is low, about 1.5% of the total primary energy requirement. In recent years, the share of renewable energy has not increased significantly. However, the analysis in the National Energy Efficiency Study has identified a significant potential in the Czech Republic. The following potentials were estimated (see Table 2.1).

The *available potential* is the technical potential that could be utilised by currently available technologies. The existing constraints are taken into account, such as the administrative, legislative, environmental and other constraints. In 2010, the available potential is 5.6% of the total primary energy requirement (current).

The *economic potential* is estimated on the basis of economic criteria. A limiting payback period (PBP) of investment of 8 years was applied, with the exception of hydro power plants (PBP of 16 years), taking into account the substantially longer technical lifetime of these investments. The economic potential is less than the available potential: 3.6%.

2. POLICY TARGETS AND PRIORITIES

2.1 The target for renewables

It is necessary for the Czech government to set quantitative targets for the share of renewable energy. Without these targets, it is not possible to establish renewable energy policy, nor is it possible to effectively evaluate the success of the policy and its contribution to the objectives of the Czech government.

Policy targets are always a political compromise, in which a great number of often-conflicting interests of government and other stakeholders in society are balanced. In this Action Plan, a target of 3.5% of total primary energy consumption in the year 2010 is adopted on the basis of the analysis of the potentials. This target probably could be achieved with a feasible but strong effort. It corresponds with a more than doubling of the current share of renewables. As a result, the required relative growth rate is high, compared to historical growth rates in the Czech Republic and the EU Member States. This target should be used by the Czech government as a starting point for the discussion on the official targets.

2.2 Comparison with other targets

No official target for future contribution of renewable energy has been adopted in the Czech Republic yet. However, two policy documents that are in preparation include proposals. The draft Energy Policy document states 3% to 6% of primary energy consumption in 2010, and 4% to 8% in 2020 (Ministry of Industry and Trade). The proposed State Environmental Policy document states about 6% of primary energy consumption in 2005 (the Ministry of Environment). Compared to these targets, the target proposed in this Action Plan is lower (3.5% in 2010), because the other targets are considered too optimistic for the following reasons:

- According to the analysis of the potential of renewable energy sources presented in Chapter 1, the available potential of renewable energy sources is less than 6%, therefore the targets presented in the policy are higher than the technical potential limited by administrative, legislative, environmental and other constraints.
- A significant increase of primary energy consumption until the year 2010 would limit the increase of the relative share of renewables.
- Some specific assumptions on the potentials used are considered to be too optimistic, mainly in the case of the contribution of heat pumps.
- The feasibility of the targets strongly depends on the current share of renewable energy. The estimate of the Action Plan (1.5%) is lower than the estimate currently used by the Ministry of Environment.

The target proposed in this Action Plan still corresponds to a significant increase in the share of renewables. In order to reach this target, a strong promotion policy is needed. The target can be used by the Czech government as a starting point for the official targets.

Table 2.1 Overview of the available and economic potential of renewable energy sources in the Czech Republic to the year 2010

	Current utilisation [TJ/a]	Available potential						Economic potential					
		Potential (excl. current utilisation)		Investments [10 ⁶ CZK]	Specific investment costs [CZK/GJ]	Share in 2010 (including current utilisation)		Potential (excl. current utilisation)		Investments [10 ⁶ CZK]	Specific investment costs [CZK/GJ]	Share in 2010 (including current utilisation)	
		[TJ/a]	[% of TPER]			[TJ/a]	[% of TPER]	[TJ/a]	[% of available potential]			[TJ/a]	[% of TPER]
Biomass	17,390	44,380	2.53	16,610	370	61,770	3.53	33,570	75.63	11,600	350	50,960	2.91
Wastes ¹	1,520	2,000	0.12	25,470	12,460	3,560	0.20	0	0.00	0	0	1,520	0.09
Solar thermal	140	11,360	0.65	90,370	7,960	11,500	0.66	0	0.00	0	0	140	0.01
Solar PV	0	80	0.00	5,090	67,470	80	0.00	0	0.00	0	0	0	0.00
Heat pumps ²	30	6,630	0.38	21,320	3,210	6,670	0.38	2,090	31.49	6,660	3,190	2,120	0.12
Wind	30	3,680	0.21	18,820	5,120	3,710	0.21	60	1.62	240	4,080	90	0.01
Hydro small	2,340	3,310	0.19	16,250	4,900	5,660	0.32	1,700	51.32	8,310	4,890	4,040	0.23
Hydro large ³	4,500	0	0.00	0	0	4,500	0.26	0	0.00	0	0	4,500	0.26
Total	26,000	71,400	4.10	194,000		97,500	5.60	37,400	52.30	26,800		63,400	3.60

¹ Net contribution (excluding the consumption of natural gas in waste combustion). Only thermal waste treatment is included. Landfill gas is included in biofuels.

² Net contribution of heat pumps.

³ No new large hydro power plant is expected to be built in the near future, mainly for environmental reasons.

2.3 Priorities in renewable energy options

A wide range of different renewable energy options is available. In renewable energy policy therefore, priorities must be set. These are based on current renewable energy resource share, their potential and the prospects of future development:

1. By far the largest absolute growth in the share of TPER is expected from biomass for heat and electricity production. In the period up to 2010, mainly biomass waste flows (agriculture, industry and forestry) will be used. The use of energy crops and energy forests will also have to be developed, but probably will become important only after the year 2010.
2. Solar thermal applications, wind power, ambient heat (heat pumps) and small scale hydro will also have to grow significantly in relative terms, although their absolute contribution is much smaller than biomass.
3. The other options: waste utilisation for energy production, solar photovoltaic, geothermal heat and large scale hydro plants will not contribute significantly to the increase of renewable energy production.

The new policy should therefore focus on the promotion of biomass for heat and electricity production. In addition, solar thermal applications, wind power, ambient heat (heat pumps) and small-scale hydro should be promoted as well. The remaining options however should not be neglected completely, because they could possibly contribute after the year 2010.

3. RENEWABLE ENERGY POLICY

3.1 Introduction

A target of 3.5% share of renewable energy in the year 2010 cannot be realised without an intensification and extension of current policy. In the current market, a number of different market barriers exists, which should be addressed by governmental policy. In the National Energy Efficiency Study, the barriers are identified and described in detail. The main barriers are:

- The lack of a long-term governmental policy and regulatory framework.
- The low price-performance ratio compared to fossil fuel options.
- The unfavourable feed-in tariffs for renewable electricity.
- The lack of information and awareness.
- The lack of investment capital.
- Administrative barriers, in particular long and difficult planning and licensing procedures.

The development of a new policy requires the assessment of all available policy instruments and the design of measures that specifically address the identified market barriers. A number of other criteria has been considered as well, such as the expected energy savings, the public and private resources required, the necessary institutional changes, harmonisation with the EU and conformity with the liberalisation of energy markets. A full account of the selection of policy instruments is given in Chapter 5 of Part II of the National Energy Efficiency Study.

3.2 Policy framework

At the moment the Energy Policy of the Czech Republic is still in preparation (July 1999). The Policy includes targets for renewables. The draft Environmental Policy sets the targets as well. The targets in both draft policy documents differ and are higher than proposed targets in this study. However, in these two documents, only a short reference to renewable energy is made, but no policy is formulated. Therefore, the preparation of more detailed policy on renewables in a separate policy document is required. This document should include the official governmental objectives and targets, and the package of policy measures that will be carried out to achieve these targets. This document will commit the government to its targets and is a necessary basis for the involvement of the other actors in the field of renewable energy. The policy should be updated every two to three years on the basis of the ongoing progress and development of renewables, and to adapt the changing economic, political and societal conditions.

The responsibilities within the Czech government, in particular those of the Ministry of Environment and the Ministry of Industry and Trade, should be clearly established. The same applies to the National Energy Agency (see Section 3.3), which will be responsible for the implementation of the policy.

Actions policy framework

1. 1999: The role of renewable energy and its priority in comparison to the other energy supply options will be clearly stated in the official Czech Energy Policy (Ministry of Industry and Trade).
2. 1999: The realistic targets for renewable energy production will be elaborated and officially adopted by the Czech government within the Energy Policy document. The results of the National Energy Efficiency Study will be taken into account.

3. 1999: The Czech government will establish a structural dialogue and negotiation framework with all stakeholders in the field of renewables (National government and related governmental institutions, regional and municipal governments, NGOs, industry, power utilities and other major energy sector players, financial institutions, renewable energy associations).
4. 1999-2000: The Ministry of Industry and Trade and the Ministry of Environment will decide which Ministry is mainly responsible for renewable energy policy⁴.
5. 1999-2000: The Ministry of Industry and Trade will investigate the options of promotion of renewable energy production within the framework of the liberalisation of the electricity and gas markets in preparation of the new Energy Act.
6. 2000-2001: The government and National Energy Agency will elaborate a policy document on renewable energy. This document will be finalised within two years. The costs of the elaboration of the renewable energy policy document and supporting documents, are about CZK 3 million.
7. 2000-2010: The Renewable Energy Policy Document of the Czech government will be updated every two to three years. The costs associated with the updating of RE policy document are CZK 9 million for the whole period 2000 to 2010.
8. 1999-2010: Co-operation with the EU and its Member States will be sought to benefit from the experience in policy making in the field of renewables. The Czech Republic will actively participate in EU programmes like ALTENER, 5th Framework Programme to promote wide utilisation of renewables in the Czech Republic.

3.3 National Energy Agency

In the Czech Republic, many potential beneficiaries of renewables have no or little experience with renewable projects. It is difficult to get information on the success and failure of existing projects. Therefore, dissemination of information and experience should be improved, and more assistance in project development should be provided. The current situation, in which two government agencies, the Czech Energy Agency and the State Environmental Fund, are involved in promotion of renewable energy through two different government programmes, reduces efficiency and confuses users of the government aid.

In the Energy Efficiency Action Plan, the establishment of a single National Energy Agency is recommended. This Agency is responsible for the implementation of the energy efficiency policy. It is recommended that this Agency should be made responsible for renewable energy also, given the strong interaction of energy efficiency and renewable energy policy. Within the National Energy Agency, a separate Department for Renewable Energy should be established.

The National Energy Agency will be responsible for co-ordination of government programmes, development, implementation and evaluation of renewable energy policy. The Agency will collect and disseminate information on renewable technology and concrete projects for all parties interested (government, investors, municipalities, NGOs, etc.), and initiate projects. Finally, the Agency will co-operate with foreign Energy Agencies.

Actions National Energy Agency

1. 2000: The responsibilities of the National Energy Agency in the field of renewable energy will be clearly established. The costs for establishing the Agency and its resources for renewable energy are included in Section 3.4. The responsibilities of the National Energy Agency in the field of energy efficiency are described in the Energy Efficiency Action Plan.

⁴ Taking into account the current split of responsibilities given by the Competence Law, everything related to energy supply is the responsibility of MIT, but the Ministry of the Environment is active in this field as well. Current practice is that both Ministries elaborate common policy papers and present them to the government.

3.4 Capacity building for policy development and implementation

Renewable energy policy needs to be developed and implemented more strongly to reach the target. Inevitably, this requires the availability of more resources (staff, financial resources) at the level of policy makers (Ministries), as well as on the level of implementation, in particular the National Energy Agency.

The Ministry of Industry and Trade, which is responsible for drafting and implementation of the Energy Policy, does not have any special department or staff dealing with renewables. In total, only about 4 people are involved with renewable energy policy in the Czech government and related institutions. The governmental budget spent in the support of renewable energy in the Czech Republic has been small in recent years (about 0,006% of GDP). It is estimated that an additional 10 people are required for the development and implementation of the Renewable Energy Action Plan.

Actions capacity building

1. 1999-2002: The number of resources (staff, budget) at the Ministry of Industry and Trade, the Ministry of Environment and the National Energy Agency will be increased, corresponding to the increased extent of activities in the field of policy making and policy implementation. The budget for 10 new employees is approx. CZK 5 million per year.
2. 1999-2010: The exchange of experiences between Czech and EU policy makers at the governmental level will be promoted. The same applies to the level of policy implementation. The National Energy Agency will co-ordinate the international co-operation, involvement in EU programmes and exchange of experiences. The costs of these activities are about CZK 3 million.

3.5 Renewable energy statistics and monitoring

It is important to monitor and evaluate the results of renewable energy policy, because regular updates are necessary to adapt to changing external conditions and changing priorities. This should be done on the policy level and on the level of renewable energy programmes.

Accurate data on the current utilisation of renewable energy sources are essential in the setting of the starting point for further evaluation and monitoring of renewable energy development, evaluation of policy and for setting the targets. However, the statistics on renewable energy in the Czech Republic are very poor at the moment. The Czech Statistical Office was to start the collection of statistical data on renewables according to Eurostat methodology in the end of 1998, however, the situation and the responsibilities related to the collection of renewable energy statistics are not clear yet.

Actions statistics and monitoring

1. 2000: The Ministry of Industry and Trade and the Ministry of Environment will support a study assessing in detail the current utilisation of renewable energy sources. This study will cover and collect data about large/centralised renewable energy sources (small hydro, wind and biomass district heating sources), and evaluate and estimate the share of small/decentralised renewable energy sources (solar, heat pumps, small biomass boilers). To obtain accurate data, several renewable energy stakeholders (renewable energy associations, technology manufacturers etc.) should participate in the study. The cost of the study is estimated at CZK 2 million.
2. 2001: The Czech Statistical Office will continue to develop renewable energy statistics according to the Eurostat methodology. Various other bodies (the new National Energy Agency, power distribution companies, renewable energy producers, users and associations) will be involved in the collection of statistical data.

3. 2001: The National Energy Agency will be responsible for co-ordination of collecting of the statistical data, for monitoring the development of renewable energy on a yearly basis. The results will be published yearly. The costs associated with the collection of statistical data on renewable energy sources and production are about CZK 3 million per year.
4. 2001: The National Energy Agency will work out a plan for the evaluation of support programmes for renewable energy, with attention to monitoring in the field and responses of participants. The costs of elaboration of evaluation action plan are CZK 1 million.
5. 2002-2010: The National Energy Agency will carry out a yearly evaluation of programmes for renewable energy. The estimated budget is CZK 1 million per year.

3.6 Joint Implementation

The marginal abatement costs of greenhouse gases in the Czech Republic are still relatively low compared to other OECD countries and that leaves a certain potential for Activities Implemented Jointly/Joint Implementation Projects (AIJ/JI). Several more or less successful AIJ/JI Pilot Projects were started in the Czech Republic in recent years. These and future projects have still to cope with several barriers especially concerning the lack of experience and novelty of the issue. Next to the increase of renewable energy capacity, AIJ/JI could bring several other benefits, such as local environmental benefits, technology transfer and financial benefits.

The Ministry of Environment, which is responsible for Joint Implementation, operates a AIJ/JI registration centre. The Ministry however, needs to adopt a JI strategy as a follow-up to the National Climate Policy, which has been negotiated by the government on May 17, 1999. This strategy could be based upon strategic variants proposed by the National Strategic for Joint Implementation Study (World Bank, 1998).

Actions Joint Implementation

1. 2000: The Ministry of Environment will develop a detailed Joint Implementation Strategy of the Czech Republic as a follow-up to the National Climate Policy. The budget is CZK 2 million.
2. 2000: The Ministry of Environment will develop an administrative framework to handle AIJ/JI projects in the renewable energy field. This includes transparent rules for reduction credits, project baselines and additional criteria for AIJ/JI projects based upon currently prepared international standards and procedures (UN FCCC). It is also important that one governmental body, probably the Ministry of Environment, is responsible for AIJ/JI.
3. 2000: The government, in particular the Ministry of Environment, will be more active in finding Czech and foreign partners for AIJ/JI projects. This will include an information campaign (conferences, workshops, etc.) to be prepared and implemented for both parties. The budget is CZK 2 million.

Actions energy pricing, taxation and emission levies

1. 1999: The Ministry of Finance, in collaboration with the Ministry of Industry and Trade and the Ministry of Environment, will outline a plan for implementation of a consistent system of the removal of subsidies to the electricity and gas prices, as well as introduction of energy taxation. This will substantially improve the competitiveness of renewable energy sources in households.
2. 1999: The Ministry of Environment will investigate the effect of a new system of emission charges on energy efficiency and the penetration of renewables, as well as the optimal way to design this system.
3. 2000: The Ministry of Finance and the Ministry of Labour and Social Affairs will study the consequences of the new pricing policy and provide possible compensation for low-income groups. The study should provide data on costs for the state budget. The costs of the study are estimated to be about CZK 1 million.
4. 2001-2003: Step by step revision of current legislation and approval of new legislation required for the introduction of energy taxation, and, possibly, emission charges.
5. 2004-2007: Arrangement of a nation-wide public awareness campaign for promotion of a new energy taxation system that should be carried out in the period of 3 years prior to implementation of a new tax. The estimated costs of such an awareness campaign are CZK 50 million.
6. 2008: Start of full implementation of the energy tax. Full implementation is expected to take about 10 years. No additional costs for the state budget are expected.

4.2 The price of renewable electricity

At the moment, the production costs of renewable electricity are on average still considerably higher than the production costs of conventional (fossil) energy. Therefore, the difference between the production costs must be overcome by additional incentives in order to permit market penetration. Different approaches are possible.

Purchase obligation and fixed feed-in tariffs

An important component in the cost-effectiveness of renewable power production is the feed-in conditions, including the costs of connection to the grid and of back-up facilities. According to the Energy Act (222/1994 Coll.), the supplier (distribution company) is obliged, if it is possible from a technical point of view, to purchase electrical energy produced from renewable and secondary sources of energy. However, at the moment, the electricity feed-in conditions, which are not fixed but negotiated, are not favourable for renewables. The current feed-in tariffs are low compared to the sales electricity prices to final consumers, and the cost of connection to the grid is often high. The tariffs are currently based on avoided production costs only, and do not reflect the external benefits of renewables.

Furthermore, the feed-in conditions are not stable. It is difficult to establish a long-term contract with the energy distribution companies. Regional differences occur also. Finally, there is no common agreement and harmonisation on the priority of renewable energy production among distribution companies and municipal authorities. This is partly a result of the lack of commitment and steering by the Czech government.

New negotiations on the increase of feed-in tariffs between the Ministry of Industry and Trade, the Ministry of Environment, regional power distributors and renewable energy associations (Association of Entrepreneurs for Utilisation of Energy Sources) have already started. Renewable energy associations want to increase the tariff to the level of end-user sales price, decreased by necessary margin of power distributors (about 30%) and increased by 20% (state) bonus. Ideally, the feed-in tariffs should be increased to the level reflecting the voltage level of the grid and other feed-in conditions and giving the distribution companies the necessary margin compared to sales prices of electricity. However, the negotiations are still at the beginning. The first successful step was the increase of feed-in tariffs by 15%-20% (to 1.13-1.20 CZK/kWh) agreed by all the stakeholders in April 1999. However, the power distribution companies are strongly against a further increase.

Green Cent Scheme

Taxation of energy carriers, exempting renewable energy, is another instrument currently implemented in a number of EU member states and under debate in the Czech Republic (see Section 4.1). Different approaches to energy taxation are possible. In a number of EU Member States, some level of energy taxation is implemented, exempting renewable energy production. For instance in the Netherlands, this contributes significantly to the promotion of renewables. A first step towards energy taxation is the Green cent scheme, which at the moment is the most politically supported instrument in the Czech Republic, acceptable also for the power distributors. The other benefit of the introduction of the Green cent scheme is that the power generation from renewable energy sources could be easily monitored. Statistical data regarding renewable energy production would be available from all the renewable electricity sources where the support from the Green cent fund would be applied.

Promotion of renewable electricity production in liberalised markets

The Czech government plans to liberalise the energy markets in accordance with the European Union's legalisation when accessing the EU (current official date 2003). This will drastically change the framework for the promotion of renewable policy. Within the EU, a discussion is ongoing on the future of fixed feed-in tariffs as the main instrument for the promotion of renewable electricity production, and its alternatives.

For the Czech Republic, considering the importance of short-term action, the uncertainty of the development of the liberalised markets, as well as the harmonisation with the EU, the following is recommended. In the short term, favourable feed-in tariffs, either through fixation or a premium system, should be pursued as the main instrument for the promotion of renewable electricity production. In the long-term, energy taxation should be introduced to provide an additional stimulus for renewable electricity production, as an alternative to fixed feed-in tariffs. The option of quota-based systems, in particular Tradable Green Certificates should be investigated. If the Green Certificates prove to be applicable in the Czech Republic, they could be applied instead of the Green Cent scheme.

Actions in short-term policy

1. 1999: In the short term, negotiated feed-in tariffs, or as alternative fixed premium schemes ('Green cent'), will be the main instrument for the promotion of renewable electricity production in the Czech Republic.
2. 1999: The negotiations with renewable electricity stakeholders on feed-in tariffs for renewable electricity will be intensified with the aim to establish a higher level of feed-in tariffs.
3. 1999-2003: A mid-term, structural policy on feed-in tariffs and the conditions for grid-delivery will be developed (up to the year 2005). In the case that the government sets the purchase obligation on the power distributors to buy the renewable electricity for a specified (higher than negotiated) feed-in tariff, this will be used as transitional instrument before the introduction of a more market conform scheme on the longer term.

Actions in medium-term and long-term policy

1. 2000-2002: The long-term strategy will focus on the energy and carbon tax. As a first step before the introduction energy taxation, the Czech government will support and introduce the Green cent scheme for the support of renewable electricity before 2003. The analysis of the introduction, awareness campaign, establishment of a Green cent fund and other costs related to the introduction of Green cent scheme are estimated at CZK 3 million.
2. 1999-2010: The Czech government will actively participate in the on-going debate in the EU on new instruments for the promotion of renewable electricity, in particular Tradable Green Certificates in combination with a mandated minimum share of renewable electricity production. The government will develop national harmonised strategies to prepare for accession. The Czech government will harmonise its efforts in this field with EU.
3. 2000-2010: The Czech government will stimulate the power distributors (and private companies after the third party access to the grid will be introduced) to make the contracts on premium-priced 'green' electricity from renewables to use it as a marketing tool. Long-term contracts with renewable electricity producers are necessary in this case.
4. 2008: In the long term, a full energy or carbon tax, exempting renewable energy, will be introduced, the level of which can be increased gradually.

4.3 Cost of grid connection and reinforcement

Renewable electricity generators feeding into the grid need to be connected. This may require expensive installations, especially for wind turbines, which are often located on sites remote from the grid. Connection costs can contribute significantly to the total investment, particularly for small projects. In addition, strengthening of the grid is in some cases necessary.

The grid owner should make the full costs and benefits that are associated with connection of renewable electricity unit. The future benefits to the grid-system, such as avoided or postponed reinforcement should be taken into account. Rules should be introduced by the regulator that foresee compensation payments if the subsequent electricity consumers connected to the grid benefit from a grid asset (connection or strengthening) associated with and paid for by the first producer connected to the grid.

The energy regulator in the discussion with the energy sector common will develop transparent and fair connection costs schemes to the grid for renewable electricity producers. Similarly, schemes for the connection of district heat source based on renewable energy to the district heat networks will be developed as well. This should be included in the new Energy Act. Also, the priority access to the grid for the renewable electricity sources should be included in the Energy Act.

Actions grid connection and enforcement

1. 2000-2002: The Czech government will set up a structural framework with power distribution companies for discussion and negotiations with the goal to improve and harmonise the conditions for grid access of independent renewable power producers.
2. 2002-2003: The energy regulator will develop common, transparent and fair connection costs schemes for renewable electricity to the grid as well as for heat supply from renewable sources to district heating systems. A study in this field (covering also influence of renewable electricity sources on the grid, need of backup capacities etc.) will be launched. The costs are CZK 1 million.
3. 2001: In the new Energy Act, the priority access to the grid for the renewable electricity sources will be included.

4.4 Market for biomass fuels

The costs of biomass fuels, such as wood or agricultural waste, are an important component of the production costs of biomass heat and power production. However, at present, the transparent market for biomass practically does not exist in the Czech Republic, which makes long-term price projections very uncertain. As a result, the risk of investments in biomass energy production is much higher than for fossil fuels, and a major barrier. The creation of a transparent market for biomass fuels is therefore essential.

Actions market biomass fuels

1. 2000: The National Energy Agency will carry out a study on the establishment of a market of biofuels to ensure the long-term stability of prices of biomass fuels. The costs of the study are approx. CZK 1 million.
2. 2000-2003: The National Energy Agency will promote and stimulate the production of biomass based solid fuels (briquettes, pellets and woodchips) as well as utilisation of currently produced forest, paper and wood industry residues and other biomass waste. The State support will consist mainly of the elaboration of analyses and studies, feasibility studies/energy audits, information and awareness campaigns. The estimated amount of State support is CZK 4 million per year during the period 2000-2003.
3. 2000-2003: The National Energy Agency will promote co-firing or fossil fuel substitution in coal-fired power plants and in existing district heating networks. The supported activities will comprise research, feasibility studies and information campaign as well as selected demonstration project(s). The budget is about CZK 20 million per year.
4. 2000-2005: The Ministry of Agriculture in co-operation with the National Energy Agency will promote the further research and application of energy crops, application and the exchange of experiences with other European countries. The State will support demonstration projects of utilisation of energy crops/forests. The estimated support to the research, awareness campaigns and demonstration projects from the State budget (Programmes of the Ministry of Agriculture) will be CZK 20 million per year.
5. 2000-2010: The government will promote the utilisation of biomass from local sources for both local and central heat supply, and the integration of biomass into energy planning procedures. The estimated amount of State support for initial information campaign and further activities is CZK 15 million. The further support for consulting, feasibility studies and other activities will reach about CZK 10 million per year.
6. 2001: In the new Energy law, operators of district heat networks will be obliged to purchase district heat from the sources based on renewable energy under the following conditions. It is technically possible; i) the heat demand is not already covered by renewable sources, CHP, waste heat or waste incineration; and ii) the total costs of heat production will not be increased.

4.5 Research, development and demonstration

Research, Development and Demonstration (RD&D) is an important instrument in increasing the price-performance ratio of renewable energy systems. The current total annual amount of funds spent for RD&D in the field of renewable energy in the Czech Republic is not known, but it is almost completely spent on demonstration projects. Although the economic conditions of the Czech Republic must be considered in this comparison, it is clear that without a significant increase in RD&D funding in the Czech Republic the target of 3.5% cannot be met. The increased support to RD&D, also increases the level of local expertise and awareness among the people who could implement or develop renewable energy policy, renewable energy projects or produce the renewable energy technology.

Actions RD&D

1. 1999: A discussion will be initiated between the government, the energy sector and the manufacturing industry on co-ordination and direction of the RD&D programmes and financial contribution from different stakeholders.
2. 2000: Co-ordination and involvement in the EU RD&D programmes on renewables will be sought. The Czech Republic will contribute to and participate in the ALTENER programme of the EU, and in the 5th Framework Programme. The involvement of the Czech Republic in these programmes will require Czech co-financing of about CZK 30 million a year.
3. 2000: The availability of renewable energy technology will be enlarged, by promoting demonstration projects and stimulating the co-operation of the Czech industry with manufacturers in the EU and other countries. Furthermore, the local capacity will be enlarged through know-how and technology transfer.
4. 2000-2002: Within RD&D policy, priorities must be set between on research, development, and demonstration. Given the limited budget in the Czech Republic and the extent of the research activities in other countries, the Czech government should focus its support on demonstration and the applied research in the areas specific for the Czech Republic. RD&D goals will be clearly defined, making a regular monitoring and evaluation of RD&D efforts possible.
5. 2000-2010: The total research and development annual budget in the renewable energy field will be increased to CZK 30 million per year, which is a level more comparable to the EU. The programmes and budget estimated for the support of demonstration projects are included in Chapter 7.

5. PROMOTING MARKET PENETRATION

Apart from the low price performance ratio, renewable energy faces other barriers that prevent market penetration. These include the lack of awareness, the high investment and capital costs, and the lack of involvement of Czech industry. In this section, also the role of fiscal measures in the promotion of renewable energy is discussed.

5.1 Raising awareness

Awareness of the benefits of renewable energy sources is still low among different target groups (investors, general public, industry, commercial and public services, energy utilities). Furthermore, a number of misunderstandings exist with regard to the costs and potentials. The information activities, awareness raising campaigns, publishing, courses and seminars are run by several institutes in the Czech Republic, however, their extent is not sufficient and they are oriented mainly on selected groups.

Actions

1. 2000-2010: The capacity in the field of awareness campaigning, marketing will be increased. The government will promote awareness through its energy efficiency and renewables programmes as well as by the general education scheme. The National Energy Agency will be responsible for co-ordination in this field as well as for responsible for gathering and disseminating information on renewable projects in the Czech Republic and in other countries. The estimated amount of State support to information and awareness campaigns, including the required capacity is estimated at CZK 15 million per year.
2. 2000-2001: The National Energy Agency will develop a strategic awareness and marketing plan for renewable energy production, targeted on the general public, municipal and local authorities, commercial and public services, industry, households, agriculture, the energy distribution sector and the manufacturing industry. The total costs are estimated at CZK 40 million.
3. 2000-2005: Targeted information campaigns will be carried out on different levels (national, regional and municipal). Various governmental bodies (ministries, agencies), public TV and radio broadcasting system and NGOs will participate. The costs are CZK 30 million.
4. 2000-2010: The existing or extended network EKIS (of the Czech Energy Agency) will be extensively used. This network will be focussed both on sectoral as well as regional promotion of renewables. The estimated requirement for funding from the State budget for the extension of EKIS network is CZK 5 million per year.

5.2 Education

Many disciplines, particularly engineering sciences, deal either directly or indirectly with renewables. Traditionally, energy engineering is limited to fossil fuel conversion. To build expertise and awareness in this field, renewables energy technologies should be covered by the curriculum at schools and universities.

Actions Education

1. 2000: The Ministry of Education will take initiative to include renewable energy agenda in the existing curricula.
2. 2000-2002: The educational system will introduce renewable energy in the curriculum on all levels (primary, secondary and university) as a part of the education on the environment. The estimated costs are CZK 15 million per year.

5.3 Fiscal measures

In the Czech Republic, the following tax exemptions and reductions are applied in the renewable energy field at present:

- Renewable energy installations (excluding hydropower over 1 MW), are exempt of income tax and real property tax for five years after the installation.
- Buildings using heating systems reconstructed from solid fuels to solar, wind, geothermal or biomass heating system, are exempt from the real property tax for five years after the installation.
- Reduced VAT rate (5% instead of 22%) is applied for small hydro turbines up to 100 kW, wind turbines up to 75 kVA, heat pumps, solar systems and all biomass based fuels.
- Zero excise tax is applied for biodiesel (rapeseed methylester) fuel.

An accelerated depreciation scheme is not generally applied to all environmental or renewable energy investments. Only selected components of renewable energy installations fall under the group with faster depreciation. In many EU member states, a range of different fiscal measures have been introduced, fully or partially replacing subsidies and grants schemes. Below, an overview is given:

- Increase of the income tax relief for renewable energy efficiency and recycling installations. The income tax base can be decreased to e.g. 20% of the purchase price, compared to the current 10%.
- Green investment scheme: income tax exemption on the interest received from a 'green' fund, compensating for the fact that the interest rate usually is lower than that offered by other accounts.
- Accelerated depreciation of environmental investments. This constitutes a corporate tax advantage to companies that invest in specific energy saving measures.

At the moment, it is not possible to recommend specific measures. Further research is needed. It is, therefore, recommended that the Czech government investigate the options in the short-term, to be able to introduce new fiscal measures at a later stage.

Actions fiscal measures

1. 2000: The Czech government will investigate which further options can be applied in the Czech Republic in addition to already applied ones. Experiences from EU countries and harmonisation with the EU policy should be taken into account. MoE will launch a study in this field, which would calculate costs and benefits of different options. The costs of study are about CZK 1 million.
2. 2000-2002: Current legislation will be adjusted to allow the introduction of accelerated depreciation scheme for renewable energy and other environmental investments in the extent to cover all renewable energy options and other environmental investments that may be attractive to the industry.
3. 2002: The VAT rate will be reduced for large wind turbines and hydro turbines as well as for the construction part of renewable energy schemes.

5.4 Promoting Czech industry

It is expected that the market for renewable energy technologies in Europe will grow strongly over the next decades. The growing international and national market could provide opportunities for the Czech industry. Regarding the Czech industrial infrastructure in the renewable energy technology, the producers of most of renewable energy technologies, with the exception of large wind turbines, are present in the Czech Republic.

Although there is a traditionally strong industrial background and some of locally produced renewable energy technologies are competitive from the point of view of both performance and price, there is no governmental or other support aimed particularly at the renewable energy technology production and/or export. Only general support schemes for local industry and export are applicable at the moment.

Actions promotion Czech industry

1. 2000-2010: Renewable energy technologies will receive special attention in the further development of the industrial support by the Czech government. The Czech government and industry will investigate and promote the opportunities for the Czech industry in the domestic and export market for renewable energy technologies. The Ministry of Industry and Trade will establish a special programme for support of local producers. The National Energy Agency will be involved as well. The annual budget is CZK 10 million.

6. REMOVING ADMINISTRATIVE BARRIERS

Administrative barriers have proven to be of significant importance for the difficult implementation of renewables in the European Union and the Czech Republic, and require therefore special attention in renewable energy policy.

6.1 General issues

When renewable options become more economic, the implementation barriers become more important, in particular administrative. These barriers are very specific and associated with a particular renewable option.

Actions

1. 1999-2000: The Czech government will review the existing planning and administrative measures (Building Act, Act on Environmental Impact Assessment, Energy Act, etc.) that potential renewable energy producers must meet to determine which action should be taken to reduce the planning and administrative barriers.
2. 2000-2001: The existing planning and administrative measures will be adjusted to support promotion of renewables on the regional level within the preparation and implementation of a new regional administrative division of the Czech Republic.

6.2 Spatial integration and planning

Spatial integration is a major bottleneck for wind energy. Administrative decisions on the siting of wind turbines (zoning plans, building and environmental permits) are complicated and take a long time. Furthermore, the spatial integration of wind turbines often competes with other functions.

Some renewable options, like heat pumps, solar thermal heat or renewable heat production in combination with small-scale heat distribution, must be integrated in the infrastructure of the built environment. As a result, their cost-effectiveness strongly depends on the other components of the system, for instance the level of heat demand, requirements for thermal insulation of buildings, special requirements for heating systems, etc. This applies not only to the residential sector, but also to the commercial and public sector. The optimal integration of renewables in the built environment is therefore very important and should be included in the planning procedures. These barriers should be addressed with strong involvement of the regional and local authorities.

Actions spatial integration and planning

1. 1999-2000: The Czech government will evaluate the main administrative and legal barriers related to the spatial integration of renewable energy and the consultation between the national government, regional and municipal authorities, and other stakeholders on the issue of administrative barriers will be set up.
2. 2000-2002: The Czech government will clarify the role and power of municipalities on various levels in the field of the planning of the energy infrastructure and promoting the role of renewable in this infrastructure.
3. 2001-2002: The Czech government will seek to establish agreements with the regions on the implementations of renewables, in which the regions will have specific tasks. Co-ordination between different administrative bodies will be improved.

4. 2000-2010: The National Energy Agency will support regional and municipal authorities in developing plans for the spatial integration of renewables and in the planning of the energy infrastructure. The estimated costs of the programme are CZK 20 million per year.

6.3 Waste management policy

Energy production from waste has been hampered by the existing regulation on waste. In the Czech Republic, for waste flows, a separate legislation regime applies (The Waste Management Act). The regime provides rules for prevention, transport and disposal of waste. Unfortunately, the use of waste as a source of energy is not accounted for. Therefore, in some cases waste regulation hinders or even makes this particular use of waste impossible.

Nation-wide rules for the distinction between waste and other substances should be defined, taking into account the whole range of waste management including energy utilisation of waste. The energy generation from waste either by thermal treatment, landfill gas recovery or anaerobic digestion will complement the waste prevention and recycling. Experiences and legal framework applied in various EU countries in this field will be analysed and the results will be taken into account when setting a new waste management policy and an update of Waste Management Act. This will be harmonised with the EU policy and legislation.

Actions waste management

1. 2000: The Czech government will develop a new waste management policy and legislation to remove the barriers for energy production from waste.

7. FINANCING OF RENEWABLE ENERGY PROJECTS

The lack of financing for investments in renewable energy is one of the main barriers for further market penetration. Although some potential schemes exist that could be used for financing of renewable energy projects (such as the Phare ESF fund), their conditions are not always suitable for renewable energy project developers. The financing of renewable energy projects is practically limited to private finance or state subsidies at present. The current schemes for financing have to be further developed and new schemes prepared. Four fields of support should be developed:

- *Supporting project development.* The government should support and provide subsidies for consulting, energy auditing and particularly the elaboration of feasibility studies, which will help in preparation of bankable renewable energy projects.
- *Supporting demonstration projects.* This support should provide investment subsidies for demonstration projects of new and advanced renewable energy technologies and applications and on the renewable energy sources that could not be supported by some other scheme. The existing programmes of the Czech Energy Agency should be continued.
- *Promoting commercial financing.* The government should facilitate the access to commercial financing. This can be done in the form of interest rate subsidies to commercial lending and guarantees provision to the lenders.
- *Soft loans schemes.* A low-interest, long-term loan scheme should be designed especially for renewable energy projects. This financing scheme should promote the development of renewable energy schemes that are already economically viable but cannot be realised because of expensive commercial loans and lack of other sources of financing. It should be applicable also for medium (CZK 1-50 million) to small-scale projects (below CZK 1 million).

The soft loan scheme could be based on a similar principle as the Phare ESF revolving fund. The current schemes (mainly Phare ESF) for financing investments in renewable energy will be evaluated and their conditions will be upgraded in order to be more favourable to renewable energy projects. The government should seek possibilities of co-financing the fund from international sources and other stakeholders.

Actions financing

1. 2000-2010: Support for project development will be provided. The estimated amount of State support is CZK 40 million per year.
2. 2000-2010: The Czech government will continue the programme of investment subsidies for demonstration of renewable energy projects. The budget for the investment support will remain at the current level of CZK 110-130 million per year.
3. 2000 – 2010: The government will provide interest rate subsidies to commercial lending and guarantees provision to the lenders. This indirect State support to renewables is CZK 150 million per year.
4. 2000-2002: A long-term, low interest rate financing scheme for medium and small-size investments in renewable energy will be developed. The estimated amount of the share of the State in the establishing of the Renewable Energy Revolving Fund is CZK 300 million.

8. SUMMARY OF ACTIONS

Table 8.1 summarises the actions that have been identified in the Energy Efficiency Action Plan. A distinction is made between those actions that have to be carried out within one year (short-term), the next five years (medium-term), and those actions that are planned for the longer-term. In the first column the Ministry or Agency in charge of the action is listed, while the other Ministries involved are in brackets.

Table 8.1 Summary of actions for the implementation of the Renewable Energy Action Plan

Policy Field	Responsible	Short Term (1999-2000)	Medium Term (2001-2004)	Long Term (2005-2010)
Policy framework	MIT / MoE	Introduction of renewables and its role into Energy Policy with realistic target. Structural dialogue and negotiation framework with all stakeholders in the field of renewables Co-operation with the EU and its Member States-ALTENER, 5 th Framework Programme	Energy Efficiency Policy and Energy Management Act in force	Evaluate Energy Efficiency Policy Evaluate Energy Management Act
	MIT	Investigation the option of promotion of renewable energy production within the framework of the liberalisation of the electricity and gas markets, including changes in new Energy Act		
	National Energy Agency (MIT / MoE)	Elaborate a policy document on renewable energy		Update RE policy every 3 years
Capacity building	MIT / MoE	Increase the number of resources in RE field Promotion of exchange of experiences between Czech and EU policy makers		
National Energy Agency	MIT / MoE	Establishment of the National Energy Agency and its responsibilities in RE		
RE statistics and monitoring	MIT / MoE (National Energy Agency)	Study evaluating in detail the current utilisation of RE Develop RE statistics	Set up monitoring and evaluation framework	
Joint Implementation	MoE	Development detailed Joint Implementation Strategy of the Czech Republic.	Development an administrative framework to handle AIJ/JI projects in the renewable energy field Active search Czech and foreign partners to be engaged in AIJ/JI projects	
Energy price subsidies/ energy taxation / emission levies	MoF (MIT/MoE)	Development plan for removal of subsidies	Removal energy price subsidies Preparation legislation for energy taxation and new system for emission levies	Full implementation energy/environmental tax
	MoE Ministry of Labour and Social Affairs / Min. of Regional Development	Investigation effects of energy taxation and emission levies on energy efficiency Investigation social effects of tax reform		

Continuation Table 8.1

Policy Field	Responsible	Short Term (1999-2000)	Medium Term (2001-2004)	Long Term (2005-2010)
The price of renewable electricity	MoF / MIT	Negotiations with renewable electricity stakeholders about acceptable level of renewable electricity feed-in tariffs Evaluation and preparation of Green Cent Scheme	Implementation of Green Cent scheme	
	MIT, MoF, National Energy Agency	Participation in the on-going debate in the EU on new instruments for the promotion of renewable electricity Stimulation the power distributors and other companies to make the contracts on premium-priced 'green' electricity from renewables		
Market for biomass fuels	MIT		Inclusion of obligation of purchase of district heat produced from RE by the district heat networks operators	
	National Energy Efficiency Agency	Study on setting the fair market of biofuels	Promotion of production of biomass based solid fuels Promotion co-firing of biomass or fossil fuel substitution	
	National Energy Agency / MoA		Stimulation the further research and application of energy forests and energy crops	
	National Energy Agency	Stimulation of utilisation of biomass from local sources and integration of biomass into energy planning procedures		
Financial Measures	National Energy Agency	Evaluation existing subsidy schemes and elaboration new subsidy scheme Support of project development Promotion of commercial lending	Implementation of improved and new subsidy scheme	
	MIT / MoF	Gradual increase of budget of Agency responsible for RE		
	MoF	Preparation of soft loan scheme for RE projects	Launch soft loan scheme for RE projects	

Continuation Table 8.1

Policy Field	Responsible	Short Term (1999-2000)	Medium Term (2001-2004)	Long Term (2005-2010)
Fiscal measures	MoF (MIT)	Investigation of fiscal measures promoting RE	Implementation of fiscal measures promoting RE	
RD&D	MIT	Provision co-financing for EU RD&D programmes	Increase grants in R&D in RE field	
Grid connection and reinforcement issues	MIT	Discussion and negotiations with power distributors about improving and harmonising of grid access conditions for independent renewable power producers	Priority access of renewable electricity sources included to the grid in the new Energy law Development of transparent and fair connection costs schemes to the grid for renewable energy producers	
Information and awareness	National Energy Agency	Development a national strategic awareness and marketing campaign and targeted campaigns Extension of EKIS network	Implementation of national strategic awareness and marketing campaign and targeted campaigns Continuous awareness raising, gathering and gathering and dissemination of information on RE projects	
	Ministry of Education	Include RE agenda in the existing curricula	Introduction basic awareness on RE as a part of the education on the environment	
Promoting Czech industry	MIT	Preparation programme for support of local RE technology producers	Implementation programme for support of local RE technology producers including support of export	
Removing administrative barriers	MIT, MoE	Review of existing planning and administrative measures and barriers	Adjustment existing planning and administrative measures	
	National Energy Agency	Support for regional and municipal authorities in developing plans for the spatial integration of renewables and in the planning of the energy infrastructure.		
	MoE	Evaluation waste management policy	Adjustment waste management policy	

9. REQUIRED STATE BUDGET

The implementation of a new renewable energy policy would lead to changes in the current public budget. In this section, a rough indication is given of the required budget.

The current total annual public budget for the promotion of renewable energy production is about CZK 110-140 million and consists of the following components:

Table 9.1 *Current budget available for renewable energy projects in 1999*

Part of Programme	Managed by	Available for RE projects [million CZK]
MIT	Czech Energy Agency	approx. 50
MoE	State Environmental Fund	approx. 50-80
MoE (R&D)	Directly from State budget	10
Ministry of Agriculture		0
Ministry for Regional Development		0

An estimate was made for the required budget for each single action (see Table 9.2). The total contribution from the state budget for the implementation of the Action Plan is an estimated CZK 4.75 billion for the whole period 2000 to 2010. The average yearly budget is approx. CZK 475 million⁶, which is about four times larger than the current budget. One should be aware that in the current budget only the funds for support programmes are listed, while in the budget of the Action Plan all other costs, e.g. personnel, are included also.

Based on the analysis of the potentials of renewable energy (Table 2.1), the total capital investments needed to achieve the target of 3.5% share of renewable energy sources are estimated at CZK 26 billion. Therefore, the required state support is about 18% of the total expected investment in renewable energy.

⁶ For comparison, in the Netherlands, in the next years, the annual budget is approx. CZK 2 billion for direct subsidies from the Ministry of Economics, excluding the costs for fiscal measures and budgets of other Ministries.

Table 9.2 Review of budget required for the state support of renewable energy in 2000-2010 (in million CZK)

Action	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Setting the RE policy framework												3
Policy document on renewable energy		3										3
Capacity building												50
Increase of capacities		5	5	5	5	5	5	5	5	5	5	50
Exchange of experiences between Czech and EU policy makers	3	3	3	3	3	3	3	3	3	3	3	33
RE statistics and monitoring												2
Study on current utilisation of RE	2											2
Collecting statistical data		3	3	3	3	3	3	3	3	3	3	30
Update of RE policy					3			3			3	9
Programme evaluation action plan		2										2
Programme evaluation			1	1	1	1	1	1	1	1	1	9
AII / JI												2
Detailed Joint Implementation Strategy	2											2
Finding Czech and foreign partners for AII/JI projects	2											2
Improving the price-performance ratio of RE												3
Introduction of Green cent scheme				3								3
Study on setting of biofuels market	1											1
Support of production of biomass based solid fuels	4	4	4	4								16
Support of co-firing of biomass and fuel substitution	20	20	20	20								80
Support of utilisation of energy forests and energy crops		20	20	20	20	20	20	20	20	20	20	200
Integration of biomass into energy planning procedures	10	10	10	10	10	10	10	10	10	10	10	110
RD&D												30
Participation in EU programmes	30											30
Increased R&D budget	30	30	30	30	30	30	30	30	30	30	30	330
Grid connection issues												1
Study on grid connection issues		1										1
Awareness & information												165
General awareness and information	15	15	15	15	15	15	15	15	15	15	15	165
Strategic awareness and marketing plan	20	20										40
Targeted information campaigns	5	5	5	5	5							25
Extended EKIS network	5	5	5	5	5	5	5	5	5	5	5	55
Introduction of RE in education system	20	20	20									60
Fiscal measures												1
Study on fiscal measures	1											1
Promoting Czech industry												110
Support of local RE technology producers	10	10	10	10	10	10	10	10	10	10	10	110
Removing administrative barriers												220
Support of the spatial integration of RE	20	20	20	20	20	20	20	20	20	20	20	220
Financing of RE projects												440
Support of project development	40	40	40	40	40	40	40	40	40	40	40	440
Support of demonstration projects	120	120	120	120	120	120	120	120	120	120	120	1320
Support of commercial lending	100	100	100	100	100	100	100	100	100	100	100	1100
Establishing of the Renewable Energy Revolving Fund		100	100	100								300
Total	460	556	531	514	390	382	382	385	382	382	385	4749

10. IMPACTS OF THE ACTION PLAN

In this section, the main economic, social and environmental impacts of the Action Plan are assessed.

10.1 Economic impacts

A number of economic benefits related to the renewable energy development can be identified. First, inefficiency in energy supply and demand leads to high expenditures for domestic energy production and imports. In the future, imports in the Czech Republic will increase. Increasing energy efficiency will decrease the expenditures for energy imports and decrease import dependency. Secondly, the penetration of renewable energy technologies is often coupled with increase of local production of these technologies.

Based on the analysis of the potentials of renewable energy (Table 2.1), the total capital investment needed to achieve the target of 3.5% share of renewable energy sources is estimated at CZK 26 billion. However, it must be underlined that these investments are connected with other benefits, particularly the avoided fuel costs.

10.2 Social impacts

An increase in renewable energy capacities has social benefits, mainly in the field of stimulation of employment. The manufacturing and installation of renewable energy technologies will require an extension of existing industry and services in this field. This will lead to new jobs. Development of utilisation of biomass-based fuels and waste will lead to an increased need for human resources mainly in agricultural and forestry sectors.

The following table gives a rough estimate of number of new jobs, related to renewable energy technology production, installation, operation and maintenance, which will be created in order to reach the target of share of renewables of 3.5%. The estimated figures are based on studies evaluating the benefits of renewable energy in EU countries and on information from sectoral associations. The total estimate varies in range of 5,000-10,000 newly created jobs in the period until 2010. Also, the number of newly created jobs will depend, among others, on the governmental support to local industry.

Table 10.1 *Renewable energy: estimate of number of new jobs in the period 2000 to 2010*

Renewable source	Number of jobs created
Biomass	4,000-8,000
Wastes	20-40
Active solar systems	300-600
Photovoltaic	30-60
Heat pumps	200-400
Wind power plants	150-300
Small-scale hydro	300-600
Total	5,000-10,000

10.3 Environmental impacts

Increasing the share of renewable energy sources will contribute to the abatement of several environmental problems related to energy production and supply, particularly environmental emissions to air. The increase in the supply from renewables will lead to a decrease in emissions to air caused by fossil fuel based energy supply, in particular CO₂, SO₂, NO_x and dust. The reduction of these emissions will abate global, regional and local environmental burdens. The following table shows estimates of reduction of annual emissions calculated, based on emission factors of electricity and heat sources replaced by renewable energy options. The most substantial benefit of achieving the target of 3.5% of renewables is the reduction of CO₂ emissions by about 4 million tons a year. The total effects on NO_x emissions are small because biomass electricity and heat production has a relatively high level of NO_x emissions.

Table 10.2 *Reduction of annual emissions related to achievement of renewable energy share target of 3.5% in the year 2010*

Technology	Reduction of emissions [tons/year]				
	SO ₂	NO _x	CO ₂	solid particles	CO
Biomass ⁷	42,770	-1,310	3,495,440	5,280	45,530
Active solar systems ⁸	560	90	44,900	110	320
Heat pumps ⁹	3,210	460	208,690	160	90
Wind power plants	570	80	36,580	30	20
Small-scale hydro	5,620	790	365,740	280	150
Total	52.7 kton	110 ton	4.15 Mton	5,860 ton	46 kton

⁷ Biomass is used in substitution of solid fuels (mainly lignite).

⁸ Active solar systems are used for domestic hot water heating.

⁹ Heat pumps are assumed to be an alternative for electric heating.