Public Information Forum

"Economies in Transition, the IEA and Renewable Energy"

Budapest, 13 October 2003

Background Paper

Prepared by

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Introduction

Energy demand in the transition economies is expected to increase steadily over the next couple of decades, as income levels and economic output expand. Growth is likely to accelerate even faster in those countries that achieve EU membership. Meeting energy demand may prove challenging to many of the countries under consideration here[1], as their energy systems are characterised by overcapacity in electricity production, high dependence on fossil fuel imports (Figure 1) and inefficient use. Renewable energy can play a role in future energy supply by reducing import dependence, improving the environment and increasing energy efficiency. Renewable energy projects may also be supported because of the region's increased focus on employment creation, energy security, agricultural policies (i.e. proposed crop changes that may favour renewable energy), and the need to modernise and upgrade obsolete production capacities.

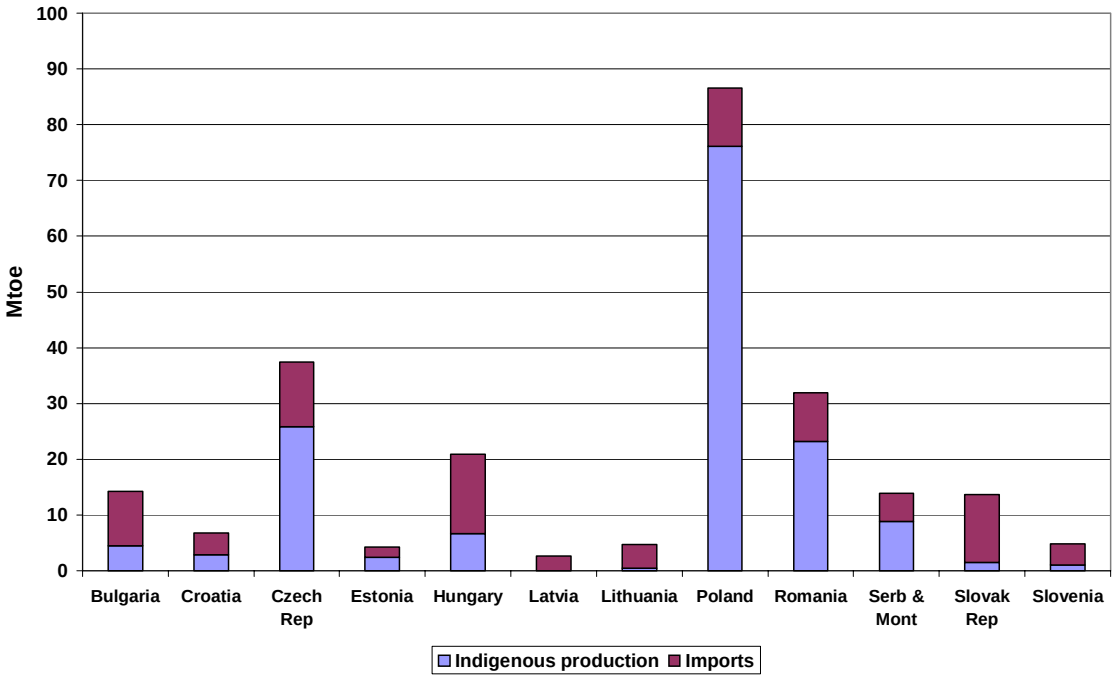


Figure 1: Oil, Gas and Coal Production and Imports in the Region

Source: IEA Statistics for OECD and non-OECD Countries.

[1] Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Serbia and Montenegro, Slovak Republic, Slovenia.

This background paper provides an overview of current demand for renewable energy and of the potential for increasing its use in economies in transition. It lays out some of the policies in place in these countries. The paper also suggests ways to support the deployment of renewable energy technologies and the market development of renewable energy sources. Barriers to renewable energy are presented in section three.

1. Overview of Renewable Energy Potential and Current Use

The use of biomass and hydropower has been traditional in many countries. The region is richly forested, and there are numerous river systems. Geothermal, solar and wind resources have not yet been exploited on any sizeable scale (Table 1 and Figure 2).

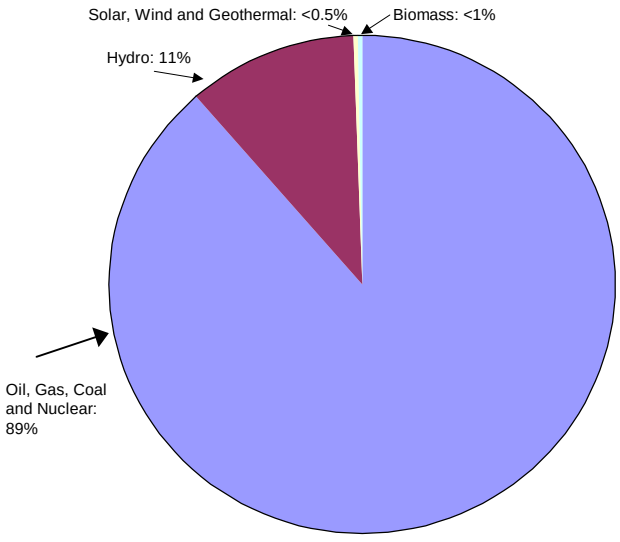
Table 1: Renewable Energy Demand, 2001

	Biomass		*Geothermal*		*Solar/Wind/ Other*		***Renewable energy (excl. hydro)***		*Hydro*	
	ktoe	*share**	ktoe	*share**	ktoe	*share**	**ktoe**	***share****	ktoe	*share**
Bulgaria	544	*3*	0	*0*	0	*0*	**544**	***3***	149	*1*
Croatia	292	*4*	0	*0*	0	*0*	**292**	***4***	536	*7*
Czech Republic	690	*2*	0	*0*	0	*0*	**690**	***2***	177	*0.4*
Estonia	539	*11*	0	*0*	0	*0*	**539**	***11***	1	*0*
Hungary	398	*2*	6	*0.02*	2	*0.01*	**406**	***2***	16	*0.1*
Latvia	1,258	*30*	0	*0*	0	*0*	**1,258**	***29***	244	*6*
Lithuania	654	*8*	0	*0*	15	*0.2*	**669**	***8***	28	*0.4*
Poland	4,341	*5*	3	*0*	1	*0*	**4,345**	***5***	200	*0.2*
Romania	2,359	*6*	5	*0.01*	0	*0*	**2,364**	***6***	1,283	*3*
Serbia and Montenegro	802	*5*	0	*0*	0	*0*	**802**	***5***	998	*6*
Slovak Republic	353	*2*	9	*0.05*	30	*0.2*	**392**	***2***	424	*2*
Slovenia	450	*7*	0	*0*	0	*0*	**450**	***7***	326	*5*
Regional total	**12,680**	***5***	**23**	***0.01***	**48**	***0.02***	**12,751**	***5***	**4,382**	***2***

* Share in total primary energy demand (%).
Source: IEA Statistics for OECD and non-OECD Countries.

Figure 2: Share of Renewable Energy in Regional Electricity Generation, 2001

Source: IEA Statistics for OECD and non-OECD Countries.



The greatest potential for the future development of renewable energy in the region lies in biomass. Wind and small hydropower plants (Table 2) offer the next best opportunities. Large hydro will likely remain the second largest source of renewable energy after biomass, but the possibilities for future growth are limited in the region. Figure 3 provides a rough indication of the potential for biomass (including biogas, wood resources and liquid biofuels), geothermal and wind. In 1999, total electricity generating capacity in the region was some 110 GW.

Table 2: Current Use and Economic Potential for Small Hydro Plants in Selected Countries

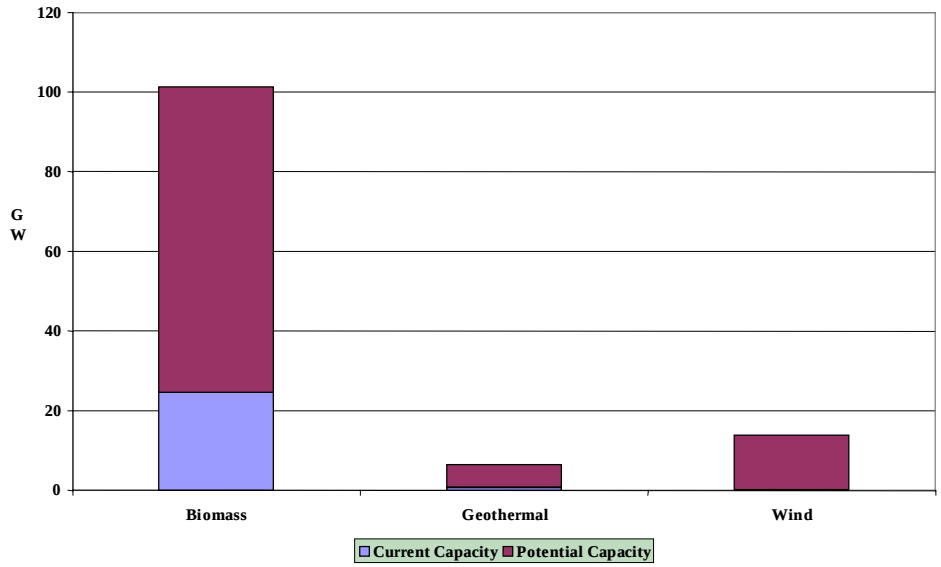
(capacity of less than 30 MW)

	Current		*Potential*
	Number of plants	*Total installed capacity (MW)*	*additional capacity (MW)*
Bulgaria	62	63	212
Czech Republic	1230	283	220
Latvia	70	64.5	5.75
Poland	-	160	200-300
Romania	317	1069	300
Slovakia	180	60	93

Source: Preliminary information prepared for European Bank for Reconstruction and Development by Black and Veatch International based on private consultancy reports.

Figure 3: Regional Potential for Biomass, Geothermal and Wind

Note: Data for many countries in the region are unavailable. Current biomass capacity excludes Estonia,



Hungary, Latvia and Serbia and Montenegro, and estimates for Croatia, Estonia, Hungary and Slovenia are unavailable for potential biomass capacity. Current geothermal capacity only includes data for Bulgaria, the Czech Republic and Slovakia, while potential capacity only includes estimates for Bulgaria, the Czech Republic and Croatia. Current wind capacity includes the Czech Republic, Estonia, Hungary, Latvia and Poland. Potential wind capacity includes estimates for every country except Serbia and Montenegro and Slovenia.
Source: Preliminary information prepared for European Bank for Reconstruction and Development by Black and Veatch International based on private consultancy reports.

The European Bank for Reconstruction and Development (EBRD) commissioned a study of the renewable energy potential in Central and Eastern European countries. While the study is still a work in progress, the information contained in the preliminary report provides a useful assessment of the region's potential. The overall prospects in Table 3 for the development of renewable energy sources are derived from the EBRD study. These prospects are based on: whether or not there is a database on the potential of renewable resources; the range of applications that have already penetrated the market or have entered the demonstration phase; and the government's willingness, as indicated by existing or planned regulations and incentives, to support renewable energy. Thus, the ratings in the table are not an indicator of the technical or economic potential. Nevertheless, if there is little public or government awareness of the potential for renewable energy or if climactic conditions have not supported its use in the past, the prospects for future development will be low. Based on average indicators, biomass will make the greatest contribution to the development of renewable energy in the region. The prospects for hydro and wind are also quite good.

Table 3: Overall Prospects for Further Development of Renewable Energy

	Biomass	*Geothermal*	*Hydro*	*Solar*	*Wind*
Bulgaria	Very Good	Good	Very Good	Fair/Good	Very Good
Croatia	*	*	*	*	Good
Czech Republic	Good	Fair	Fair	Poor	Good
Estonia	Fair	Poor	*	Poor	Very Good
Hungary	Very Good	Good/Very Good	Poor	Poor	Fair
Latvia	Good	Fair	*	Fair	Good
Lithuania	Good	Good	*	Poor	Fair
Poland	Very Good	Fair/Good	Good	Poor	Good
Romania	Good	Good	Very Good	Good	Very Good
Serbia and Montenegro	*	*	*	*	Poor
Slovak Republic	Good	Poor	Good	Good	Poor
Slovenia	*	*	*	*	Poor
Regional Average**	**3.2**	**2.3**	**2.8**	**1.7**	**2.6**

* No rating available.

** Average indicators are derived from assigning a point system to the qualitative assessments for each country: poor = 1; fair = 2; good = 3; very good = 4.

Source: Preliminary information prepared for European Bank for Reconstruction and Development by Black and Veatch International based on private consultancy reports.

PROSPECTS BY COUNTRY

Bulgaria's renewable energy potential lies in biomass, wind and small hydro. 90% of the country's land is arable, agricultural land or forests. There are not, however, clearly defined strategies for full exploitation of this biomass potential. Further studies and more detailed evaluations of the potential are needed. The highest potential for electricity production from wind is found in mountains with altitude of over 1,000 metres above sea level and along peninsulas on Bulgaria's Black Sea coast. Prospects for wind development are good because there is state of the art information about the resource potential, and local developers have started building wind turbines. Solar power is a promising electricity production source for small applications in the southern and eastern parts of the country. Other feasible uses include solar collectors for hot water production and heating. According to experts, small hydropower plants with power of up to 10 MW have the widest application in Bulgaria for electricity production from renewable energy sources.

Along the coastal areas and islands, **Croatia's** renewable energy potential lies in solar and wind energy. Inland areas are more adapted to exploiting biomass, geothermal and hydro. Croatia has major geothermal potential in the north, only a small fraction of this potential is currently under exploitation. Today geothermal energy is used for bathing and space heating but estimated power generation from tested reservoirs with temperatures higher than 120 degrees C is 28 MWe.

Biomass is the best exploitable renewable resource in the **Czech Republic**. It is estimated that the country is only using some one-tenth of its potential. Wind has a long history of use, but to date there is only 5 MW of installed capacity. Economic potential of wind is reckoned to be 2,200 MW. The Czech government estimates that the technical potential of renewable energy would be 5.6% of total energy demand in 2010 and that the economic potential would be 3.2%. Biomass represents nearly 90% of the economic potential.

As with other countries situated on the Baltic Sea, the technical wind potential in **Estonia** is quite high. At an average capacity figure of over 30%, installed wind power capacity could reach 550 MW. Demand for wind energy will likely increase with cross-border trading of CO_2 credits. Estonia produces a considerable quantity of agricultural waste that could be used in biogas plants, but, for the most part, the country lacks any real potential renewable energy resources besides wind.

The **Hungarian** wind farm builder Greenenergy Kft is expected to invest $66 million in the construction of four wind farms in southwestern Hungary, if wind measurements give positive results. The company established the first wind measurement tower in Marcali, southwestern Hungary, in 2002 and has built similar towers also in Sarbogard, Szigetvar and Magyarhertelend, all in southwestern Hungary. Greenenergy plans to sell the generated energy to the regional electricity distributor Dedasz. The German company Vin-Pro Invest GmbH also plans to build wind farms in southwestern Hungary. The company has encountered some resistance from environmental protection organisations. (Source: www.adatbazis.com)

Significant near-term renewable energy prospects in **Hungary** lie in exploiting bioenergy resources, renewable municipal wastes for electricity and heat production, and geothermal

energy for heat. Hungary has some of the largest reserves of geothermal energy in Eastern Europe. Most of the resources are of low to medium enthalpy and not suitable for electricity generation. Biomass accounts for the largest share of renewable energy, mostly fuelwood. There is no country-wide assessment of Hungary's wind energy potential, but the largest Austrian wind park is being built just across the border. The grants and funds that are currently available to support technologies will have little economic relevance in Hungary, unless clear technology or market priority is given.

Current wind energy capacity in **Latvia** is about 23 MW, but total potential capacity is estimated to be 550 MW. Most of the potential lies along the Baltic coast and in the Gulf of Riga. Biomass resources are also considered to be quite good, although the high investment costs of production and construction of new biogas plants is considered to be a barrier. Small hydropower development will consist of reconstructing and renovating existing plants, adding small hydropower plants to water management projects to utilise waste and the construction of new plants. Unlike wind, small hydropower potential is spread over the entire country.

Biomass and small hydropower have the most promising potential in **Lithuania** (see Box). Wind resources exist along the Baltic Sea, but there appears to be little public or government awareness or interest in developing them. The technical potential for wood fuel, straw and biogas is estimated to be nearly 600 thousand tonnes of oil equivalent per year. Current installed capacity of small hydropower plants is 11 MW, 10% of total hydropower generation. Proposed programs will increase capacity by 26% by rehabilitating old plants and constructing additional ones.

The Ignalina district heating company in north-eastern **Lithuania** installed a wood-fired 6 MW boiler in 1999. Prior heat production was based 40% on light oil and 60% on heavy fuel oil. Today, 25,000 MWh / year are produced from biofuels, and only 10,000 MWh / year from fuel oil. The company still uses fuel oil for peak load and as reserve capacity, but the primary fuel is sawdust and wood chips from industries in the municipality area. Heat production costs fell by 27% from 1998 to 2000. The fuel for heat production used to be imported from other municipalities, but today the company uses locally produced bio-fuel. The new boilers reduced CO_2 emissions by 8,112 tons per year; SO_2 by 123 tons per year, and NOx by 3 tons per year. (Source: Abaravicius J. "Bio-fuel Based District Heating in Lithuania. Towards Sustainability", LUMES, November 2001; Swedish Energy Agency, "The Ignalina Biofuel Boiler House and District Heating Reabilitation Project")

The Baltic coast of **Poland** has promising wind energy potential – there are currently 28 MW of installed capacity – but estimates indicate that the economic potential for wind is 3,000 MW. Wind resources are well-documented and there is a wind industry and an attractive climate for investors in Poland. The barrier to the use of wind energy lies in the presence of the powerful coal lobbies. Geothermal resources in Poland are better suited for heat generation than power. Their potential has only recently been exploited and the sector is underdeveloped. The potential for biomass, however, is well-documented and quite large. Biomass fuel is available at relatively low prices and the biomass / biogas sector is mature. Poland has established specific targets to 2010 for biomass from wood (target of 4.7 MW), straw boilers (2.2 MW), individual small boilers (8.9 MW) and biomass from wood in CHP plants (1.2 – 1.9 MW). Targets for biogas from WWTP, agriculture / livestock, landfills and communal plants have also been established. Hydropower has chances for

development, particularly small hydro power plants which are being developed by private investors.

Romania is considered to have the highest wind energy potential in the region. Its wind resources are well-documented, and there are a broad range of existing applications from small autonomous units for rural areas to large off-shore potential. There is no current installed capacity, but the government has a target of 200 MW by 2010. Romania exploited its significant solar resources in the past, but since 1990, the manufacture, installation and research and development has virtually ceased. The potential market for solar applications is very large but specific incentives will be needed in order for this potential to be realised. The same is true for biomass, which is currently used only for heating purposes. Installed capacity of hydropower is 6,120 MW, representing nearly 30% of Romania's total installed electricity generating capacity. The country's hydropower potential is extremely large, with an estimated additional potential of over 9 GW. Lack of funding is the greatest barrier to increasing current capacity.

There is very limited information on the renewable energy potential in Serbia and Montenegro. Solar irradiation levels are among the highest in Europe, and the country's manufacturing base for active solar technologies is strong. Most of the companies, however, were producing at some one-fifth capacity, even before the recent economic decline. Biomass resources are estimated to be significant, but more research is needed in order to determine their full potential. Hydropower is believed to account for some one-third of total generating capacity.

Hydropower accounts for nearly one-third of current generating capacity in the **Slovak Republic**, and there are some 180 small hydropower plants currently operating. Further hydro development is likely, although biomass resources are considered to have the highest potential for development. It is estimated that only 10% of the country's potential for energy production from biomass is currently being exploited. The potential for solar projects for utility water heating are considered to be quite good.

Over half of Slovenia is covered with forests and wooded areas, and wood is an important fuel for space heating in the residential sector. There is also some 350 MW of installed generation capacity from forest residues. The potential of biomass lies in exploiting its use for biofuels and biogas. More research is needed, however, to determine this potential. Hydropower supplies some one-third of the country's current electricity generating capacity. The potential for increasing the share of small hydropower is believed to be limited.

2. Overview of Renewable Energy Policies, Technologies and Markets

POLICIES

Most countries have set targets or at least objectives for the development of renewable energy. For power generation these have been in the form of obligations to purchase electricity from renewable energy sources. Only recently has some specific primary legislation been adopted, whether as a consequence of the harmonisation process with EU

legislation or because exploiting renewable energy sources is increasingly perceived as one possible way to mitigate commitments under the Kyoto Protocol.

Policy development is still preliminary in most countries. Much remains to be done in designing adequate policy instruments and in developing secondary legislation and economic instruments to support the market penetration of renewable technologies. As a first step, many countries have implemented feed-in laws to create a market for renewable energy. It is hoped that this will stimulate an opening of the market and will aid in the creation of local industrial capacity. In the future, the countries might move towards market oriented mechanisms like green certificate trading, once some degree of harmonisation between European energy systems and a legal framework has been achieved and demand for green electricity created. Obligations for utilities to purchase electricity generation from renewable energy sources may result in worsening the already significant over-capacity in electricity production. However, plans to expand transmission interconnections to Western Europe might offer an opportunity to export power based on renewable energy.

Renewable Energy Targets (% in total energy demand, excluding large hydro)

Poland – 7.5% in 2010 and 14% in 2020
Czech Republic – 5-6% in 2010 and 8-10% in 2020
Bulgaria – 12% in 2010
Lithuania – 12% in 2010
Latvia – 6% in 2010 (in power generation, excluding large hydro)
Hungary – 5-6% in 2010

Given that many of the countries set themselves very ambitious targets, a strategic assessment of priorities with respect to what renewable energy sources could be developed in the short term is important. In general, policies should be subject to the following scrutiny:

- √ Are the policies based on a clear assessment of renewable energy potential? Only a very few countries have an atlas or some type of database which would allow policymakers to accurately assess renewable energy potential.
- √ Are renewable energy technologies available locally and is there a systematic way of locating these local or regional manufacturing companies and design engineers and consultants?
- √ Are the targets broken down by sectors of the economy? Priorities should take into account development plans in other sectors, such as agriculture, housing, transport or landscape planning. The development of sectoral programmes and action plans facilitates implementation.
- √ Is there an appropriate regulatory framework in place to support renewable energy development?
- √ Is there a review process in place? Assessment of implementation of national energy policies should be systematic. Continual monitoring of the cost-effectiveness of renewable energy systems is required to ensure that subsidies are reduced over time.
- √ Should there be penalties for non-compliance?

POLICIES BY COUNTRY

Bulgaria – The country will draw up an Action Plan that will include an integrated approach and instruments for the promotion of renewable energy sources, as well as a campaign for their accelerated development. The National Energy Efficiency Review will serve as the basis for this Action Plan. Bulgaria's State Commission on Energy Regulation has set the purchase price of eco-electricity at $0.05 per kWh – a relatively high price that supports the construction of renewable energy facilities in the country. Currently there are no specific regulations regarding the use of biomass, although the development of the Action Plan will set the foundation for the promotion of biomass.

Croatia – Prior to the war, Croatia was producing solar collectors, PV modules and wind turbines. Most of the production has ceased, and Croatia is in the process of setting up legislation to effectively utilize its diverse and substantial renewable energy resources. The government has embarked on a program to develop to the maximum extent feasible its renewable energy potential, particularly hydropower and geothermal. Croatia has one of the highest feed-in tariffs for wind generation in the region, $0.065 per kWh, although it only applies to projects smaller than 5 MW.

In the **Czech Republic** town of Bystrice nad Pernstejnem, the local authority decided to replace its brown-coal boiler heating centre with biomass. Two biomass boilers of 4.5 MW each were installed. A heat storage tank and a biomass storage facility were also constructed. The previously separate district heating grids were joined, creating a unified grid for the whole town. The project started operation in November 2001. In the short term, sawmills supply the biomass fuel, but, over the longer term, the plan is to cultivate biomass independently for the boilers. Total investment for the project was $5.4 million. The project was supported by the Czech State Environmental Fund. The nonmaterial costs were partly financed by Kommunalkredit Austria. As a result of the new boilers, the town's hazardous emissions have been markedly reduced. (Source: *Energy Technologies for a Sustainable Development: cooperation between Austria and Central and Eastern Europe*)

Czech Republic – To reach its proposed renewable energy target, the Czech government has adopted a programme that gives priority to CHP demonstration projects using biomass (see Box). Estimates indicate that to attain a 6% renewable energy share by 2010 would require capital investment of about $8.4 billion, supported by incentives of $1.4 billion. The Renewable Energy Action Plan (a joint Czech government and World Bank initiative) was published in August 1999. The Action Plan of 2002 updated energy law and policy.

Estonia – An economic and legal framework to support renewable energy is largely in place in Estonia. Since 1999, the fixed wind tariff, at $0.055 per kWh, has equaled 90% of the price paid by household customers. This arrangement applies only if the amount of electricity generated from renewable energy does not exceed 2% of total energy consumption in the previous year.

Hungary – By 2010, the government aims to increase its share of renewable in primary energy demand to at least 5%. Meeting this target will be challenging, given the current laws and policies in place. At present, renewable energy systems are only allowed to connect to the grid using preferential rights if their capacity is greater than 100kW, thus

disqualifying small domestic renewable energy systems. The current use of a single feed-in tariff may also end up promoting too few renewable energy options.

Latvia – The government encourages the construction of wind farms. Latvenergo purchases electricity generated by wind farms at a double tariff for eight years after grid connection. After that the purchase prise will correspond to the average tariff.

Lithuania – The National Energy Strategy of Lithuania favours the exploitation of geothermal resources for heat, but this will require raising the current low heating tariffs. The country's biomass potential is quite large, but information on policies in the sector is minimal.

Poland – The *Polish National Strategy for the Utilisation of Renewable Energy Sources by 2020* was officially adopted in August 2001. The plan is to increase renewable use, mostly for households, with biomass boilers, wood and straw fired district heating and biomass for CHP. In addition, the Polish Biomass Association has been actively performing research as to the feasibility of such projects as well as new possible uses for biomass. Public support of $58 million per year is needed to achieve Poland's goal of a 7.5% renewable energy share in power generation by 2010.

Romania – The government approved the *National Strategy for Energy Development on Medium Term (2001-2004)* which is aimed at developing a competitive national energy market in line with integration to the EU. Romania has ratified the Kyoto Protocol, and the country is planning to support less-polluting renewable energy sources for electricity generation. A June 2002 law on the environment that stipulates penalties for polluters is likely to encourage the use of renewable energy.

Serbia and Montenegro – It is difficult to obtain information on renewable energy policies in FR Yugoslavia. The country has only recently reconstructed its war-damaged electricity infrastructure. It is not evident what role renewable energy played in this process. The current share of renewable energy in primary demand appears to be high, but financial and legislative incentives will be needed to support future growth.

Slovak Republic – The government plans to increase its use of renewable energy sources twofold by 2010. Currently low energy prices are the greatest barrier to fulfillment of this plan, but the government is making some efforts to gradually increase prices to cover costs.

Slovenia – The Slovenian Energy Agency is responsible for promoting renewable energy sources inline with EU targets. To meet its target of increasing the share of renewable energy to 15% in 2010, renewable energy demand will need to reach 31.5 PJ, compared with 14 PJ today. Slovenia has some fiscal incentives for wind in place, but additional incentives will be needed to promote renewable energy development.

TECHNOLOGIES

Many countries lack access to advanced renewable energy technologies for their domestic markets. In the short-term, the region may need incentives for investment by technology companies outside the region to gain improved renewable energy technologies. For

example, the Czech Republic has defined a biomass demand target of 96.5 PJ per year in 2010. Czech companies currently produce reliable and inexpensive small-scale boilers, but in order to attain the bioenergy target, large-scale boilers and co-generation plants will be needed. If investment from international technology companies is to take place adequately, specific, regional marketing strategies to penetrate markets in the region must be developed. This would include convenient leasing schemes and reduced prices for products.

The IEA provides a framework for international co-operation between two or more countries through Implementing Agreements. The Implementing Agreements allow governments and industries to benefit from the exchange of information and the development of new technologies. The IEA Framework for Implementing Agreements also makes provisions for the participation of industry and non-governmental organisations from countries that are not members of the IEA. Information on the IEA Framework can be found at http://www.iea.org/techno/framework_text.pdf .

Currently, there are eight Implementing Agreements dealing with renewable energy. For example, the Bioenergy Implementing Agreement aims to expand the use of environmentally sound and cost-competitive bioenergy on a sustainable basis. Work underway includes the technical improvement of biomass crop production technologies, development of systems and guidelines for environmentally sustainable and economic production of biomass for energy, combustion, thermal gasification, pyrolysis, techno-economic assessments, municipal and industrial solid wastes and refuse derived fuels, and analysis of bioenergy systems on a full fuel cycle basis to establish overall greenhouse gas balances. The other implementing agreements are concerned with research and development and dissemination of technologies associated with hydropower, geothermal energy, photovoltaic power systems, solar heating and cooling, solar power and chemical energy systems, wind energy and ocean energy systems. More details can be found on the IEA website: http://www.iea.org/impagr/imporg/imagpub/listof.htm .

A Delta hotel on the Black Sea in **Bulgaria** installed a solar plant for the preparation of domestic hot water. Prior to the installation of the plant, a 250 kW gas boiler was used to heat water. After installing a solar collector area of 100.8 square meters on the roof of the hotel and renovating hot water tanks, the owner of the hotel was able to lower his fuel consumption costs by 40% in the first year of operation. The total cost of the plant, including modernisation of the existing boilers, was $33,000. In Bulgaria, solar energy can compete with conventional sources for large-scale water and space heating installations. It can also reduce the variation of loads between summer and winter months. (Source: *Energy Technologies for a Sustainable Development: cooperation between Austria and Central and Eastern Europe*)

Some Central and Eastern European countries already have industries producing reliable and efficient renewable energy technologies. In Poland, biomass technologies are relatively mature. The biogas sector is also maturing quite rapidly, with many local private sector organisations supplying a variety of biomass boilers and turn-key installations. The Czech Republic manufactures wind turbines locally, and Hungary has developed local capabilities for manufacturing solar panels. Romania has several manufacturers of wind energy components and the country seems ready for local manufacturing of wind energy technologies. Except for niche applications, the potential for using solar energy for heating and cooling is largely undeveloped.

Lack of government support has seriously hampered the deployment of renewable energy technologies in many countries. In Germany, in contrast, the government has actively promoted renewable energy through financial incentives and research and development funding. As a result, it has become the world leader in wind power installations and the European leader in photovoltaic installed capacity. Employment in the renewable energy industry has increased rapidly.

MARKETS

The development of local and regional markets in many countries will be affected by economic reforms related to EU accession. Regional integration can provide a sufficient level of aggregation to stimulate private investment. Market size is important for attracting investment. Moreover, a free trade zone encourages the emergence of a larger, stable market and the efficient allocation of resources and transforms a group of fragmented markets into a single integrated one. The Customs Barriers Analysis Project provides information on market barriers in the region (Table 4). Reducing these barriers can accelerate the markets for renewable energy.

Table 4: Import Duties for Renewable Energy Technologies

	Solar Water Heaters	***Hydraulic turbines and water wheels (<= 1,000 kW)***	***Hydraulic turbines and water wheels (between 1,000 kW and 10,000 kW)***	***Solar cells in modules***	***Photovoltaic generators DC (output > 37.5 W but <= 750W)***	***Photovoltaic generators AC (output > 37.5 W but <= 75 kVA)***	***Mechanical stokers (including grates), mechanical ash dischargers and similar appliances for exploiting biomass energy***	***Wind operated electric generators***
Bulgaria	**MFN=11.9 GSP=11.9 EU free**	**MFN=4.9, GSP=4.9 EU free**	**MFN=4.9 GSP=4.9 EU free**	**free**	**free**	**free**	**MFN=7.9, GSP=7.9 EU free**	**For use in civil aircraft=free other: MFN=8.2 GSP=8.2 EU free**
Croatia	**MFN=10 EU=6**	**free**	**free**	**free**	**free**	**free**	**MFN=14 EU=9.8**	**free**
Czech Republic	**MFN=2 EU free**	**MFN=7 EU free**	**MFN=7 EU free**	**free**	**MFN=4 EU free**	**MFN=4 EU free**	**MFN=2.9 EU free**	**MFN=4 EU free**
Estonia	**free**	**free**	**free**	**free**	**free**	**free**	**free**	**free**
Hungary	**GSP=8.5 EU free**	**MFN=8 GSP=8 EU free**	**MFN=8 GSP=8 EU free**	**MFN=5 GSP=5 EU free**	**MFN=10 GSP=5 EU free**	**GSP=5 EU free**	**MFN=8.5 GSP=8.5 EU free**	**MFN=10 GSP=5 EU free**
Latvia	**free**	**free**	**free**	**free**	**free**	**free**	**free**	**free**
Lithuania	**free**	**free**	**free**	**free**	**free**	**free**	**free**	**free**
Poland	**MFN=9 EU free**	**MFN=9 EU free**	**MFN=9 EU free**	**free**	**MFN=9 EU free**	**MFN=9 EU free**	**MFN=9 EU free**	**MFN=9 EU free**

Romania	MFN=15 EU free	MFN=15 EU free	MFN=15 EU free	free	free	free	MFN=5, EU free	For use in civil aircraft=free other: MFN=15 EU free
Serbia and Montenegro	MFN=10 RCG=3	MFN=1 RCG=1	MFN=1 RCG=1	MFN=1 RCG=1	MFN=1 RCG=1	MFN=1 RCG=1	MFN=10 RCG=1	MFN=1 RCG=1
Slovak Republic	MFN=2 EU free	MFN=7 EU free	MFN=7 EU free	free	MFN=4 EU free	MFN=4 EU free	MFN=2.9 EU free	MFN=4 EU free
Slovenia	MFN=15 EU free	MFN=16 EU free	MFN=16 EU free	free	MFN=15 EU free	MFN=15 EU free	MFN=10 EU free	MFN=5 EU free

MFN = most favoured nation; GSP = generalised system of preferences; RCG = recycled capital grant.

Source: IEA / CERT / REWP(03)1 / ANN2.

Locally-produced applications would avoid import duties entirely, but markets for renewable energy technologies in the region are largely underdeveloped. Efforts that would encourage the development of these markets include: having more agencies that have common interests in promoting RE systems; establishing and empowering an organisation where stakeholders are directly involved in RE development and implementation; and promoting community ownership of projects. Involving local communities and authorities in project development has led to the successful development and marketing of renewable energy systems in many Western European countries.

Market Development in Croatia

In February 2003, the Global Environment Facility of the World Bank provided a grant of $350,000 to the Croatian Bank for Reconstruction and Development for the upcoming Renewable Energy Resource Project in Croatia. The grant will be used to develop an economically and environmentally sustainable market for renewable energy resources. The project is also intended to assist the Government of Croatia to codify its national policy that would legally require a minimum share of energy supply to be met from renewable resource and to promote the creation of financial mechanisms needed by the market.

(http://www.worldbank.hr/ECA/Croatia.nsf **)**

3. Barriers to Renewable Energy Development in the Region

Legislative: A predictable legislative framework is needed to attract investment in renewable energy projects. The legislation that is currently under development in the region lacks clear signals for long-term guarantees of return on investment in renewable energy projects, making it unlikely that they will attract investors in the short-term.

Economic: The pricing and tariff structure, particularly subsidies to fossil fuels and low heating tariffs, in many countries hinders the development of renewable energy sources. Fossil fuel generators are not required to account for environmental costs associated with electricity production. These costs are not internalised in any regularised or mandatory fashion. Artificially low prices for fossil fuel-based energy are a major barrier to renewable

energy. Electricity prices are low, particularly for households, in many countries in the region compared with EU countries (Table 5).

Table 5: Electricity Prices in Selected IEA Countries, 2001

(US dollars per kWh)

	Industry	*Households*
Czech Republic	0.043	0.060
Hungary	0.051	0.068
Poland	0.045	0.079
Slovak Republic	0.043	0.063
Denmark	0.060	0.195
Netherlands	0.059	0.145
Portugal	0.066	0.118

Source: *Energy Prices and Taxes, Fourth Quarter, 2002*, IEA.

Renewable energy technologies also face entry barriers because of their high capital costs and relatively long payback periods. In Bulgaria, the high price of a wind generator, which can cost more than $35,000, has been a major obstacle (www.banker.bg). According to the Danish Wind Energy Association, in 1999, the average price for large, modern wind farms was around $1,000 per kilowatt electrical power installed. A solar energy collector and its installation can cost nearly $20,000.

Pressure from unions/lobbies for fossil fuels: The present structure of the power production system in many countries in the region is a result of the abundant and cheap supply of coal. Strong oil and coal industry lobbies, energy-intensive industries and utilities might perceive renewable energy as competition. In response, renewable energy strategies might focus on other economic sectors, such as agriculture or employment. Wind energy developers in Poland are up against a powerful coal sector and miners trade union. These lobbies heavily influence the Polish parliament. Similar lobbies exist in the Czech Republic.

Financial: In many countries, there is a lack of capital on the side of investors; private investors have limited access to adequate long-term financing from local banks and funds. This deficiency is exacerbated by the high costs of initial investment for renewable technologies and the financial problems of state budgets. For the most part, there are no specialised sources of financing for renewable projects. In Western Europe, feed-in laws are instrumental in developing renewable energy projects. In transition countries, feed-in laws need to be further refined in order to provide the predictability for return on investment that investors need. Lack of funding goes beyond just that for investment – funding for research and development of renewable energy technologies and systems is inadequate in many countries. The experience in EU countries shows even a limited program of support to renewable energy requires a sustained policy and adequate resources.

Land ownership: For renewable energy, land ownership could become a serous barrier to project development in the short term. Many countries are revising their laws with respect to land ownership rights. Ambiguous legislation and long-lasting conflicts between current and future owners may hamper the planning process of renewable energy projects, leading to high lead times and increasing the project risk.

Knowledge-based resources: In general, there is limited access to information about the distribution of the energy potential of particular kinds of renewable energy. There is often no generally accessible information about the procedures for undertaking renewable energy investments and the typical costs of investment. Another barrier to the uptake of renewable energy technologies is the lack of educational and training programs addressed to engineers, designers, architects, representatives of the power-engineering sector, banks and local authorities.

Conclusion

There is considerable renewable energy potential in Central and Eastern Europe. Significant wind resources are found along the Baltic, Black and Adriatic Seas and in mountainous areas in Central Europe. Bioenergy will undoubtedly continue to play the largest role of all renewable energy sources in energy demand in the entire region. Hydropower has long been exploited, but the potential for small hydro is still quite large, in Bulgaria and Romania in particular. Geothermal energy, largely for heat, and the use of solar collectors also have good potential for future development.

Today, many transition countries rely on imported fossil fuels to meet over half of their energy needs. With properly targeted policies, renewable energy could play a much larger role in the energy system of the region. The potential is there, but policymakers need to create an attractive environment for foreign and local investment in order for this potential to be realised.

Detailed policies are needed to encourage the technological development and market penetration of renewable energy sources. Careful crafting will be essential to avoid obligations for electricity generation for renewable energy that may increase overcapacity. Government priority to renewable energy sources should be increased, as should public awareness of their benefits. The IEA can contribute to this process. For example, the **Renewable Energy Policies and Measures Database** provides a detailed reference to legislative acts in IEA Member countries that support the development and market uptake of renewable energy sources (http://www.iea.org/renewables/index.asp). Plans are to expand the database to include countries participating in the Johannesburg Renewable Energy Coalition (JREC).

Regional cooperation has been linked to enhancing trade opportunities, to increasing the credibility of policy reforms and to improving the climate for foreign investors. The IEA also has experience in setting up frameworks on a regional basis. The Agency is working to set up a renewable energy market in the Mediterranean Basin in order to provide least cost solutions to this region's sustainable development needs (www.medre.org).

References

Cross, Eugene D., “Guidelines and Strategies for Energy Policies in Transition Economies”, IEA / UNDP Workshop, October 2002, ECN Policy Studies.

European Bank for Reconstruction and Development, Transition Report 2001: Energy in Transition, 2001.

European Bank for Reconstruction and Development, Renewable Energy Resource Assessments, Black and Veatch International, Project Coordinator, work in progress.

European Commission, DG Energy and Transport.

Battocletti, Liz, Bob Lawrence and Associates, Inc, Geothermal Resources in the Balkans,

April 2001.

International Energy Agency, Czech Republic Energy Policy Review, 2001.

International Energy Agency, Hungary Energy Policy Review, 2003.

REEEP, final report of workshop, July 2003.