OPET CHP/DH WP 3

Conversion to Biomass CHP and district heating

Deliverable 3 - 10 - 3

National report

May 2004

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European Commission (Directorate-General for Energy and Transport)
Contract no. NNE5/2002/52: OPET CHP/DH Cluster

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The project "OPET CHP/DH Cluster" has obtained financial support from the European Commission (Directorate-General for Energy and Transport) under the contract no. NNE5/2002/52 for Community Activities in the Field of the specific programme for RTD and demonstration on "Energy, Environment and Sustainable Development - Part B: Energy programme"

Overview of Biomass Utilisation in the Slovak Republic

While final energy consumption per capita in the Slovak Republic is rather low in comparison with EU countries, it is expected to increase alongside an expected growth in GDP and improvements in living standards. The Slovak energy sector is characterised by a high level of energy intensity in comparison with the EU and some neighbouring countries. This is mainly due to the high level of energy demand from heavy industry. The potential role of national renewable energy sources is highlighted by the fact that over 90% of primary energy sources are imported. This means that energy efficiency and increased use of renewable energy sources are of interest to the Slovak Republic from a political and economic perspective in particular regarding the balance of trade.

While renewable energy sources are not currently used to a great extent in Slovakia there is great potential to develop this type of energy. By exploiting the current potential that is economically viable the Slovak Republic could more than double the present use of these resources. Without specific policy measures however only a small percentage of the economic potential will be realised.

A review of the main barriers to energy efficiency and the development of renewable sources leads to the conclusion that while significant changes are needed in the regulatory framework, the lack of access to finance and the general lack of awareness about existing technologies and best practice represent the greatest barriers.

Improvements in energy efficiency and the development of renewable energy sources are closely related to the general economic and social policy. They have a real potential to contribute to sustainable development and economic growth and can affect all areas of economic activity. Furthermore, Slovakia must also take international commitments into consideration when defining its energy targets. This will require significant institutional, legislative and behavioural changes.

In order to evaluate the success of energy efficiency and renewable energy policy, and to adapt priorities according to the results of the evaluation, it is necessary to set quantitative targets in terms of what the chosen policy instruments should achieve. This study involved the calculation of low and high targets for energy policy. The low targets would represent an 11.6% reduction in overall energy consumption. The high targets would represent a 13.6% reduction in overall energy consumption. The low targets would mean an 88% increase in the exploitation of renewable energy sources while the high targets would mean a 130% increase. The latter would exceed the objectives indicated by European policy in this field. The results show that while the differences between the low and high targets are seemingly modest, they represent significant savings in absolute terms, savings which will require important initial investments. Expected savings are lowest in the residential and transport sectors. This can be explained mainly by the level of investment necessary to reach the proposed targets.

Policy instruments have been identified which can turn energy efficiency and renewable sources into one of the driving forces of the country's overall economic and development strategy. Some of these instruments deal with general issues such as general policy issues, regulatory and legal aspects, the institutional framework and fiscal, taxation and pricing policy. They are designed to improve the present conditions and would use only a limited part of the available public budget. A limited number of instruments, requiring a higher allocation from the public budget, has also been selected due to their potential to motivate stakeholders and to demonstrate success stories from other countries which could be replicated in Slovakia. The remaining instruments are directly related to specific sectors and address the barriers identified for each type of stakeholder.

The state budget dedicated to energy issues will need to be increased significantly if the proposed targets are to be realised. This increase in budget allocation would enable the implementation of programmes to significantly reduce energy imports and therefore lead to an improvement in the balance of payments. According to estimations made for this study, the yearly state budget for direct

support should be increased between SKK 560 Million and SKK 700 if the proposed targets are to be realised.

The adoption of these instruments will be beneficial for the entire economy. The most obvious impact is related to the level of energy imports, and therefore the balance of payments. The reduction in energy imports is estimated between 8% (low targets) and 12% (high targets) for natural gas, and between 8% (low targets) and 14% (high targets) for petroleum products. Furthermore it is estimated that the implementation of the proposed energy efficiency and renewable energy policy could create approximately 10,000 new jobs. The annual reduction in CO_2 emissions has been estimated between 9 million tonnes (low targets) and 16 million tonnes (high targets).

Past and future trends of energy consumption

Although the final energy consumption per capita is rather low in Slovakia, in comparison with EU countries, consumption is expected to increase in the next decade along with an expected growth in GDP and improved living standards. One of the main characteristics of the Slovak energy sector is still a high level of energy intensity in comparison with the EU and some neighbouring countries. This is mainly due to the high energy demand of heavy industry.
The level of energy consumption in the next decade is a crucial indicator to estimate the impact of an energy efficiency and renewable energy policy, and to point out the areas where policy measures can be most effective.

Potential for energy savings and renewable energy sources

In order to elaborate an appropriate policy framework it is necessary to assess the potential for energy savings and renewable energy. This potential can be seen in terms of economic potential, meaning the level of savings or energy substitution which can be achieved under ideal conditions, and of market potential, meaning the barriers faced by the market actors.

Potential for the development of renewable energy sources

As far as renewable energy sources are concerned, the technical potential should be divided into different categories. The “full” potential is characterised by existing resources and the possibilities to use them to produce energy by implementing existing technologies. It does not however provide much information, as it is only a theoretical quantity.

Technically exploitable potential: Potential that can be used by implementing available technologies, limited by legislative, administrative and environmental barriers.
Available potential: Technically exploitable potential limited by other uses of the resource.
Economic potential: Part of the available potential that is economically viable, given the social constraints (legislation, fiscal regulations, equipment and operation costs, discount rates, inflation, etc.).
Market potential: Economic potential, taking market barriers into account (investments risks, expected benefits, etc.).

Going on the basis of existing analyses, the technical potential of renewable energy sources is estimated at 87,754 TJ/year, excluding large hydropower plants (over 10 MW) and 107,820 TJ/year including them.

In the case of biomass, the technical potential already excludes uses other than energy for this resource.

Renewable sources have only a 1.6% share in total primary energy consumption; this share doubles if large hydropower plants are taken into account. Only about 17% of the potential for renewables is currently exploited in Slovakia. This means the unused potential is 73,094 TJ/year.

Biomass is the renewable energy source with the greatest technical potential (46% of all RES). This is closely followed by geothermal energy (26%) and solar energy (21%). The technically exploitable potential for wind is less than 3% of total RES technical potential, and that of small hydropower plants is less than 5%. Biomass has also the highest degree of exploitation (almost a third of total biomass resources are exploited). This is followed by small hydropower plants (19.5%). The other renewable sources are exploited to a lesser extent: up to 5.4% of the identified technical potential of geothermal energy is currently used, while only negligible quantities of solar and wind energy sources are used. As a result, the potential available for further energy uses is still rather high, and corresponds to over 83% of the technically exploitable sources.

In terms of technically available potential, biomass comes first with a share of 38% of the available resources; geothermal and solar energy follow closely with 29% and 26% respectively, while hydropower and wind have only a small share with 4% and 3% respectively.

Technically available potential of renewable energy sources, in TJ

Type	Technical potential	Current exploitation	Available potential
Geothermal energy	22,680	1,224	21,456
Wind energy	2,178	0	2,178
Solar energy	18,720	25	18,695
Small hydropower plants (SHPP)	3,722	727	2,995
Biomass	40,453	12,683	27,770
Forest biomass	*6,710*	*1,778*	*4,932*
Energy plants	*6,613*	*0*	*6,613*
Wood industry	*15,862*	*9,497*	*6,365*
Agriculture biomass	*8,359*	*216*	*8,143*
WWTP sludge	*828*	*47*	*781*
Domestic waste	*2,081*	*1,145*	*936*
Total	**87,754**	**14,659**	**73,094**

Potential for renewable energy sources in Slovakia, in TJ, in 2012

Type	Technically available potential		*Economic potential*		Market potential	
	heat	electricity	heat	electricity	heat	electricity
Geothermal energy	20,384	1,073	7,920	504	4,230	125
Wind energy	0	2,178	0	505	0	150
Solar energy	16,321	2,374	4,250	210	1,260	10
Small hydropower plants (SHPP)	0	2,995	0	749	0	299
Biomass	***23,606***	***4,164***	***10,058***	***1,810***	***2,412***	***520***
Total	**60,310**	**12,784**	**22,228**	**3,778**	**7,902**	**1,104**
Grand total	**73,094**		**26,006**		**9,006**	

Given that geothermal energy and biomass have the highest potential overall, and that they contribute significantly to the production of heat energy, it is not surprising that the potential for heat is higher than that for electricity. While the economic potential for heat represents 36.9% of the available potential, that for electricity represents only 29.5%. This trend is also confirmed in terms of the market potential, which is 13.1% of the available potential for heat, and only 8.6% for power.

Potential according to renewable source

Technical potential

Biomass has the highest share of technical potential of RES (42%). This corresponds to an energy value of 40,453 TJ/year. Given the conditions prevailing in the Slovak Republic, it is realistic to use forest biomass, agricultural biomass and waste from wood processing and food industry, to develop energy plants and to use waste biomass from industry in the municipal sector for energy purposes. Considering the present use of biomass resources (12,683 TJ/year), the available potential is 27,770 TJ/year.

Economic potential

It is theoretically possible to install biomass installations in apartment buildings as well as for family houses. However under present conditions, it is most likely that biomass in the residential sector will be used more for single-family houses and district heating systems, including combined heat and power plants, than for large boilers in apartment buildings.

The installation of a biomass boiler in family houses can be seen as economically viable as the investment can be amortised within its lifetime. It can be estimated that about 15% of the family houses using oil or coal-based heating systems will opt for a biomass boiler, when deciding on the replacement of an existing heating system (it is unlikely that natural gas systems will be replaced with oil or coal-based ones).

The installation of a complete DH system based on biomass, is economically viable over its lifetime. What is more likely however is the upgrading of existing DH systems based on fossil fuels (e.g. oil, coal). In the case of a switch from fossil fuels to biomass, it can be estimated that about 15% of all households connected to DH systems would switch to biomass. For CHP, large installations (over 10 MW) can be regarded as more economically attractive than small units, and it can also be estimated that half of the technically available potential is viable, provided that sales of power to the grid can benefit from fair feed-in tariffs.

Waste incineration plants for domestic waste are characterised by high specific investment costs. Such plants can be run profitably over their lifetime (payback period approx. 16 years). Assuming an input of approximately 100,000 tonnes of domestic waste per year to new waste incineration plants, the total heat output generated is estimated at 65% of the available potential.

The economic potential represents approximately 20% of the available amount of waste wood used by the industry for their own energy consumption.

Under the short-term environmental requirements for accession to the European Union, all agglomerations with over 10,000 inhabitants should have waste water treatment plants (in the medium-term this requirement applies to agglomerations with over 2,000 inhabitants) This will certainly result in a drastic increase in the volume of sludge readily available. However, due to the high level of investment involved in building plants which can use the sludge to gain energy, the economic potential for the use of this resource is considered to be null.

Market potential

The cost of biomass installations in family houses, without any subsidy, would be 35% higher than the cost of gas installations and approximately 62% higher than the cost of coal installations. Similar price levels could be reached only in the case of 50% subsidies, which is not realistic. With a funding level of 30% (which is the average level in some EU countries), the cost would still be 15% higher. In addition, as the acceptable payback period for households is 4 to 5 years and biomass installations have a payback period of 11 years, it is very unlikely that investors will opt for biomass installations. The under-developed fuel supply chain for biomass and the low level of awareness among households about the performance, reliability and costs of biomass systems represent further major barriers to biomass utilisation. As a result, the market potential for biomass for family houses can be estimated at only 2% of the economic potential, if no funding is available.

Biomass is much more competitive for district heating installations, and could reach about the same price level as oil DH systems without any funding. It would still be 17% more expensive than gas DH. Again, taking a realistic level of 30% funding into account, biomass DH would be able to reach the same price as gas, although it is unlikely that installations will switch from gas to biomass. Given the payback period (16 years) for new district heating networks, requiring the installation of the global system (including pipes), as well as the current large coverage of DH networks, the market potential lies more either in small networks, in rural areas, or in the substitution of fuels, especially for systems using fuel oil. As a results the potential for biomass for district heating installations is estimated at 20% of the economic potential. The market potential for co-generation with biomass is rather limited, due to current high investment costs. A reasonable part of the potential (10% of the available resource) could be realised however, provided that operators use the existing support programmes.

One barrier to building further large capacities for treating domestic waste is the long payback period - (16 years), assuming that operators will have to charge high prices for taking over the waste for incineration. This price burden will then be transferred to households through increased fees for waste collection. Reducing these fees will make the plants unprofitable. Therefore, the market potential is estimated at 20% of the available potential.

The following table presents the economic and market potential for the different uses for biomass.

Uses	Economic potential	Market potential
Individual boilers	1,998	40
DH networks	6,156	1,242
Electricity through CHP	1,810	520
Wood processing industry	1,274	950
Domestic waste	630	187
Total	**11,868**	**2,932**
% of technically available potential	42.7%	10.6%

Barriers related to the policy, legal and regulatory framework

Slovakia already has a general framework for energy policy but this focuses mainly on the supply side: security of supply and market liberalisation to meet the requirements of accession to the European Union. Part of this policy deals with the sustainable development of the energy sector, indicating the need for energy efficiency and the promotion of renewable energy sources. However, the policy provides only a general overview of energy savings in each sector and of renewable energy sources and gives no indication of concrete targets nor possible instruments.

Under its preparations for accession to the European Union, Slovakia has successfully negotiated its Energy Chapter and is harmonising its energy legislation with the *acquis communautaire*. The adoption of the relevant legislation is considered to be proceeding at a good rate and is not expected to present any specific difficulties. The steps taken under the accession process are mainly related to the supply side (e.g. privatisation of utilities, amendments to the energy act, etc.). Many directives and standards related to energy efficient equipment either have been or are in the process of being adopted. The barriers presented below concern only EU requirements which either have not yet been adopted or for which there are currently no plans for introduction. A list of the laws and directives currently relevant is presented in Appendix 1.

The barriers included in this group are as follow:

Lack of precision of the Energy Act

The Energy Act, adopted in 1998 and amended in August 2001, does not yet include some principles established by the EU for the common market of electricity, gas and district heating. The role and responsibilities of the Regulatory Authority are not specified either. Although many EU directives concerning energy conservation and which constitute part of the *acquis communautaire*, have been approved separately, no real state energy strategy has been elaborated.

Slovakia has not yet stated clearly how energy efficiency and renewable sources should be supported. The rights and obligations of energy suppliers and consumers must be addressed in an official document. To give an example, there are currently no sufficient provisions to ensure that energy (especially heat) is supplied to users according to good standards of service, or that the supply could be interrupted in case of non payment by the user.

Lack of integration of energy in public procurement laws

Procurement criteria do not usually take a life-cycle cost analysis into account, thus discouraging the purchase of energy efficient equipment that while requiring a higher investment would involve lower operating costs in comparison with conventional solutions. Additionally, regulations applied in the construction sector to set energy standards for new buildings or retrofitting of existing ones mainly concern energy savings but rarely deal with or promote the use of renewable energy source.

This issue is especially important for municipalities, who have a double role as suppliers of energy (e.g. district heating) and consumers (e.g. as managers of public buildings).

Lack of regulation/legislation on certain technologies (CHP, heat pumps, RES)
Certain technologies, not yet widely used in Slovakia, particularly those that could contribute to the diversification of energy supply, are not sufficiently addressed by the regulatory or legal framework. This is particularly true in relation to:

- fair access to or even preference for CHP or renewable sources in the case of retrofitting or procurement of new equipment;
- the obligation for transmission system operators to accept electricity generated by renewable sources or CHP;
- the determination of the level of energy produced by these sources and;
- the standards for the construction, and site planning and permitting for renewable energy installations.

Lack of organisation within the energy sector

Lack of organisation is particularly true for suppliers of energy efficient and renewable energy equipment and for certain energy suppliers such as district heating companies. It is also true for consumers. Altogether it results in a lack of mobilisation of stakeholders and their inability to lobby for their interests.

Institutional framework

This group of barriers concerns the implementation of energy policy and the management of energy programmes by public or even private institutions.

The most significant barriers relevant for the institutional framework are:

Lack of co-ordination between different institutions

Various institutions are currently involved in implementing energy policy by providing permits or licenses, carrying out control activities, disseminating information and running funding programmes which can be used for energy efficiency or renewables projects. For example the Ministry of Economy, the Ministry of Agriculture, the Ministry of Environment and the Ministry of Construction offer support for energy efficiency and renewable energy projects (see the following chapter for more details). However, these efforts are not fully co-ordinated, leading to a lack of efficiency in the use of resources.

Moreover, the criteria for granting permits or licenses, while making sense in one sector, could have negative repercussions in the energy sector, if not co-ordinated with the relevant authorities. Several public or private organisations offer services to different market actors (industry, households, etc.), but a large range of advice and support is still not provided.

Lack of monitoring and evaluation of programmes and policy

Although monitoring and evaluation is extremely important to measure the success of a policy or support programme and to readjust their priorities if necessary, little has been done in this field. The dispersion of resources and lack of staff have largely contributed to this situation. If a medium and long-term energy efficiency and renewable energy strategy is to be implemented, it needs to include a strong and consistent methodology for assessing the results of the initiatives undertaken and orienting future policy accordingly.

Lack of dedicated teams within the relevant authorities

Another barrier is the lack of structure within the institutions in charge of identifying and implementing energy efficiency and renewable energy policy, and their limited means in terms of staff and financial resources. In most ministries, only one person is responsible for these issues in addition to his/her other duties. At the Ministry of Economy, priority has been given to the preparation of The Energy Chapter to be negotiated with the EU, as well as to the privatisation of the main gas and electricity utilities, and the establishment of the Regulatory Authority. As a result, insufficient attention is being paid to other issues considered as secondary.

Lack of state commitment to support a national energy agency

The shortage of staff dedicated to energy issues in public administrations is aggravated by the lack of financial support to an active national energy agency. No state budget is currently or will be in the short-term earmarked to that purpose. Although the Slovak Energy Agency acts as such, especially at the regional and the international levels, it is presently forced to rely on external funding (from private companies, households, international funding) rather than benefiting from public support for activities usually undertaken by such agencies. This situation also implies a lack of direction for SEA's strategy and activities, resulting in a waste of resources.

Unsuccessful local and regional energy planning

Energy concepts have been prepared in most regions of the Slovak Republic, but the majority of the plans have not been implemented. This has a number of reasons, varying from the lack of finance, to the lack of political commitment to energy issues, and to the lack of information of decision-makers. The newly elected regional councils are however now responsible for managing health, educational and environmental issues on the regional level. This should contribute to an improvement of local and regional energy planning in the long-term.

Access to finance

These barriers concern access to public (supporting programmes) or private funding (from banks, ESCOs, etc.) by market actors who want to invest in energy efficiency and renewable energy sources.

All sectors are concerned by the lack of capital:

a) *In the residential sector*, there are few incentives to use the little capital available for the thermal renovation of buildings or the improvement or replacement of energy equipment and appliances. Rents do not usually cover the costs of major renovations and tenants do not feel ready to invest in a property that does not belong to them. The main difficulty faced by owners is that they are not able to benefit from the savings created through their investment in energy conservation.

   In addition, owners are often unable to provide adequate guarantees to commercial banks, who do not consider buildings as a sufficient guarantee. This virtually bares access to credit for co-operatives who do not have any other assets than the buildings they own.

b) *In the tertiary sector*, and mainly in public buildings, the source of funding for investment and management generally comes from the state or the municipal budget. Building managers are allocated a certain amount yearly, but as any unused part of the budget goes automatically back into the general state budget they cannot benefit from energy savings.
c) *In industry* available capital is firstly used to modernise production processes, necessary for the very survival of the companies. Therefore, the introduction of energy saving equipment and processes is not usually perceived as a priority, let alone an opportunity to reduce costs.
d) Limited capital is available for the renewal of fleets and improvement of the service *in the transport sector,* generally managed by public companies under the control of municipalities for urban transport, and state authorities for road and rail transportation. This problem is mostly due to the lack of integration of transport issues in urban and regional planning.

These barriers can be summarised as follows:

Very limited public funds to support EE and RES at national level
Despite the various sources of public financial support, the overall amount of funding available is very limited (SKK 150 Million, or EURO 3.4 Million). The details of these support programmes are presented in the following chapter (Chapter 4). This budget is insufficient to meet requests from applicants to existing funds. It is even less adequate in terms of financing part of the energy efficiency and renewable energy policy that would be necessary to overcome the most serious barriers presented here. If a real and effective policy is to be implemented, a political commitment has to be made and resources allocated to release its objectives.

Bureaucratic scheme for state support funding

A number of criteria used to select proposals which will be funded by state support programmes are very difficult to meet and *de facto* excludes potentially good projects. For example applicants for state funding may not have any debts. This severely limits the number of eligible private or public entities. Furthermore, the criteria might vary from a scheme to another.

Information and awareness

These barriers concern the level of awareness of the market actors about not only the potential savings but also about the comfort and improvements they might enjoy through using energy efficient technologies or, in case of public decision-makers, the potential impact on the overall economy. They also concern access to information on requirements (e.g. for the building sector), possible tax exemption and funding opportunities.

Lack of information among users about consumption and energy costs
Lack of information about energy consumption and costs affects all sectors, but is particularly important for industry and the residential sector, for whom it is an essential input for an investment decision. The energy checks presently carried out in industry do not provide sufficiently reliable data to identify energy flows and overall consumption, to identify potential energy efficiency measures and related cost-savings. In the residential sector, it is often difficult for users to monitor their own consumption due to the billing method which often divide the costs according to the number of flats in a building, and not the actual consumption. The issue of energy prices, as discussed above, also contributes to confusion in assessing the real costs.

Lack of information on the availability and reliability of EE and RE technologies
Even if they were aware of their energy consumption and related costs, many potential investors (households, public authorities, building managers, industrial managers) lack information on the technologies that could reduce their consumption. They often do not know where to find this

information and are not aware that savings can be realised through simple measures that do not entail a high investment (good housekeeping).

In the cases where information is available, it is usually incomplete and fails to convince end-users that energy savings equipment are reliable and efficient. This is an even stronger issue as far as renewable energy sources are concerned. Additionally, retailers and installers themselves are often unaware of the available technologies, or unable to advise users on the most appropriate equipment to meet their needs. Maintenance services are not properly guaranteed in some cases and this can contribute to a lack of confidence into the technologies available. Architects and planners have also a very limited knowledge about best available technologies, and little experience in carrying projects in this field.

Lack of awareness of additional benefits
Other benefits in addition to energy savings are generally not considered when investment decisions are made. Increased information about these benefits could encourage consumers to opt for more efficient equipment. The additional benefits vary according to the different end-users:

Industry: control of energy consumption; lower operational costs (for fuels and other elements, such as water); improved quality of products; reduced and/or better maintenance; improved workers' health (air quality, lighting conditions, etc.); increased skills in workforce; improved image; etc.

Households: control of consumption and costs; improved comfort; reduced water consumption; reduction of the deterioration to the thermal envelope; increased value of property; etc.

Public authorities: control of consumption and costs; improved comfort in offices and stated-owned accommodation; better qualified employees; increased value of assets, etc.

Other advantages for society in general include: lower water consumption and lower waste and waste water production; reduced greenhouse gases emissions; improved health and safety; developed professional skills and employment.

Additional barriers to the development of renewable energy sources

Although some of the barriers mentioned above are also relevant for renewable energy sources, a number of barriers are specific to renewables, mainly because of their higher investment costs in comparison with technologies using conventional fuels.

Power over-capacity
The present over-capacity of power plants in Slovakia represents a major barrier to the development of renewable energy, discouraging investment in medium or large renewable electricity plants. The largest share of electricity is generated by nuclear energy (44% of the total power production). Decommissioning and shut down of two nuclear power plants are being planned for the period between 2006-2008.

Uncertainty of RE prices in future pricing policy
At the moment, due to cross-subsidies, it is difficult to compare the production costs of energy generated by renewable sources with those generated by conventional sources. However, it can be said that feed-in tariffs, variable according to the region of production and the utility purchasing it, are insufficient to ensure the profitability of renewable installations for independent producers, therefore limiting the competitiveness of these installations. Moreover, the level of VAT applicable to renewable energy technologies is higher than for more conventional ones, and the level of depreciation of investment is also higher, reducing their margin even more.

The forthcoming regulation of prices and progressive liberalisation of the energy markets does not cover any plans to prepare a strategy for renewable energy tariffs, in particular renewable energy generated by independent producers. Under the current conditions, it is unlikely that the potential for developing these sources will be realised.

Connection to the grid
Under the prevailing conditions in Slovakia, the public grid cover almost all users (98%). Technical and financial considerations can present difficulties when independent producers are willing to feed the grid with their surplus electricity. These include for example the voltage or the volume requirements of the utilities, or the cost and standards of connections which can substantially increase production costs.

Efforts should be undertaken to set standards and common regulations to avoid penalising independent power producers, while guaranteeing a good quality output.

Risk appraisal
Investors often consider renewable energy technologies as representing a higher risk than conventional sources. This perception is reinforced by the higher discount rates and interest levels associated with the external funding of renewable projects. The lack of confidence in the technologies' performance, the lack of organisation within the sector (manufacturers, maintenance service providers, spare parts suppliers), the uncertainty related to the continuing availability of the resource, and the perceived lack experience of project promoters are the main criteria to estimate the risks as being high.

These barriers can only be overcome by a strong dissemination of information on the performance and reliability of renewable energy systems, through demonstration projects and success stories.

Lack of installation and maintenance know-how
Even more than for energy efficient technologies, renewable energy equipment is seldom well known by installers. They are unable to propose alternatives to conventional materials even where the possibility exists. The lack of trained staff in maintenance of this equipment reinforces the perception of poor performance or reliability.

Public authorities, in collaboration with representatives from the equipment manufacturers and installers, should support the definition of a strategy for promoting these systems in their organisations and organise technical training on proper installation and efficient maintenance.

Lack of organised marketing and lobbying
Although a number of renewable technologies exist in Slovakia, only a few domestic manufacturers (mainly for biomass technologies) are actually offering their products on the market, which is dominated by imported products. There is scope for the development of an emerging industry in this sector, through the creation of joint ventures or associations with international companies that would also provide their standards and practices. Joining existing European networks could help strengthen the sector. Although there are a limited number of interested parties, the sector is not well organised and does not undertake the necessary steps to promote its products to the public and to get support from the authorities to support their activities.

Support programme for energy efficiency and renewable energy sources

This programme, supported by the Ministry of Agriculture, Forestry and Water, under the co-ordination of the Ministry of Economy, offered subsidies between 1995 and 1998 for projects to save energy, reduce energy intensity and develop renewable energy sources. The yearly budget amounted to about SKK 30 Million and resulted in energy savings of approximately 160 GJ per year.

Performance indicators for the programme "Energy efficiency and renewable energy sources", 1995-1998

Indicator	Unit	1995	1996	1997	1998	Total
State subsidy	MSKK	19.2	40.5	35.6	22.75	**118.05**
Nr. of projects		17	17	33	27	**94**
Energy savings	GJ/year	100.2	275.2	-	-	**Average 187.7**

Current programmes supporting energy efficiency and renewable energy sources

The state budget presently, funds three main programmes to support energy conservation and the promotion of renewable energy sources.

The total amount of state budget allocated to support energy efficiency end renewable energy projects reached a peak in 2001 with just over SKK 150 Million (EURO 37.5 Million). As these programmes were only implemented recently, only partial data is available concerning their results in terms of savings or energy generated.

The analysis of eligible projects under these programmes shows that there is an overlap between the first fund (for projects on energy conservation and renewable sources) and the second (for projects on energy intensity reduction and the use of alternative fuels and energy sources); and between the first and the third programmes (for projects on housing development) in terms of energy efficiency. Moreover, some sectors, such as transport, do not have any specific budget for energy saving measures.

Programme supporting energy conservation and the utilisation of renewable sources

This programme, introduced in January 2000 to replace the former programme described under Section 4.1.1, is managed by the Ministry of Economy. The implementing agency is the Slovak Energy Agency.

The programme's objective is to create favourable conditions for investments in energy efficient technologies. The budget is approximately SKK 30 Million per year.

Eligible projects:

1. Energy savings in residential buildings
   - Purchase and installation of regulation and control equipment
   - Retrofitting of heating systems: condensation boilers and CHP units up to 10 MW_e
   - Development of district heating systems and optimisation of their extension
2. Use of renewable energy sources
   - Construction of small hydro power plants
   - Energy use of biomass
   - Installation of solar collectors
   - Use of geothermal energy
   - Use of wind energy
   - Use of heat pumps
3. Promotion of energy efficiency
   - Implementation of energy saving and renewable energy technologies
   - Rationalisation of fuel and energy consumption with significant effects
   - Substitution of fossil fuels, especially through the production of biomass processing technology.

Form and scope of support:

- Partial compensation of loan up to 70% of basic interests (at the interest rate applicable at the date of signature of the loan agreement). It should not, however, exceed 4 Million SKK per project.
- Repayable financial assistance, with a total amount not exceeding 3 Million SKK per project, and a pay-off period of three years. This form of support may be provided only to the projects of Group 1 and only to legal persons.

Financial limits:

- Projects generating electricity savings through the acquisition of new equipment with higher energy efficiency: 1.2 SKK/kWh per year as maximum
- Project generating electricity savings through the installation of energy efficient equipment: 0.30 SKK/kWh per year as maximum
- Projects generating heat savings through the acquisition of energy efficient equipment: 300 SKK/GJ per year as maximum
- Projects generating heat savings through the installation of energy saving equipment: 100 SKK/GJ per year as maximum
- Projects using biomass to produce wood chips, briquettes and pellets: 300 SKK/t of annual production as maximum
- Projects aimed at using co-generation units: maximum 500 SKK/GJ of annual heat production, and maximum 3 SKK/kWh for annual electricity generation,
- Projects using alternative energy sources: maximum 100 SKK/GJ of annual heat production and maximum 4 SKK/kWh of annual electricity generation.

Selection criteria:

- no negative impact on the environment
- investment effectiveness related to payback period
- creation of new job opportunities
- improved export performance
- priority to projects to be conducted in areas with unfavourable climatic conditions and projects using materials, equipment and devices manufactured in Slovakia
- the project must be implemented only in the territory of the Slovak Republic

- additional criteria:

for groups 1) and 3): applicants should be free of debts; the project duration is maximum 12 months; the project must be completed within one year of submission of an application

for group 2): applicants should be free of debts; the project duration is maximum 24 months.

Programme for the reduction of energy intensity and the use of alternative sources of energy

The budget for this programme, launched in 1999 by the Ministry of Agriculture under the co-ordination and supervision of the Ministry of Economy, has increased over the last 3 years:

Year	Budget proposed	Budget allocated
1999	SKK 30 Million	SKK9.25 Million
2000	SKK 40 Million	SKK16.2 Million
2001	SKK 74 Million	SKK0.33 Million (one project only)

Eligible projects

- Use of biomass in the agriculture and foodstuff processing sectors
- Use of forest biomass
- Use of solar energy
- Use of geothermal energy for heating
- Use of hydro power
- Use of straw and other forms of agricultural and forest wastes for energy purposes.

List of large-impact renewable energy projects

The following list presents two groups of projects:

- Projects already identified, that should be implemented within the next few years

Examples of large-impact projects that could be implemented through the fund for demonstration projects or by the suggested financing sources listed above.

Energy efficiency projects

State support, demonstration projects	Recycling and more efficient use of materials for glass, paper and process scrap.
State support, Revolving fund	Reduction of heat losses in industrial buildings: envelope insulation, replacement or retrofitting of windows, and heat and ventilation control.
GEF	Implementation of large cogeneration units in industry (>50 MW).
Bilateral co-operation, JI	Fuel switch to more environmental friendly fuels.
ESCOs	Implementation of small cogeneration units (<50 MW)
Commercial banks	Heat recovery from exhaust gases of kilns and furnaces
Commercial banks	Reduction of losses in drives: implementation of variable speed drives and high efficiency motors
Commercial banks	Improvement of heat production and distribution: control of burners and reconstruction/renovation of boilers

Residential sector

State support	Improvement of the thermal quality of buildings: roofs, walls, windows and indoor insulation
State support	Improvement of heat distribution production and distribution in buildings
State support	Implementation of metering and control for heating systems

Tertiary sector

State support	Improvement of the thermal quality of buildings: roofs, walls, windows and indoor insulation
State support	Energy efficient lighting
ESCOs	Improvement of heat production and distribution in public buildings
ESCOs	Implementation of cogeneration units in hospitals

District heating and combined heat and power

Private investors	Installation of combined heat and power plant (19 MW) in Holíč
ESCOs	Installation of new CHP/DH plant (50.4 MW) to supply heat for space heating and warm water and electricity for the regional grid.
	Installation of new combined cycle with CHP source (332 MW), providing heat supply for industrial process and for heating and warm water for the city Humenné, and electricity for the regional grid.
IFIs, JI	Combined heat and power in the district heating system of Pezinok
	Combined heat and power in the district heating system of Malacky
	Combined heat and power in the district heating system of Detva
	Combined heat and power in the district heating system of Brezno

Renewable energy projects

GEF	Fuel switch from coal to biomass (straw) for district heating systems in. Prenčov
EU/ISPA	Replacement of coal and gas-fired boilers by biomass for the district heating of Žilina
ESCOs, Private investors	Replacement of obsolete gas-fired district heating plants by biomass in Poprad.
Commercial banks/ Bilateral co-operation	Fuel switch from brown coal to biomass (wood) for district heating in Turzovka.
Commercial banks/ Bilateral co-operation	Replacement of brown coal-fired boilers by biomass (wood) systems in Kružlov.
State support, Demonstration projects	Installation of a large central biomass boiler (wood chips) for space heating and domestic hot water in a community building.

State support, Revolving fund/private investors	Biomass boilers for family houses (<25 kW).
ESCOs/Revolving fund	Heating plant burning wood and wood waste (500 kW to 3 MW) for municipalities.
State support, Demonstration projects	Boilers using cereal and rape straw (300 kW to 1 MW) in municipalities.
GEF	Incineration of municipal waste and production of combined heat and power

Biogas

ISPA	Waste water treatment plant and bio-gas utilisation in various municipalities (280,000 m^3 /year each).
GEF	Waste water treatment plant and bio-gas utilisation, with use of CHP in food industry.
GEF	Utilisation of landfill gas in Hanušovce.

Small hydropower

Private investors/ Commercial banks	Realisation of a series of micro hydropower plants on the Hron river.

Geothermal energy

IFIs/private investors	Installation of a district heating system using geothermal energy, heat pumps and natural gas in Tvrdošín (30 MW installed capacity)
IFIs/private investors	Installation of a geothermal district heating system (100 MW capacity) in Košice.
Private investors	Development of small heating systems using geothermal energy in the tourism sector.
Public support/EU co-funding	Use of geothermal energy for housing and cultural/sport facilities, as well as for agriculture purposes.

Wind energy

Bilateral co-operation	Installation of 2 wind farms funded under Austrian and Danish co-operation.

Solar energy

State support, Revolving fund	Solar thermal installations in apartment buildings for domestic hot water.
State support, Revolving fund/ private owners	Solar thermal installation and heat pumps for family houses.
State support, demonstration projects	Solar thermal installation for public buildings, e.g. sport facilities, swimming pools.
Private investors	Equipment of telephone booths with photo-voltaic by a private telephone company in Bratislava.
State support, Demonstration projects	Use of photovoltaics for telephone boothes and highways signs

Energy efficiency and renewable energy policy objectives and targets

The improvement of energy efficiency and the development of renewable energy sources are closely related to the general economic and social policy of most countries. They have a real potential to contribute to sustainable development and economic growth, and can affect all areas of economic activity. Furthermore, international commitments must be taking into consideration during the definition of Slovakia's objectives. This will require significant institutional, legislative and behavioural changes.

In order to evaluate the success of energy efficiency and renewable energy policy, and to be able to adapt priorities according to the results of the evaluation, it is necessary to set quantitative targets in terms of the outcomes of the implementation of the chosen instruments.

Policy objectives

Energy production and use have strong impacts not only on the competitiveness of the Slovak economy, with an industrial base which is largely export-oriented, but also on the quality of life of the Slovakian people. They can also have a strong impact on public finance, as Slovakia has only limited domestic energy resources. Due to the structure of economic production in the Slovak Republic, the energy intensity is 1.8 times higher than in developed industrial countries, after calculation of the purchasing power parity.

The Slovak Republic is opening to the world economy and will soon integrate the European single market. In these conditions, it will need to use all available opportunities to reduce costs, including the largely untapped resources represented by energy savings and renewable sources.

Current energy use also has strong negative impacts on the environment. Although this situation has improved over the past few years in Slovakia, considerable progress is still needed. To be effective, present initiatives need to focus on well-identified priorities and to be co-ordinated with the national and international objectives of sustainable development.

The Energy Policy approved by the government in 2000 concentrated on the supply side, while energy efficiency was paid only limited attention. The need to develop renewable energy sources has been recognised but no comprehensive plan of action has yet been proposed. Slovak energy policy has lately relied on freeing market forces by reducing energy price distortions.

Apart from legislative amendments, relevant to energy efficiency, the main direct instruments of the Slovak energy efficiency and renewable energy policy consist of three support programmes managed by the Ministry of Economy (Programme Supporting Energy Conservation and Use of Alternative Energy), the Ministry of Agriculture (Programme of Energy Intensity Reduction and Use of Alternative Fuel and Energy Sources) and the State Fund for Housing Development. As described in Section 4.1 of this report, the funds attributed to these programmes are rather limited (SKK 150 Million per year). Even with a significant increase in the state budget for these purposes the mobilisation of private funding for the necessary investments will still be required.

Energy efficiency, exploitation of renewable energy sources and economic and social policy

Energy imports, mainly natural gas and oil, weigh heavily on the Slovak balance of payments. A reduction in energy consumption and increased use of domestic resources resulting from energy conservation measures and the development of co-generation, as well as a larger exploitation of renewable sources, would help to free capital for other purposes, such as increasing the well-being of the population. The same can be said at the micro-economic level. A reduction in energy costs would increase the competitiveness of enterprises and encourage investments.

Additionally, the implementation of measures in the field of energy should contribute to the development of new professional skills and the creation of qualified jobs, in the private as well as in the public sector.

Policy targets

Existing energy policy in Slovakia does not cover any specific targets in terms of energy savings or the share of energy to be generated by renewable sources. This section proposes indicative targets to be reached by the year 2012. These targets have been set according to the following:

- Present and future trends in energy consumption
- Economic and market potential for energy savings and renewable energy sources
- Analysis of barriers limiting the realisation of full economic potential
- The general principles governing energy policy in Slovakia

Two sets of targets are proposed. The low targets correspond to the adoption of a "mild" energy efficiency and renewable energy policy, including the remaining measures necessary to implement the *acquis communautaire*. The higher targets reflect a stronger policy and are coherent with the scenarios describing energy consumption to the year 2012 (see Figure 5). One important criteria for the calculation of these targets was to develop realistic targets, in order to propose a sustainable policy, affordable by market actors and the society as a whole.

The results of the policy can be seen by the level of energy savings and increase of the use of RES. When they are situated at a higher level than the market potential (which should be realised without additional policy measures), the policy can be declared successful. It is therefore interesting to compare how the targets are fixed in comparison with the economic and market potential.

Given the short time remaining to the year 2005, it is difficult to set credible and concrete short-term targets, which could be significant in evaluating the effectiveness of new energy efficiency and renewable energy policy. Therefore the targets proposed here are to 2012.

The target for overall end-use energy efficiency is derived from the contribution of each end-user group separately (industry, agriculture, tertiary sector, residential sector, and transport). The approach per user group is necessary to develop sector-specific energy efficiency policies, but also because of specific constraints and possibilities in meeting these objectives under prevailing conditions in the different sectors. The main priorities for each sector, based on the work undertaken for this study, are outlined in the following sections, and constitute the basis for the calculation of these two sets of targets.

The proposed targets will be discussed with the Slovak authorities and key stakeholders. After finalisation, they should be integrated into the official documents presenting the national energy efficiency and renewable energy policy.

Proposals for renewable energy targets

Renewable energy sources can significantly participate in the Slovakia's objective of diversification and security of energy supply. Furthermore, the development of renewable energy sources are closely related to the general economic and social policy. They have a real potential to contribute to sustainable development and economic growth, and can affect all areas of economic activity. Furthermore, international commitments must be taking into consideration during the definition of Slovakia's objectives. This will require significant institutional, legislative and behavioural changes, and the state can provide a level-field for renewables in comparison with fossil fuels.

The targets can be set in accordance with the White Paper of the European Commission i.e. at least a doubling of renewable energy's share in the energy balance for the year 2010. The arguments for renewables presented in the White Paper, i.e. security of supply, environment, business opportunities, regional development are particularly valid for the Slovak Republic. This represent a general target of 12% of renewable sources in the gross inland energy consumption for the whole Community for the year 2010, which corresponds to a specific share of 22.1% for consumption of electricity.

In Slovakia, a target of 4% has recently been chosen for the year 2005; however, this target is unlikely to be realised in the next three years under the present circumstances, as too many barriers remain to the development of these sources.

Two sets of targets are proposed in the framework of this study. The low targets correspond to the adoption of a mild renewable energy policy, including the remaining measures necessary to implement the *acquis communautaire*. The higher targets reflect a stronger policy and are coherent with the scenarios describing energy consumption to the year 2012.

The high target proposed represents more than a doubling in the share of renewables up to the year 2012 (130% of increase of the present exploitation). This corresponds to approximately 3.8% of the share in energy consumption. The low target represents a significantly lower development (88% of additional exploitation of renewables), which is about 2.6% of the energy consumption. Although the high target is only slightly lower than the one previously fixed (4%), its horizon is the year 2012 and not 2005. An important criteria for the calculation of these targets was to develop realistic goals, in order to propose a sustainable policy, affordable by market actors and the society as a whole.

Targets for the development of renewable energy sources, 2012, in TJ

	Low targets			High targets		
Source	**Heat**	**Electricity**	**Total**	**Heat**	**Electricity**	**Total**
Geothermal energy	6,015	185	6,200	6,726	374	7,100
Wind energy	-	220	220	-	365	365
Solar energy	1,790	60	1,850	2,850	130	2,980
Small hydropower	-	310	310	-	452	452
Biomass	3,708	555	4,263	6,995	1,299	8,294
Total	11,513	1,330	12,843	16,571	2,620	19,191

The short-term focus should be on establishing a favourable legislative, support and fiscal system to increase investment in biomass boilers for district heating companies. Because the market potential for geothermal energy is relatively high, the high targets set are likely to be reached. A significantly

higher use of biomass is suggested for the high target, supported by a strong series of policy instruments.

Main characteristics of the new energy efficiency and RES policy

Due to public budget constraints, a special effort has been made to select low-cost instruments and to identify external funding sources. However, to reach even the low target of an 11.6% reduction in energy consumption and that of increasing the share of renewable energy source by 88% (less than the EU target of doubling the share), the state budget dedicated to energy issues will need to be increased significantly. An even greater increase in budget allocation would be required to achieve the higher targets of 13.6% and 130% respectively. A significant increase of the available budget allocation would enable the implementation of programmes to significantly reduce energy imports, and therefore an improvement in the balance of payments.

Where applicable, links between Slovakian and EU policy and programmes are high-lighted, in addition to the availability of funding from sources other than Slovakian authorities.

Over 80 instruments have been identified to make energy efficiency and renewable sources one of the driving forces of the country's policy in terms of e.g. the accession process, other international commitments such as the Kyoto Protocol, Slovakia's membership of international organisations and the improvement of the economic and social indicators.

The main difficulty in assessing the overall energy policy in Slovakia is the disparity of information and policy documents according to the various sectors of the economy. Most of the policy is oriented towards the supply side, as formulated in the Energy Law, or in the international commitments made by the country (Energy Chapter for the Accession to the EU, International Energy Agency). Although the lack of energy efficiency policy is often noted, little has been done so far to formulate a comprehensive and coherent strategy for the demand side. While action plans have been developed for the transport sector and combined heat and power systems (also included in this study), energy issues in other sectors such as industry or the building sector are not dealt effectively. In addition, a strong strategy is lacking to promote wider use of renewable energy sources and contribute to the diversification and security of supply which is one of Slovakia's main objectives.

Policy framework

Renewable energy concepts

In addition to the elaboration of a general strategy, detailed concepts should be designed for the main types of renewable energy sources. Appropriate strategies reach the different target groups are also necessary. First priority should be given to biomass, given its importance both in terms of the available resources and the existing potential, followed by small hydropower and solar thermal energy. The detailed concepts should:

- include credible targets;
- identify the sector stakeholders and their role in the development of the resource and;
- define concrete measures to be implemented by the State as well as by the market actors.

The development of these concepts would be best out-sourced by public authorities to specialised experts and consultants. These documents should also be updated on a regular basis (approximately every 5 years).

Renewable energy policy

The development of renewable energy sources in Slovakia is limited by a series of technical and non-technical barriers.

The common perception is that RE equipment involves much higher investments than equipment required for conventional energy sources, although the operational costs are lower. The present price distortion in Slovakia also means that heat and power generated from independent sources at on average more expensive than heat and power generated from conventional sources.

Furthermore, a lack of organisation among manufacturers of the equipment and within the supply chain (especially for biomass) and the lack of knowledge among those who install and maintain the equipment have contributed to the perception that renewable energy technologies, are unreliable.

Renewable energy technologies are often seen as a "luxury", which could moreover have negative environmental impacts (e.g. disturbing water flows, noise from wind turbines).

General policy measures

The following instruments are suggested as incentives to support renewable energy developers, promoters and operators, in particular small independent producers, who are usually faced with more non-technical and non-financial barriers than large utilities.

Site planning/permitting
All renewable energy installations, but in particular hydropower plants, wind turbines, geothermal systems and large biomass and solar thermal plants, can face difficult and lengthy administrative procedures before being able to operate. It is suggested that existing procedures be studied and recommendations made on acceleration of site planning and permitting processes. This should encourage investment from promoters, reduce the risks of refusal of their permit applications and decrease their costs by decreasing potential delays in construction works.

Interconnection standards
The status of the adoption of international interconnection standards (from CENELEC and the International Electro-technical Commission) for renewable energy in the Slovak Republic should be reviewed. Awareness of the contents of these standards should be raised through professional meetings and events (such as fairs, and workshops).

Bio-fuel blending in existing petrol
The Slovak government should adopt the EU existing Directive 98/70/EC which permits 5% of existing motor fuel to be ethanol. It should then commission a report in conjunction with Slovnaft, the refinery owner, and representatives on the issues associated with incorporating various levels into the fuel mix (the EU bio-fuels directive is likely to consider raising this amount).

Guidelines for new building developments
It is recommended to investigate the integration of a minimum renewable energy element in all new large housing estates and large buildings, in accordance with the proposed EU Energy Buildings Directive. Guidelines should be drafted for this and a series of meetings held with builders to get input on how this can be done.

Information and awareness

Justification

Raising awareness on the potential economic and environmental benefits of renewable energy, especially among the general public and private operators is a slow process, one which is still at an early stage in Slovakia.

The level of public awareness about renewable energy technologies is insufficient. Such technologies are often perceived as a luxury, not fully reliable and not adapted to the needs of users. A series of national information campaigns should be prepared to overcome this problem.. These campaigns should include information on simple applications of renewable energy sources, existing financial schemes (including Third Party Financing) and successful uses of renewable energy technologies.

Experiences from abroad show that public awareness-raising measures can lead to a significant increase in the use of renewable energy in the residential sector, especially for biomass and solar thermal. Information campaigns should use different media including articles in daily newspapers, popular magazines, short TV spots, TV and targeted discussions on the radio and information leaflets. An abundance of information material already available on the European level could be adapted and/or translated for such campaigns.

The first step in a comprehensive strategy for promoting renewable energy sources is to identify:

- the contents of the information to be disseminated;
- the most appropriate means of reaching the target groups and;
- how to involve stakeholders in the dissemination strategy.

Only then can efficient tools be successfully developed. Further steps include the provision of support to market actors in developing capacity to produce and install efficient equipment (by way of networking, experience exchange, training, etc.) and in gaining access to capital (through joint ventures, third-party financing, commercial banks).

Actions for professionals

RES panels of experts

The establishment of working groups of experts to support public authorities in implementing the renewable energy strategy, especially as far as information is concerned is proposed. This working group should be co-ordinated and supervised by the Ministry of Economy. These groups would be composed of experts participating on a voluntary basis with a permanent core team, common to all renewable energy working groups, as well as temporary members depending on to the type of renewable energy. Representatives from relevant public institutions, consultants and research institutes could constitute the core team for all renewables, while in the case of biomass for example, biomass associations, manufacturers, farmers, companies exploiting and transporting the resources and users would be temporary members.

The groups would be to identify the detailed measures needed to increase public awareness in the field of renewables, e.g.:

- to identify the content of information campaigns in detail;
- to discuss and propose changes regarding the legal and regulatory framework and;

to initiate dialogue among the different stakeholders.

It is suggested that the first panel of experts established address the biomass sector. Its main tasks would include the improvement of the fuel supply chain, support to the Ministry of Agriculture and the Ministry of Economy for launching the programme promoting biomass in district heating systems, and the preparation of the first information campaign. The biomass working group should be established first. Then different panels of experts can be established separately for each of the following:

- heat pumps;
- solar thermal energy and;
- small hydropower.

At a later stage, on the basis of the results from the first group, panels for geothermal and wind energy could also be constituted.

A number of local organisations already work to inform the general public and other market actors in Slovakia about renewable energy. However their aims and activities need to be redefined and adjusted to the needs of their target groups. Their activities should in particular be closely co-ordinated with regional and local energy planning.

Regional and local energy support

An efficient means of providing regional and local support services is through regional and local energy agencies. Such agencies are usually initiated by municipal governments. They are partly supported by the European Commission (through the SAVE programme) for the first three years of operation, and can benefit from experience exchange with other European regions. They should provide services to local business and institutions (municipalities, regions), as well as to the general public, and provide economic, financial, technical and legal information on energy efficiency and renewable energy sources. They should focus on national and EU support for energy efficiency and renewable energy projects, energy management, good house-keeping, TPF and energy auditing.

Network of RE business

Slovakian stakeholders should be integrated into the EU network of companies involved in the different sectors of renewable energy (e.g. producers of biomass fuel, manufacturers and operators of biomass installations, solar thermal collectors, small hydro power plants, heat pumps) with the aim of supporting them in their market activities. The networks bring together market actors and offer different types of support, for example training, information platforms, export support, joint-venture opportunities, support for R&D activities and promotion of co-operation. The panels of experts described above, that include trade associations relevant to this sector, should encourage their companies to become more active in EU networks.

Expected impacts

Macro-economic impacts

The adoption of these instruments will have benefits affecting the entire economy. The most obvious impact should concern the level of energy imports, and therefore the balance of payments. A preliminary assessment would estimate the reduction of imports by 8% (low targets) to 12% (high targets) for natural gas, and 8% (low targets) to 14% (high targets) for petroleum products.

These avoided costs could in turn be used for financing investments in infrastructure for the sector, thus increasing the efficiency and the development of domestic resources, as well as in other sectors, such as in transport, increasing the gross domestic product and creating investment opportunities.

Additional benefits can be drawn, such as the strengthening of industrial competitiveness, as by reducing their operational costs, enterprises should be able to increase their profits and to invest further to improve the quality of their outputs. Healthier companies and higher profits should in turn attract domestic and foreign capital.

The adoption of energy efficient measures and the development of renewable energy sources should also have a positive impact on the production of efficient equipment, able to reinforce existing or to create new opportunities for equipment manufacturers.

Lower energy costs for households also signifies that they would be able to purchase other goods available on the market, thus increasing the domestic growth.

Social impacts

Energy efficiency improvement and the development of renewable energy sources also have significant social benefits. These include impacts on employment and the level of qualification of the work force, as well as the improvement on the quality of life.

In industry, lower energy costs mean better profits, which in turn imply the development of the production capacity and the increase of the range of production. Additional jobs will therefore be available, boosted by an increase of demand created by a higher demand.

The implementation of retrofitting programmes for apartment buildings should have some positive impacts and could lead, according to experts, to approximately 3,200 new job opportunities in the construction sector and building services.

The development of efficient technologies should also creates jobs opportunities for qualified workers in energy efficient and renewable energy equipment industry. It should also improve the skills of installers and maintenance staff. It is expected that the achievement of the targets for CHP could create about 1,100 new jobs, while the development of the biomass sector could initiate the recruitment of an additional 3,300 persons in the production, transportation and utilisation of biomass.

More efficient technologies and equipment should lead to an increase of health and safety in industrial companies, as well as in the streets and at home.

Environmental impacts

Improving energy efficiency and relying on renewable energy sources should contribute to the reduction of pollutant emissions, in particular of CO_2 emissions, but also SO_2 and NO_x. they will therefore contribute to

the country's commitments to the Kyoto protocol and improve the quality of air and general well-being of the population.

In a first assessment, the annual reduction of emissions of CO_2 could be estimated at between 9 million tons (low targets) and 16 million tons (high targets).