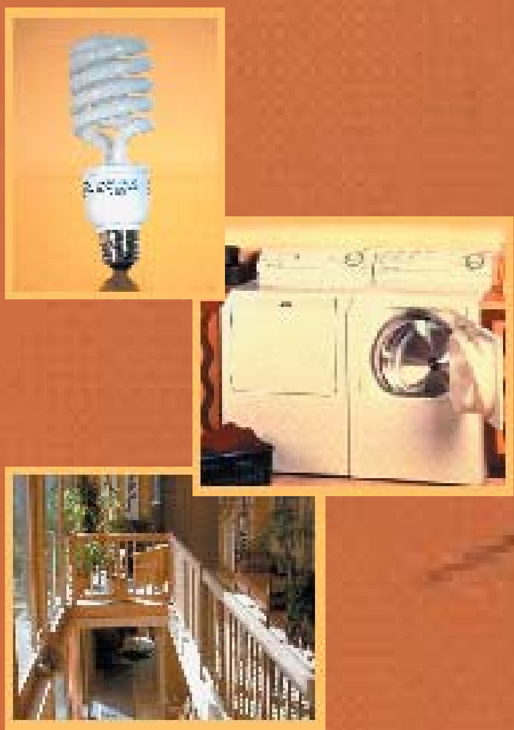
Integration of Energy Efficiency and Renewable Energy Policies



Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects

PEEREA

2005

Energy Charter Protocol on Energy Efficiency and
Related Environmental Aspects (PEEREA)

Integration of Energy Efficiency and Renewable Energy Policies

2005

Contents

Executive Summary

Energy efficiency and renewable energy for a sustainable energy future

Improvements in energy efficiency and increases in the contribution from renewable energy to supplies are both important for achieving a sustainable energy future with reductions in greenhouse gas emissions (GHG) and improvements in the security of supply situation. On this background, the objective of the current report is to draw the attention of policy makers to the advantages of exploiting the synergies between policies promoting energy efficiency and renewable energy.

Energy intensities have declined in most of the PEEREA countries over the last decade, but there remain wide differences in the level of the intensities between countries and regions. Global growth in energy demand, increasing concerns about the security of supply, and the challenges related to meeting climate change objectives impose stronger improvements in energy efficiency in all countries.

The same concerns are justifying the further development of renewable energy. Over the last decade substantial efforts have been made by many of the PEEREA countries, especially by OECD countries, for technology development and market deployment of renewable energy, but there is a potential for further policy efforts in this area. In a number of countries the share of renewables in Total Primary Energy Supply (TPES) is still very low and the potential for renewable energy is far from tapped.

The energy transformation sector dominates in the utilisation of renewables. In average in the PEEREA countries 62% of renewables are used to produce electricity and heat supplied to the grid. However, the share of renewable energy consumed in the end-use sectors (38%) is substantial. End-use of renewable energy is mainly in small and decentralised installations generating heat or electricity for individual households, public buildings or industries. On this background, the report focuses on policy approaches for on-grid as well as off-grid renewable energy. In both cases there are advantages of integrating renewable policies with energy efficiency policies.

Integration on policy formulation level

In policy making there is a rationale for considering energy efficiency and renewable energy together, because they both seek to reduce the need for conventional, commercial fuels and they both address environmental concerns. Many PEEREA countries have created links between energy efficiency and renewable energy policies. Some are doing it as part of an overall energy strategy, combining all elements of the energy policy. Others link energy efficiency and renewables as part of their climate change strategies. Still others are making this linkage through sustainable energy strategies.

Climate change policy is a catalyst for energy efficiency policies and renewable energy development and for their integration. National climate change strategies often include support for research in new technologies for higher energy efficiency and renewables. Also, the flexibility mechanisms under the Kyoto Protocol support the development and implementation of energy efficiency and renewables in the host countries by capacity building, demonstration of the benefits and technology transfer.

Integration in policy implementation

There are different approaches among PEEREA countries as to the integration of energy efficiency and renewable energy programmes. Some countries have created strong linkages with programmes developed and implemented in single agencies or ministries. Often individual programmes are directed at both energy efficiency and renewable energy. In other countries, the links are weaker or totally absent.

On the implementation level the combination of energy efficiency and renewables would lead to higher economic, social, and environmental efficiency:

- The overall environmental performance of energy supply and use is improved;
- The investment support provided to renewable energy by public funds or by increased consumer commitments calls for efficiency of energy consumption;
- The competition between energy efficiency and renewable energy projects within a defined policy framework is a driver for increased effectiveness.

Examples of approaches to integrated implementation include combined energy efficiency and renewable energy national programmes and one and the same implementing agency for energy efficiency and renewables.

Policy instruments to promote energy efficiency and renewables

The major barriers for improving energy efficiency and increasing the share of renewables are similar. They include subsidised prices of conventional energy, inefficient regulation, absence of information, institutional barriers, difficult access to finance, etc.

The report includes an overview of policy instruments applied for the promotion of energy efficiency and renewable energy. Based on the experience so far, the report demonstrates the benefits of the integrated use of some of the instruments. They include the integrated application of energy certification, investment tax credits, special lending instruments, third party financing, information, and training. The possibilities for integration should be evaluated carefully taking into account the specific national circumstances.

Conclusion

In the national policies a balance should be struck between energy efficiency and renewables taking into account their complementarities and the competition between them. There is no simple rule for setting the right balance, which depends on national circumstances and is influenced by the level of economic development, the degree of market liberalization, the energy import dependency, existing track record in energy efficiency and renewable energy policies, and environmental and climate change commitments.

1 Introduction

1.1 Policy Objectives

Energy Efficiency and Renewable Energy for Sustainable Development

The active promotion of energy efficiency as a way to reduce energy demand and to use the energy rationally became a policy priority in the 1970s following the first oil crisis. Many countries, mainly the developed economies with the highest dependence on imports, implemented a wide range of programmes directed at both supply and demand. Improved energy efficiency was also seen as an important tool in addressing environmental issues and came even more into the political focus with the political commitments to sustainable development at the Rio Summit in 1992.

In parallel to improving energy efficiency, the role of renewable energies for sustainable development was acknowledged but it received relatively little policy attention until the 1990s. Over the last decade many OECD countries have started promoting renewable energy as part of their policies for sustainable development, helped by technological developments which led to decreased costs and improved reliability. On the international level, the Johannesburg World Summit for Sustainable Development in 2002 brought additional political attention to renewables and since then there has been an increased momentum in policies directed at encouraging the use of renewable energy.

Improved energy efficiency and a shift to no- or low-carbon energy technologies are important options in climate change mitigation. In recent years, climate change has increased in importance in the national policy agenda of the countries, which are Parties to the Framework Convention of Climate Change (UNFCCC), and especially in Annex I countries.

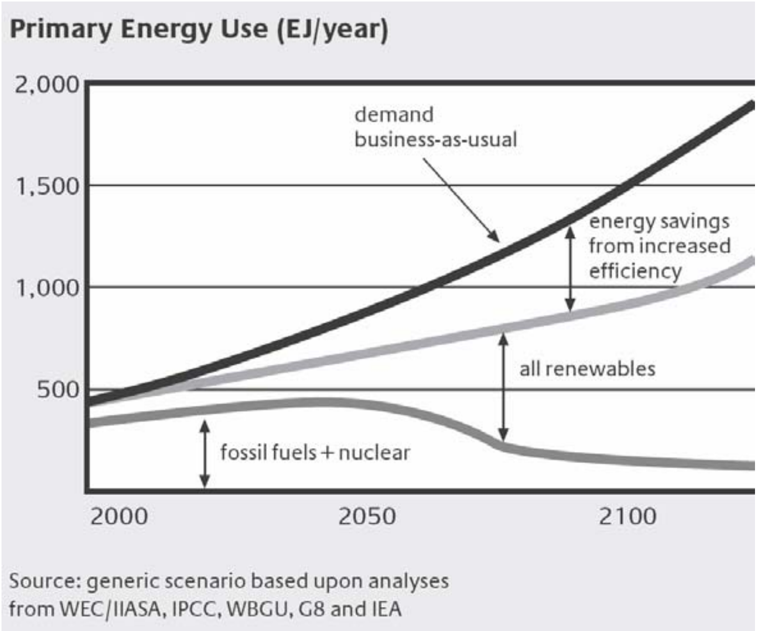
Objectives for the Future

In 2004, the Political Declaration at the International Conference for Renewable Energies in Bonn linked energy efficiency with renewable energy:

> Ministers and Government Representatives from 154 countries gathered in Bonn, Germany, June 1-4, 2004, for the International Conference for Renewable Energies, acknowledge that <u>renewable energies combined with enhanced energy efficiency,</u> can significantly contribute to sustainable development, to providing access to energy, especially for the poor, to mitigating greenhouse gas emissions, reducing harmful air pollutants, thereby creating new economic opportunities, and enhancing energy security through cooperation and collaboration.

The vision of a sustainable energy future, accepted by the Renewables 2004 Conference as a ground for decisions of today, is based on <u>drastic improvements in energy efficiency and a massive expansion of the use of renewable energy</u>. The energy services growth would increase energy demand, but the demand would be drastically reduced by energy efficiency measures (some 30% by 2050), and supply would increasingly be secured by renewable energies (approximately 50% by 2050) (Figure 1).[1]

Figure 1. Sustainable Energy Development



Source: Renewables 2004 Conference Issue Paper

This vision, although ambitious, is very important for showing the need for more aggressive targets and practical initiatives in regard to both renewable energies and energy efficiency. It also underlines that a substantial increase in the global share of renewable energies requires major improvements in energy efficiency – especially on the demand side.

PEEREA and Renewables

The Energy Charter Treaty in Article 19 requires countries to have particular regard to improving energy efficiency and developing and using renewable energy sources. While the Energy Charter's Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA) does not specifically address renewable energy, it is obvious that the linkages between energy efficiency and renewables policies are increasing in the countries, which are parties to PEEREA. Many countries are integrating the two concepts under the banner 'sustainable energy'.

In Western Europe, the EU-15 plus Norway and Switzerland, in particular, have developed robust policies and programmes for renewable energy, especially since the early 1990s. Climate change strategies have led governments to re-consider the role renewable energy can play in the overall fuel mix. Within the EU all of the Member States are obliged to have indicative targets for renewables and to develop their policies and institutional/legislative framework accordingly. In the other PEEREA countries in Central and Eastern Europe and the CIS, renewable energy has not been a high policy priority so far.

[1] Renewables 2004 Conference Issue Paper

1.2 Objectives and Scope of the Report

The objective of this report is to stimulate a policy discussion in the PEEREA constituency in support of the development of more coherent and integrated national policies for energy efficiency and renewable energy. The objective is to provide guidance to policy makers in finding the most appropriate balance between policies and to take advantage of the synergies between policies promoting energy efficiency and renewables.

While energy efficiency measures are mainly directed at the demand side, renewables are helping to reshape the structure of energy supply, and both are contributing to climate change policies and reducing energy import dependency. Renewables may be more “visible” and drawing more attention from industry and decision-makers. While this is important to energy and environment policies, getting the right balance between supply and demand options is vital.

The report focuses on the following issues:

1. Main trends of energy efficiency and renewables in various countries of the Energy Charter constituency; potential and barriers in various regions;
2. Economic and environmental benefits of combining energy efficiency measures and supporting the penetration of renewables; the issue of competition which may appear between the two;
3. Role of energy efficiency and renewables in addressing climate change issues;
4. Possible steps which would ensure better integration of policies promoting energy efficiency and renewables;
5. Good practices used for promoting both energy efficiency and renewable energies;

The report makes use of existing studies and reports prepared under the umbrella of national or international organisations. The data used in the report is predominantly based on the official IEA statistics. Some additional information about non-OECD countries relies on other sources as well.

2 Energy Efficiency and Renewable Energy - Complementary and Competitive

2.1 Status and Developments

This section gives an overview of the current status of the energy intensity and renewable energy utilisation in the PEEREA countries by country and by main 'regions': EU-15, OECD/non-EU countries[2], new EU members, South-East Europe[3], and the Commonwealth of Independent States (CIS).

Energy Intensity Development

There has been a decline in the total energy intensity[4] of most of the PEEREA countries over the last decade. However, the amount of energy used to produce a unit of GDP and the rate of decline vary significantly among countries and between regions.

The energy intensity levels in EU-15 in 2002 range between 0.13 toe per thousand '95 USD (adjusted with the Purchase Power Parity) in Ireland and Italy and 0.28 in Finland, but the majority of countries are under the level of 0.20 toe/thousand '95 USD (Annex A). The non-EU OECD countries have similar levels of energy intensity, except for Iceland with 0.44 toe/thousand '95 USD.

IEA analyses[5] show that significant energy savings have been achieved since 1973 in all sectors in the IEA/OECD countries as a result of energy pricing and policies responding to the oil crisis, improved energy efficiency in key end uses, shifts in fuel mix and changes in the structure of human and economic activities. However, reductions of energy intensities have slowed in most IEA countries and sectors since 1990. Some increase of the total energy intensity is even recorded for Portugal, Spain, Iceland and Turkey. A new momentum of increase in energy efficiency in the OECD countries is required in the context of growing energy demand, climate change objectives and the need of increased security of supply.

Energy intensity in the new EU member states is considerably higher (reaching levels between 0.44 and 0.84 toe/thousand '95 USD in 2002 for six of these countries), and although the levels are substantially reduced when calculated with Purchase Power Parities (in the range of 0.20-0.33 toe/thousand '95 USD), they are still higher than in the EU-15. They are strongly influenced by the overall energy inefficiency inherited from the socialist period and the transition to a market economy. The primary and final energy intensities have been declining very rapidly in most of these countries since 1996. The average annual reduction is around 6% in Estonia and Latvia; around 4% in Slovenia, Hungary, and Slovakia; 8% in Poland; and 2% in the Czech Republic. Nevertheless, the new EU members need to improve substantially their energy

[2] OECD/non-EU countries include Japan, Liechtenstein, Switzerland, Turkey, Australia, Norway and Iceland.

[3] The South-East European countries include the ECT and PEEREA parties in the region: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Romania and FYR Macedonia.

[4] Total energy intensity is measured as total primary energy supply (TPES) per unit of GDP and is adjusted with Purchase Power Parity (PPP).

[5] Oil Crises & Climate Challenges, 30 Years of Energy Use in IEA Countries, OECD/IEA, 2004

efficiency in order to catch up with the EU-15. The primary energy intensities are still in most of the new EU Member States about 50% higher than the EU average[6]. As the energy demand in these countries is projected to rise because of economic growth, they need to prioritize energy efficiency programmes in all sectors.

The trends and levels of energy intensity in the countries of South-East Europe are quite similar to those in the new EU Member States. The energy intensity in the region is decreasing and ranges between 0.14 toe/thousand ’95 USD (PPP) in Albania and 0.37 toe/thousand ’95 USD (PPP) in Bulgaria. The decline is partly due to lower level of energy services.

The energy intensity in the CIS is traditionally high due to a number of factors, including climate and economic structure, but also low efficiency of energy production, distribution and consumption, lack of price incentives and low awareness and little policy concerns for energy efficiency. The energy intensity continued to grow between 1992 and 1997-1998, while after 1998 the trend turned downward. The energy use has been influenced greatly by the structural economic changes in these countries. However, the current levels of energy intensity are between 2 and 7 times higher than those in the EU-15. Armenia and Georgia are the only countries with comparable level of energy intensity, but it is predetermined by very low level of energy services. Uzbekistan with 1.41 toe/thousand ’95 USD (PPP) and Turkmenistan with 0.82 toe/thousand ’95 USD (PPP) have the highest energy intensity among the PEEREA countries.

Renewable Energy Sources

Since 1990, renewable energy sources (RES)[7] have grown worldwide at an average annual rate of 1.7%, which is slightly higher than the growth rate of world Total Primary Energy Supply (TPES) of 1.4% per annum. In 2002, 13.4% of TPES, or 1 376 Mtoe, was produced from renewable energy sources. The biggest contribution is from solid biomass (10.4% of world TPES), second is hydropower, providing 2.2%, and geothermal is the third largest renewable source, although with much smaller share of 0.4%. Solar, wind and tide energy represent less than 0.1% of world TPES. OECD accounts for most of the production and growth of “new” renewables (solar, wind and tide), while the solid biomass is produced mainly by non-OECD countries.[8]

The PEEREA countries produced 181.2 Mtoe of energy from RES in 2002. This accounts for 5.27% of their TPES, which is more than twice below the world average.

There are big differences in the share of RES between countries (Annex B). Iceland has a high share of geothermal energy, comprising around 72% of TPES. Georgia assures about half of its TPES from hydro and biomass. In Norway about half of TPES is covered by renewables, mainly hydro. Kyrgyzstan and Tajikistan depend for 37-39% on energy produced also from hydro. Latvia, Sweden, Albania, Finland, and Austria produce between 22 and 35% of their energy from a mix of hydro and combustible

[6] Cross-country comparisons of energy efficiency trends and performance in Central and Eastern European countries, ADEME, Synthesis Report, March 2004

[7] By IEA definition, renewable energy sources include combustible renewables and waste (solid biomass, charcoal, renewable municipal solid waste, gas from biomass and liquid biomass), hydro, solar, wind and tide energy.

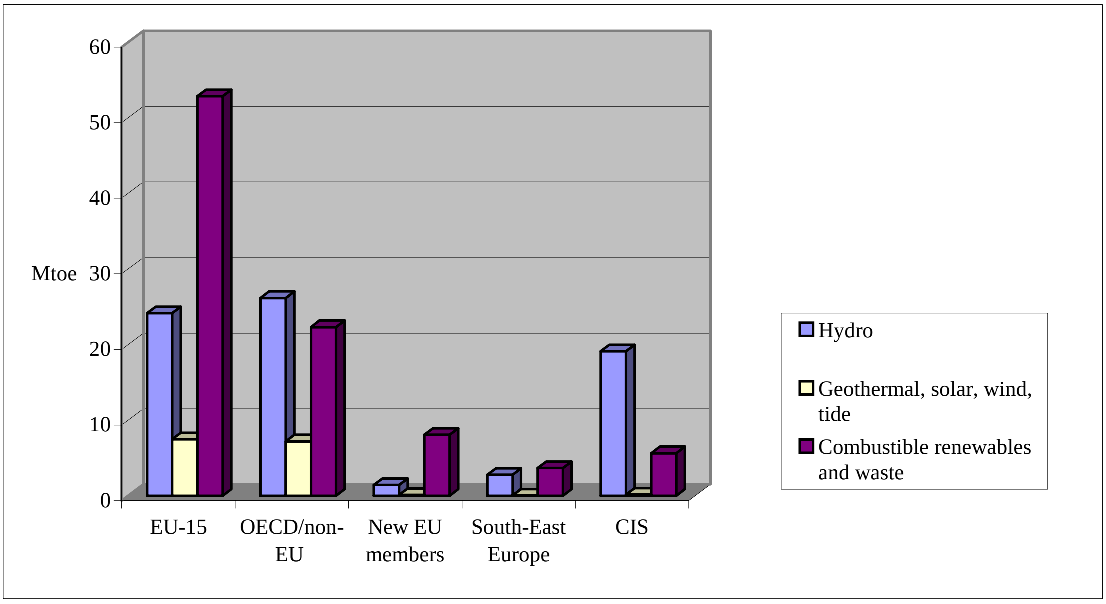
[8] Renewables Information 2004, IEA Statistics, p. 3-4

renewables and waste. At the same time in a number of countries (14) among the PEEREA constituency the share of renewables is below 2%. The national availability of renewable resources, the energy system and infrastructure, but also the political priorities have a considerable influence on the utilisation of RES.

As for the different types of renewable energy, combustible renewables and waste are dominating in the EU-15 (Figure 2), mainly due to the high production in France, Sweden and Germany. Combustible renewables and waste are also dominating in the production of renewable energy in the new EU members and South-East Europe, although in much lower absolute quantities. Hydropower is the main renewable energy source for the CIS.

The 'new' renewables – geothermal, solar, wind and tide – are utilised in the OECD countries, and very little in other countries. The biggest producers are Japan (3.91 Mtoe in 2002) and Italy (3.59 Mtoe), followed by Iceland, Germany and Turkey. Denmark, Germany and Spain are the leaders in wind installed capacity, while Germany and Japan are the leaders in installed solar photovoltaics. The absolute levels of energy production from these sources in the new EU members, South-East Europe and the CIS are symbolic, with a number of countries with no production from these energy sources.

Figure 2. Renewable Energy in PEEREA Countries, 2002



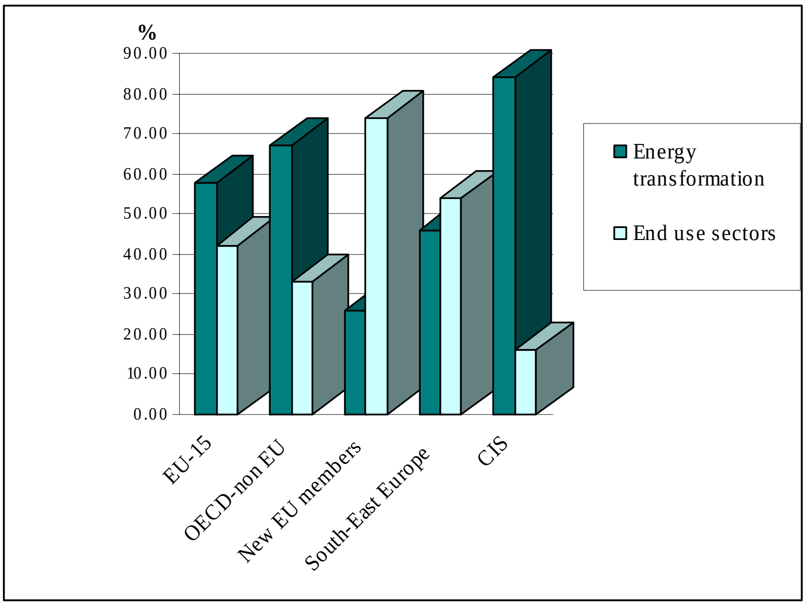
Source: Based on Renewables Information 2004, IEA Statistics

Renewable energy sources are used for both energy transformation and directly as an energy source in the demand side. In average, in the PEEREA countries 62% of renewables are used to produce electricity and heat (transformation sector) and 38% are consumed in the end-use sectors (Annex C).

Renewable energy sources are used primarily in electricity production, accounting for 52.6% of the RES use in 2001. The main source is hydropower (78.3%). About 3% of the utilized RES enter the heat production plants.

At the same time a considerable part of the renewable energy is consumed directly in the end-use sectors (Figure 3), mainly in small-scale installations, which generate heat or electricity in decentralised systems for the local supply of individual households or industrial enterprises.

Figure 3. Renewable Energy Use in PEEREA Countries, 2001



Source: Based on Renewables Information 2004, IEA Statistics

Combustible renewables and waste use in the residential and industrial sectors comprise a considerable part of the renewable energy use directly on the demand side. As an average for the PEEREA countries, about 70% of the combustible renewables and waste are utilised in the end-use sectors. 38% of the solar/wind/other renewable energy and 23% of the geothermal energy are also used in the end-use sectors.

Statistical data show for the CIS countries a high share – nearly 84% - of RES use in transformation (the electricity sector). However, this is probably due to the availability of information for the hydropower use in big power plants and the lack of information about the use of combustible renewables in the end-use sectors.

2.2 Energy Efficiency and Renewable Energy Potential

Energy Efficiency Potential

Whatever uncertainty exists as to the methods and tools for defining the energy efficiency potential, there is evidence for the existence of a substantial energy efficiency potential in all PEEREA countries. This is the case for both the developed OECD economies and for transition economies.

For example, the EU Directive on Energy Performance of Buildings points to an existing saving potential of around 22% of present consumption in buildings, which can be realized by 2010. The proposal of the European Commission for a Directive on

Energy Efficiency and Energy Services is based on estimates that energy consumption in the European Union is approximately 20% higher than can be justified on economic grounds. For industry this potential for energy savings is estimated to be approximately 17% of current final consumption, realisable by 2010. For the domestic and tertiary sector, it is 22% and for transport 14%, excluding modal shifts. National case studies show that typical energy performance projects often have a cost-effective potential savings of 15-35%.[9]

Considering the higher energy intensity and the physical and technological condition of the equipment, there is realistically a much higher potential for energy efficiency improvements in the transition economies than the developed OECD economies. An IEA paper[10] estimates that the economic potential for energy savings in the new EU members in Central Europe exceeds 20% of the total current final consumption. In the South East Europe and the CIS the energy savings potential is estimated to be even higher, in the range of 30-50%.

Renewable Energy Potential

Different studies provide varying estimates of the technical potential of renewable energy sources in the PEEREA regions. However, it is more important to identify the economically feasible potential of renewables. Specific studies are available for many of the OECD and some of the Central European countries, they are lacking for most of the transition countries, and especially for the CIS where, except for hydropower, most renewable energy resources have not been tapped. As an example, a recent IEA study[11] identifies a huge potential for energy efficiency and renewable energy in Russia. The volume of renewable energy with economic potential is estimated to about 30% of the Russian TPES.

Considering the building sector, for example, in many buildings in the PEEREA countries there is a promising potential for a significant contribution of small-scale renewables applications. In many cases energy saving options for the building envelope can be combined with innovative approaches for renewable energy generation, e.g. solar thermal applications, biomass heat generation, geothermal heat pumps, photovoltaic and even wind installations.

Cost of Saved and Green Energy

The value of energy saved through energy efficiency improvements is in many cases sufficient to repay the cost of the investment within a reasonable length of time and to cover interest charges. A number of energy efficiency initiatives in PEEREA countries report a payback of two-three years.

The average cost of saving a unit of electricity in the domestic sector in the EU is calculated to be around 2.6 € cents, compared to the average off peak price for delivered electricity of around 3.9 € cent/kWh. Similar relations between the cost of savings and

[9] Proposal for a Directive on Energy Efficiency and Energy Services, European Commission, December 2003
[10] Energy Efficiency in Economies in Transition (EITs): a Policy Priority, IEA, 2003
[11] Renewables in Russia, From Opportunity to Reality, OECD/IEA, 2003

the price of delivered energy exist for other energy carriers. If external costs are taken into account the benefits would be even bigger.[12]

The costs of renewables are still comparatively high and are dominated by the up-front investments. On an average cost basis, some renewables in the best locations are competitive with conventional energy sources; however, in most cases renewables are still not competitive.[13] Off-grid renewable electricity systems have proven to be cost effective in locations, where they save the cost of transmission and distribution. The costs of grid-connected renewables, particularly wind, geothermal, small hydro and bio fuels have declined because of technology improvements, more efficient production techniques and wider application, leading to economy of scale. In the last two decades the costs of some technologies have fallen dramatically. For solar photovoltaic (PV) cells unit costs have fallen by a factor of 10 in the past 15 years. Onshore wind power at good sites can compete with traditional fuels, and modern biomass heating is often cheaper than oil heating.[14]

The cost-efficiency of both energy efficiency and renewable energy is greatly influenced by the prices of conventional energy. Therefore, integrating all costs and removing the subsidies for conventional energy are of importance. At the same time, the value for the society of energy efficiency and renewable energy, such as the contributions to an improved energy security and a better environment, values which are difficult to measure, should be taken into account.

Climate Change Mitigation Potential of Energy Efficiency and Renewable Energy

Energy systems based on fossil fuels are mainly responsible for GHG emissions. The share of fuel combustion in the total GHG emissions of the countries included in Annex I to the UNFCCC is about 80% and is increasing.[15] Fuel combustion is the source of 95% of the emissions of CO_2, the main GHG gas, in Annex I countries in 2000, while industrial processes contributed about 4%[16]. The energy sector accounted for 38% of total CO_2 emissions from fossil fuel combustion, followed by the transport sector (27%), energy use in manufacturing and construction (17%), and the residential and public sector (13%).

Improved energy efficiency and energy management and shift to no- or low-carbon energy technologies are important options for GHG emissions reduction. Energy efficiency has the ability to deliver energy and CO_2 savings by reducing the energy demand and consequently, the energy production. Renewable energy leads to reduced GHG emissions by replacing fossil fuel generation installations. Most renewable energy technologies do not emit at all or emit very little CO_2 during operation. The emissions from biomass combustion are neutralized by the sequestration effect.

[12] Proposal for a Directive on Energy Efficiency and Energy Services, European Commission, December 2003
[13] Renewable Energy: Market & Policy Trends in IEA Countries, OECD/IEA, 2004
[14] Renewable Energy - The Solution to Climate Change, European Renewable Energy Council EREC
[15] Among PEEREA constituency, 36 countries and the EU are Annex I Parties to UNFCCC, and 15 countries are Non-Annex I Parties
[16] National Communications from Parties included in Annex I to the Convention, Compilation and synthesis report on third national communications, FCCC/SBI/2003/7

The potential CO_2 emission reductions in the building sector are estimated by the Intergovernmental Panel on Climate Change (IPCC) at about 700-750 MtC_{eq} per year in 2010 and 1000-1100 MtC_{eq} per year in 2020. The energy efficiency in industry can bring about 300-500 MtC_{eq} per year in 2010 and 700-900 MtC_{eq} per year in 2020. Most of these reductions are available at negative net direct costs (direct benefits exceeding direct costs). Potential CO_2 emission reductions in energy supply and conversion amount to about 50-150 MtC_{eq} per year in 2010 and 350-700 MtC_{eq} per year in 2020, many options being available for less than USD100 per tone carbon equivalent.[17]

Assessing and ranking the policies and measures for climate change mitigation according to their cost-efficiency depends to a large extent on national circumstances. However, experience so far has identified energy efficiency among the most cost-effective measures across countries with very different national circumstances.[18] This points out energy efficiency measures as being the best investment opportunities for GHG abatement.

[17] IPCC Third Assessment Report, 2001

[18] National Communications from Parties included in Annex I to the Convention, Compilation and synthesis report on third national communications, FCCC/SBI/2003/7

3 Barriers to Achieving the Economic Potential for Energy Efficiency and Renewable Energy

Achieving the economic potential for energy efficiency or for renewable energy is hampered by the various barriers that affect the market. These barriers – and measures to overcome them – are rarely discussed in relation to both energy efficiency and renewable energy. Energy efficiency actions relate mainly to end-users and all the stakeholders that impact on them. These can include manufacturers, installers, retailers and so on. Renewable energy is an energy supply option and, thus, obviously the target audiences are mainly energy producers. However these include not only utilities with large wind farms or hydroelectric facilities, but also individuals with a wood stove or a small wind turbine, as well as industrial enterprises with biomass boilers and public administrations with solar collectors on their buildings, for example. Also for renewable energy, the relevant stakeholders include manufacturers, installers, retailers, etc.

The Energy Charter Secretariat recently prepared an analysis of the barriers to financing of investments in energy efficiency in its report on third party financing. Much of this analysis is also relevant to renewables[19]. Drawing on this work this chapter provides a brief introduction to the barriers and where there are some common elements to the categories and analysis.

The following categories that have been commonly used for energy efficiency can be used for both energy efficiency and renewable energy.

- *information-related barriers* – absence of information or distorted, biased or confusing signals to the energy user that affect the entire energy cycle (including technology development and the development of service industries);
- *price related barriers* – subsidised energy prices are not an incentive for energy efficiency measures; low energy prices, not internalising environmental costs, constitute the main market barrier for renewables;
- *structural barriers* – the capital stock and structures that have been developed after long periods of distorted, biased or confusing signals (particularly energy price signals); insufficient access to funding is one very important barrier for both energy efficiency and renewables;
- *technical barriers* – to obtain continuing improvements in energy technologies there is a need to ensure that existing technologies reach the market and that research & development for new technologies is adequate to provide a new generation of technologies;
- *institutional barriers* – there are two main types of institutional barriers: 1) those which affect the development, design and implementation of policies specifically meant for improving energy efficiency and deployment of renewables (including insufficient staffing and expertise, and insufficient intervention budget to fulfil objectives); and 2) those which have no apparent and direct relationship with energy efficiency and renewables, such as deficiencies in interministerial co-ordination, but which can significantly affect

[19] Third-Party Financing, Achieving its potential, ECS, 2003.

them nonetheless. Both types of institutional barriers also affect the other categories of barriers, thus creating a vicious circle;

- *political barriers* – there are barriers for government decision-makers at the political level in ensuring that energy efficiency and renewables receive the sustained, unbiased attention that they need in order to be effective.

The IEA recently published a report on *Creating Markets for Energy Technologies*, including technologies relating to energy efficiency, renewable energy and fossil fuels. The report provided an overview of barriers for energy technologies, their characteristics and typical measures to overcome them. Some similarities and differences between their effect on energy efficiency (EE) and renewables (RE) are given in the column with comments in Table 1 below.

Table 1. Types of Market Barriers and Alleviating Measures

Barrier	**Key Characteristics**	**Typical Measures**	**Comments**
Uncompetitive market price	Scale economies and learning benefits have not yet been realized	• Market transformation programmes • Additional technical development	Uncompetitive prices affect both EE and RE and especially new technologies.
Price distortion	Traditional technologies may be subsidised and associated costs may not be included in their prices	• Regulation to internalize 'externalities' or remove subsidies • Special offsetting taxes or levies • Removal of subsidies	Price distortion affects the cost-effectiveness of both energy efficiency and renewable energy technologies.
Information	Availability and nature of a product must be understood at the time of investment	• Standardisation • Labelling • Reliable independent information sources • Convenient and transparent calculation methods for decision makers	For EE the most relevant information is related to possible energy savings and cost reductions; regarding RE the key information to be provided regards mainly the environmental benefits.
Transaction costs	Costs of administering a decision to purchase and use equipment (overlaps with 'information' above)	• Standardisation • Labelling • Reliable independent information sources • Convenient and transparent calculation methods for decision makers	Depends on the size of the investment but is probably more important now for RE investments; for EE the small size of projects is one of the most known barriers, addressed mainly through bundling the projects.
Buyer's risk	• Perception of risk may differ from actual risk (e.g. 'pay-back' gap') • Difficulty in forecasting over an appropriate time period	• Demonstration • Routines to make life-cycle cost calculations easy	There are bigger perceived risks for renewable energy today but this is often a problem for energy efficiency technologies as well.
Finance	• Initial cost may be high threshold • Imperfections in market access to funds	• Third party financing options • Special funding • Adjust financial structure	Financing is a major concern for both energy efficiency and renewable energy technologies.

Barrier	Key Characteristics	Typical Measures	Comments
Inefficient market organisation in relation to new technologies	• Incentives inappropriately split – owner/designer/user not the same. • Traditional business boundaries may be inappropriate • Established companies may have market power to guard their positions	• Restructure markets • New instruments, compatible with market liberalisation should be developed.	This is true for both energy efficiency and renewable energy technologies.
Excessive/ inefficient regulation	Regulation based on industry tradition laid down in standards and codes not in pace with development	• Regulatory reform • Performance based regulation	For EE measures regulations can help creating motivation for various actors embarking on such measures; for RE, regulations should mainly ensure access to the grid and allow financial incentives.
Capital stock turnover rates	Sunk costs, tax rules that require long depreciation and inertia	• Adjust tax rules • Capital subsidies	This depends on the specific technology but probably more pertains to energy-efficient technologies.
Technology-specific barriers	Often related to existing infrastructures in regard to hardware and the institutional skill to handle it	• Focus on system aspects in use of technology • Connect measures to other important business issues (productivity, environment)	This is true for both, but perhaps mainly for renewable energy technologies.

Source: based on IEA, *Creating Markets for Energy Technologies*, OECD, Paris, 2003, p. 65 with comments column added.

Undoubtedly, policy, economic and administrative issues are important to both energy efficiency and renewable energy investments. Addressing them with coordinated or integrated policies in many cases may prove beneficial. More discussion on policy issues will be provided in the following chapters.

4 Policy Integration

4.1 Introduction

In policy making there is a rationale for considering energy efficiency and renewable energy together, because they both seek to reduce the need for conventional, commercial fuels and they both address environmental concerns. Effectively, they are both seen as “clean”. But, they approach the issues of reducing conventional energy use from different directions in the energy cycle. Energy efficiency policies are designed to reduce energy demand by targeting the use of specific fuels or certain sectors, depending on policy priorities. Renewable energy policies are designed to increase energy supply or to substitute existing sources of supply.

In many instances because of these differences there is a tendency to treat energy efficiency and renewable energy totally separately. This raises some issues for policymakers that need to be addressed. Some of the major ones are:

- How to secure that energy efficiency policy and renewable energy policy are compatible and mutually reinforcing?
- Is there a policy framework that combines effectively both energy efficiency and renewable energy policies?
- Is the integration best done at the policy or the programme level or both?
- When developing a framework where is the right balance between energy efficiency and renewable energy in terms of priority, budget and targets?

4.2 Integration – Policy Formulation

Many PEEREA countries have created links between energy efficiency and renewable energy policies. Some are doing it as part of an overall energy strategy, combining all elements of the energy policy. Others link energy efficiency and renewables as part of their climate change strategies. Still others are making this linkage through sustainable energy strategies.

The main driver for the integration of energy efficiency and renewable energy on the policy formulation level is their potential to support the achievement of security of energy supply (respectively to reduce import dependency) and the reduction of GHG emissions. Respectively, integration is done mainly within the national energy and environmental policies.

Integrating energy efficiency and renewable energy into both energy and environmental policies is important for establishing a framework for riping the practical benefits of the integration opportunities.

Integrating into Energy Policy

For energy policy, energy security and climate change appear as increasingly important drivers, which is reflected in the increasing role of energy efficiency and renewables.

Most national energy policies will include both energy efficiency and renewables. A few examples are:

- Denmark's Energy 21 published in 1996 provided a framework for sustainable energy policies, which included both energy efficiency and renewable energy.
- The 2002 National Energy Strategy in Bulgaria included the rational use of energy and renewable energy sources utilisation.
- The National Energy Policy of the Czech Republic combines energy efficiency, renewable energy and cogeneration in one long-term framework[20].
- Estonia's 1998 energy efficiency strategic goals include promoting the wider use of renewables. For Estonia, the energy strategic goals also include development of oil reserves, greater energy independence, stable fuel supply, encouraging distributed electricity and CHP.

Some governments set quantitative national targets for energy efficiency and renewable energy. The targets are used as drivers for the efforts directed to increased energy efficiency and utilisation of the renewable energy sources and constitute a benchmark against which to measure progress.

A number of the PEEREA countries have quantitative energy efficiency targets: Denmark, Estonia, Finland, Hungary, Italy, Latvia, FYR Macedonia, Moldova, the Netherlands, Romania, Russia, Slovenia, Switzerland, and Ukraine[21].

Italy Sets Energy Efficiency Targets

Italian electricity and gas suppliers are to be required to help their customers to save energy under two new government decrees. The laws set targets of reducing national electricity and gas consumption by 2.9m tonnes of oil equivalent and CO_2 emissions by 7m tonnes by 2006. The government is to announce details of incentives for energy suppliers.

Source: Environment Daily, 28/06/2004

Setting targets is a policy instrument accepted as useful in the EU, although the level of targets is subject to different opinions and continuous discussions. The new directive on energy efficiency and energy services, proposed by the European Commission in December 2003, sets two compulsory energy efficiency targets to be respected by the Member States for the period 2006 to 2012:

- An overall energy savings target of 1% a year, compared with the average final energy consumption of the previous five years. Each Member State is to decide which sectors should be addressed and how much each sector should contribute to reaching the national target.

[20] The in-depth Energy Charter 2003 review of the Czech Republic provides a good overview of this approach.
[21] For more details, see "The Road towards an Energy Efficient Future", Energy Charter Secretariat, 2003

- A target of 1.5% annual energy savings in the demand of the public sector in each Member State, mainly through public procurement of energy services and efficiency measures.

The achievement of the overall goal is expected to lead by 2012 to a reduction of total energy use of around 6% compared with 2006. The European Parliament's environment committee proposed in January 2005 higher mandatory national targets of 2.5% annual energy savings.

Some countries set national targets for the contribution from renewable energy. They are in the form of minimum percentage of energy supply or electricity production from renewables. The European Union's Renewable Energy Directive sets a target of 22.1% renewable share in total produced electricity and 12% of renewables in the gross energy consumption. The indicative target should be transformed into national targets of the Member States. The new EU members and some other OECD countries also established renewable energy targets (Table 2).

Table 2. Targeted Share of Renewables in Electricity Production

Countries	Share of Renewables in electricity production, 2002	Targeted share for 2010*	Targeted share for 2010**
Austria	69.0	78.1	78.1
Belgium	1.4	6.0	6.0
Cyprus			6.0
Czech Republic	3.9		8.0
Denmark	18.2	29.0	29.0
Estonia			5.1
Finland	27.6	31.5	35.0
France	11.9	21.0	21.0
Germany	7.9	12.5	12.5
Greece	6.6	20.1	20.1
Hungary	0.7		3.6
Ireland	5.6	13.2	13.2
Italy	17.4	22.0	25.0
Latvia			49.3
Lithuania			7.0
Luxembourg	7.2	5.7	5.7
Malta			5.0
Netherlands	4.0	9.0	12.0
Norway	99.6		7 TWh[1)]
Poland	1.9		7.5
Portugal	21.9	39.0	45.6
Slovak Republic	16.8		31.0
Slovenia			33.6
Spain	14.9	29.4	29.4
Sweden	48.7	60.0	60.0
Switzerland	55.6		3.5 TWh[2)]
Turkey	26.2		2.0
United Kingdom	2.8	10.0	10.0

1) from heat and wind 2) from electricity and heat

Sources: * RENEWABLE ENERGY, Market & Policy Trends in IEA Countries, OECD/IEA, 2004
** Johannesburg Renewable Energy Coalition (JREC) Policies and Measures Database, IEA webpage

> Mandatory Renewable Energy Target in Australia
>
> Introduction of a Mandatory Renewable Energy Target for the uptake of additional renewable energy in power supplies has been announced in Australia in 1997. The target seeks to increase the contribution of renewable energy sources in the country's electricity mix by 9500 GWh per year by 2010, enough power to meet the residential electricity needs of around four million people. The fixed target requires a significant expansion of renewable energy capacity in Australia and in 2010 renewable energy is expected to represent around 12% of the total electricity supplies, an increase of more than 50% above 1997 levels of renewable energy generation.

Energy efficiency improvements support meeting the renewable energy targets by reducing the overall energy demand. Energy efficiency policies and measures directed specifically at reductions in the use of fossil fuels have even greater effects.

Energy efficiency and renewable energy can be integrated into regional and local energy policies and there are many good examples of that occurring[22].

Energy planning effectively started looking at both energy efficiency and renewable energy as a result of the introduction of integrated resource planning (or least cost planning), which started in the 1980s. The integrated resource planning analysis included all options for the electricity sector. In the current context of market liberalisation there is less planning, but an integrated policy approach remains useful.

Integrating into Environmental Policy

Since the emergence of the climate change issues as increasingly important elements in the environmental policy, more attention has been given to integrated approaches in energy and environmental policy making with substantial focus on energy efficiency and renewables. Almost all GHG mitigation and stabilization scenarios are characterised by the introduction of efficient technologies for both energy use and supply, and low- or no-carbon energy production.

Initially, the policies and measures to address climate change were based on existing policies and activities which originally had other objectives than climate change but contributed to the reduction of GHG emissions. Energy efficiency improvements and the utilisation of renewable energy sources have been among the most important elements of these policies.

[22] For example, the assessment report of the European Campaign for Take-off, Renewable Energy for Europe (1999-2003) and the "Catalogue of good practices in European Town and Cities" published by Energie-Cités present an exhaustive list of case studies.

The quantitative commitments of Annex I Parties under the Kyoto Protocol reshaped their climate change policy responses. Many Annex I Parties have looked to a better integration of policies and measures in order to achieve significant greenhouse gas emission reductions in the medium term. More than 20 Annex I Parties have elaborated national strategies to address climate change. The most frequently reported measures in the national climate change strategies are energy efficiency improvements and renewable energy utilisation, which are practically implemented in all Annex I Parties. Pollution prevention in industry, combined heat and power, fuel switching, vehicle and fuel taxes and integrated transport policy frameworks are also among the key policies and measures, but with more limited scope of use among the countries. [23]

The Austrian Climate Strategy, 2002

The realisation of the Austrian Climate Strategy should guarantee that Austria reduces its GHG emissions according to the Kyoto-Protocol. Austria has committed to reduce its GHG emissions by 13% (compared to 1990) until the period 2008/2012.

The Austrian Climate Strategy is a package of measurements, focusing especially on:

- the renovation of buildings including installing improved insulation
- the re-design of transportation (Road Pricing for trucks, the extension of train infrastructure)
- the promotion of renewable energies
- reducing the methane emissions of waste sites and
- reducing the use of synthetic GHG-active gases

French Climate Change Action Plan, 2004

Tax credits of up to 40% for energy efficient equipment for the housing sector were one of the major measures in a national climate action plan, released by the French government in September 2004. Proposals in the plan include a CO_2-related labelling system for cars and other energy efficiency labels for air-conditioners, windows, hot-water systems and insulating material. France should achieve 5.76% penetration of bio fuels in transport by 2010, or five times current usage, it says. A tax credit for "green" building equipment, such as solar hot water heats, will come into effect next January.

Source: Environment Daily, 26/07/2004

There is lately an indication of a shift towards implementing climate-specific policies and measures that have climate change as their primary objective. Examples of such new policies and measures include emissions trading, carbon taxes and green certificate trading. These specific climate-driven policies and measures lead to emission reductions from specific sources by influencing indirectly their energy efficiency and the introduction of low- or no-carbon energy.

[23] National Communications from Parties included in Annex I to the Convention, Compilation and synthesis report on third national communications, FCCC/SBI/2003/7

In many cases national climate change strategies include support for research in new technologies for higher energy efficiency, renewable energy and optimizing the energy efficiency of transportation systems. A number of Parties (e.g. Netherlands) highlight in their national communications that their research is specifically targeted to assess technologies and measures helping to meet their Kyoto targets and post-Kyoto requirements.

The flexibility mechanisms under the Kyoto Protocol - Joint Implementation (JI) and Clean Development Mechanism (CDM) - have the potential to stimulate energy efficiency and renewable energy projects. JI and CDM cannot be the main drivers for energy efficiency and renewable energy, but can support the development and implementation of such projects in the host countries by capacity building, demonstration of the benefits and technology transfer. At the same time they can help investing countries in reducing the overall costs of their climate change commitments. Renewable energy (with the notable exception of large-scale hydropower) is the project type preferred by most Annex I Parties under the CDM, followed by energy efficiency and landfill gas projects.

Climate change policy necessitates developing a specific institutional framework by Parties or strengthening the existing institutional arrangements. More emphasis is placed on the coordination between all relevant national institutions to ensure an integrated policy approach.

The European Climate Change Programme, launched by the European Commission in 2000 with the objective to identify strategic paths for the implementation of the Kyoto Protocol, included a series of measures directly or indirectly related to energy efficiency and renewables. Climate change mitigation has been a major driver for the Directive on the Energy Performance of Buildings, the Renewable Energy Directive that sets indicative targets and the proposed Energy Services Directive. The EU emission trading scheme is intended to drive industry investment in the direction of low carbon technologies.

4.3 Integration - Programmes and Programme Delivery

There are different approaches among PEEREA countries as to the integration of energy efficiency and renewable energy programmes. Some countries have created strong linkages with programmes developed and implemented in single agencies or ministries. Often individual programmes are directed at both energy efficiency and renewable energy. In other countries, the links are weaker or totally absent. Examples of countries that combine their energy efficiency and renewable energy implementation programmes include:

- The 1996 national energy efficiency programme in Lithuania included using renewable energy resources.
- In the Czech Republic the 2001 Energy Management Act established a National Programme for Energy Efficiency and the Use of Renewable Energy Resources.
- In Hungary, the 1996 Energy Saving Action Plan included increasing the penetration of renewables as well as promoting greater energy efficiency.

The 1999 Energy Saving and Energy Efficiency Action Plan included promoting renewables.

- The Special Fund for the Development of the Energy System in Romania includes support for both energy efficiency (mostly in district heating in municipalities) and renewables.

In a number of countries the energy agencies implement both renewable energy and energy efficiency measures. All of the national energy implementing agencies in the EU handle both energy efficiency and renewables even if the ministries for the two areas are not always the same. For example, in the UK, the Energy Saving Trust (see box below) implements programmes for both energy efficiency and renewables (not for the commercial or industrial sectors) but the responsibility for energy efficiency lies with the Department of the Environment, Food and Rural Affairs (Defra) while renewable energy is under the Department of Trade and Industry (DTI).

The following three boxes give some description of the role of the implementing agencies for both energy efficiency and renewable energy.

Energy Saving Trust – UK

The Energy Saving Trust provides independent evidence-based policy analysis around the areas of energy efficiency, small-scale renewables and clean low carbon transport, covering both the UK and Europe. Recent consultation documents have been submitted around cleaner fuels and fiscal incentives for energy efficiency.

The Energy Saving Trust develops and manages programmes for UK Government, covering awareness raising, provision of advice and support and grants for innovative technologies and techniques. It supports a UK-wide network of 52 Energy Efficiency Advice Centres, providing impartial advice to householders. It also manages the Department of Trade and Industry's £25m Major Photovoltaics Demonstration programme, designed to kick-start the market for electricity generation from the sun, for domestic, public sector and private enterprise. The PowerShift programme, now in its eighth-year, funds cleaner fuelled vehicles from both public and private customers and is credited with a significant contribution to priming the cleaner fuels market and improving air quality.

Source: www.est.org.uk

ENOVA – the Norwegian Energy Efficiency and Renewable Energy Agent

Enova is an autonomous public enterprise, owned by the Norwegian Ministry of Petroleum and Energy. Its main mission is to contribute to environmentally sound and rational use and production of energy, relying on financial instruments and incentives to stimulate market actors and mechanisms to achieve national energy policy goals.

Enova's role is to work on a strategic level. On an operational level Enova draws on a number of regional energy efficiency centres and other subcontractors to coordinate and implement its programmes. Enova manages the Energy Fund and finances programmes and initiatives that support and underpin national objectives.

Enova has activities in specific programme areas: heat distribution and heat generation; energy end use in industry, commercial and residential buildings, and retrofitting of street lighting; wind energy; renewable energy (other than wind); but also in some cross cutting areas like information, advice and campaigns; training and education.

Source: www.enova.no

Sustainable Energy Ireland

Sustainable Energy Ireland is Ireland's national energy authority. The Authority promotes and assists environmentally and economically sustainable production, supply and use of energy, in support of Government policy, across all sectors of the economy.

Its remit relates mainly to improving energy efficiency, advancing the development and competitive deployment of renewable sources of energy and combined heat and power, and reducing the environmental impact of energy production and use, particularly in respect of greenhouse gas emissions.

The Authority is charged with implementing significant aspects of the Green Paper on Sustainable Energy and the National Climate Change Strategy as provided for in the National Development Plan.

Source: www.irish-energy.ie

On the implementation level the combination of energy efficiency measures with renewable energy would lead to higher economic, social, and environmental efficiency:

- a higher energy efficiency reduces demand, which together with the effects of introducing clean energy sources, allows an optimisation of the overall environmental performance of energy supply and use;
- the efficiency of energy consumption is indispensable when considering the investment support provided to renewable energy by public funds or by increased consumer commitments through no matter what type of mechanisms (direct support, tax measures, incentive tariffs, government purchases, etc.). And this concerns both the transformation and direct final consumption of renewable energy;
- the competition between energy efficiency and renewable energy projects within a defined policy framework is also a driver for increased efficiency.

Implementation at the local level is important as it is the closest level to the end users of energy. The involvement of local authorities in implementation is crucial for deriving the benefits of the integration of energy efficiency and renewable energy policies. This requires creating coherency between national and local authorities' understanding of policy objectives. The integration of renewable energy and energy efficiency policy measures on the local level is beneficial when the target audiences for energy efficiency and renewables in a local community are the same as is often the case in the building sector.

Many towns and cities have implemented sustainable local energy policies and programmes. A number of relevant initiatives can be listed not only for the OECD countries, but also for Central and South-east Europe. National and international municipal energy networks (Energie Cité, Fedarene, MUNEE, EcoEnergy) are providing guidance and support to these activities.

Energie-Cités, the Association of European Towns and Cities

With over 110 members in 21 countries and representing close to 300 towns and cities, Energie-Cités is the association of European local authorities for promotion of local sustainable energy policies. Its main objectives are:

- to strengthen the role and skills of municipal governments in the sphere of energy efficiency, in the promotion of renewable and decentralised energy sources and in protection of the environment,
- to develop initiatives through exchange of experiences, the transfer of know how and the organisation of joint projects,
- to influence the policies and proposals made by European Union institutions in the fields of energy, environmental protection and urban policy.

The association has a database of more than 400 good practice examples in integrated actions, energy efficiency, renewable energy and urban mobility.

Source: www.energie-cites.org

5 Policy Instruments to Promote Energy Efficiency and Renewable Energy

5.1 Introduction

To get a better perspective on the linkages between energy efficiency and renewable energy, this section reviews the range of measures in place for energy efficiency and renewables, to see where they come together and where there are differences. This section provides an overview of the range of programme types but it is not as comprehensive for all PEEREA countries as the overview provided in the Kiev report[24] for energy efficiency programmes.

The Energy Charter Secretariat uses six broad categories of policy instruments for monitoring energy efficiency policies. These include regulations and standards, financial incentives, voluntary measures, information/awareness, education/training/advisory, and R&D. Where measures for energy efficiency and renewable energy come together is in addressing individuals or companies who are not producers of electricity or heat.

There are for renewable energy a number of separate mechanisms that are normally not used in the energy efficiency field. These include instruments such as bidding systems, green pricing, guaranteed prices/feed-in tariffs, and production tax credits. These instruments can be used for both large-scale and small-scale renewable energy technologies, but are normally used for those that feed into the grid.

The following section compares the main policy instruments used for both energy efficiency and renewables.

5.2 Use of the Policy Instruments

Regulations and Standards

Regulations and standards are widely used for both energy efficiency and renewable energy. They can be set not only to specific technologies (e.g. photovoltaics) or systems (e.g. building codes) but also for the availability and quality of information (e.g. obligations to have energy labelling of appliances). Regulations and standards can also include monitoring and reporting requirements for example for industrial energy use. Regulations can also require utilities to establish demand-side management programmes or to use renewables in their fuel mix. Regulations and standards can be mandatory or voluntary.

Regulations and standards are used widely throughout the PEEREA countries for all sectors. The European Union is in the lead with its range of labelling and efficiency directives as well as a renewable energy directive requiring all member states to promote renewable energy. Most recently, the Energy Performance in Buildings Directive requires a range of actions including revising building codes and requiring

[24] The Road towards an Energy Efficient Future, Energy Charter Secretariat, 2003

energy certification of buildings. A new directive to oblige energy supply companies to provide energy services to consumers has been proposed by the Commission.

Legislation in the Czech Republic

The Energy Act, which came into force in January 2001, defines a framework for the liberalisation of the electricity and gas markets and supports the use of renewable energy sources and CHP. It defines conditions for the obligatory purchase of electricity and heat produced from renewables and from CHP. The Energy Act also includes the creation of the Energy Regulation Office.

The Energy Management Act, which entered into force in January 2001, established standards for energy efficiency of heat and electricity production, transmission, distribution and use, energy planning requirements, and energy auditing obligations. It also sets out the obligation to formulate a National Energy Policy, to prepare a National Programme for Energy Efficiency and Use of Renewable and Waste Energy Sources. The Act stipulates mandatory regional energy plans for all fourteen regions and for fourteen towns.

Market Liberalization in Favour of Renewable Energy and CHP in Belgium

In April 2000, the federal government decided that all generators of electricity from renewable sources will gradually be free to choose their own electricity supplier if they use more electricity than they are able to generate. Consumers who buy a significant amount of their electricity from renewable sources are also eligible to choose their electricity supplier. The Flemish Parliament approved the decree regarding the liberalisation of the electricity market and marked the following categories as eligible:

- Producers using quality CHP installations or renewables for electricity generation (up to a certain ceiling).
- Consumers of renewables-generated electricity by means of a CHP unit (for a certain amount of electricity) or consumers using heat from CHP units or renewables.
- Consumers using heat from a supplier who generates this heat by means of CHP units or renewables (for a maximum of 500 kWh electricity per GJ heat).

In Wallonia, a corresponding decree was approved. It aims to gradually open the market for producers using CHP and/or renewables for electricity generation, as well as for consumers using renewable electricity or co-generated electricity or using heat from CHP units and renewables.

> Regulation Incentives in Portugal
>
> The government has implemented measures to encourage the development of more efficient or carbon free electricity production, including co-generation, small hydroelectric production and generation using other renewable energy sources. The formula for payments of capacity and energy supplied to the grid by new co-generators was set in 1999. Monthly payments are a function of performance and availability. An environment premium is added if thermal efficiency of the plant is at least equal to the most efficient combined-cycle. The payments of electricity from renewables are based on the value associated to the environmental benefits of avoided carbon emissions.

Financial Incentives

Investments in energy efficiency or renewable energy can range from relatively small amounts to multi-millions of Euro. Finance of even relatively small amounts can be difficult to obtain for some consumers, even though the payback may be good. Governments and international development banks have developed a range of financial instruments to help consumers decide to invest in energy-efficient and renewable energy technologies.

Financial instruments are well established and are generally well targeted to meet specific objectives (e.g. national climate change targets) or to promote specific technologies (e.g. insulation or PV systems). The financial instruments normally include subsidy/grant schemes, soft loans, funds and tax credits.

> Financial Incentives for Energy Saving and Renewables in the Czech Republic
>
> The State Programme to Support Energy Saving and Use of Renewable and Secondary Sources was established in 1991. It is revised each year. The programme for 2000 included energy-saving measures in production, distribution and consumption of energy; wider use of renewable and secondary sources of energy; development of co-generation of heat and electricity; counseling; implementation of low-energy technologies; and educational and promotional activities. Currently it provides the following incentives for renewables:
>
> - Obligation for distribution companies to purchase electricity and heat generated from renewables based on regulated buy-back tariffs.
> - Exemption from excise taxes for biodiesel fuel (methanol from rape seed).
> - Reduced import duties on renewable energy equipment.
> - Five-year tax relief (income and property) for investment in renewables (small hydropower plants restricted to capacities > 1 MW).
> - Reduced VAT rate (5% instead of 22%) for small facilities (hydropower: 0.1 MW; wind: 0.075 MW; and all solar and biomass units).
> - Exemption from property tax for five years for the conversion of building heating systems from solid fuel to renewable energy.
> - Reduced VAT rate of 5% paid by final consumers of biomass heat, provided that it is a part of district heating system.
> - Direct investment incentives for non-profits, municipalities and individual end-users.

For many of the economies in transition the offer of financial incentives is limited by government budget constraints. For this reason, commercial banks and third-party financing schemes have been encouraged to promote energy efficiency and renewable energy. However, there are some offers of financial incentives, which are linked to other government priorities and existing financial measures, such as housing modernisation. A large number of the financial incentives in transition countries are funded through international support – either bilateral or multilateral.

A Revolving Fund for Energy Efficiency and Renewables in Hungary

The German Coal Aid Revolving Fund (GCARF) started in 1991 with an original target to provide financing for the private sector to support energy efficiency investments and reduce environmental pollution. The GCARF is administered by the Hungarian Credit Bank. Its scope has been expanded to include municipalities. The main objectives are to replace traditional energy sources with renewable or waste-related energy sources, to induce energy saving in businesses and to reduce energy waste at the lowest possible cost. The preferential interest is one-third of the central bank's base rate with an additional 2.5% interest. From 1991 to 2002 the total amount of investments approved was HUF 14.4 billion, of which HUF 11.9 billion was made up of preferential credits.

In 2000, the GCARF allocated more than HUF 1 billion in preferential credit for SMEs, which resulted in energy savings of 325 TJ per year and total investment of HUF 1.6 billion. In 2001, a total of HUF 0.89 billion was spent on renewable investments from preferential credit. In 2002, the amount of the preferential credit was increased to HUF 1.51 billion. A total investment of HUF 3.53 billion resulted in 1.04 PJ energy savings.

The Energy Charter Secretariat has published a study that gives a thorough analysis of the use of Third Party Financing (TPF) instrument to overcome the financing barriers[26]. While the report deals with energy efficiency, the instrument can also be used for financing renewable energy projects. Spain was one of the first countries in Europe to use TPF for renewables as well as for energy efficiency.

Credit line for Renewables and Energy Efficiency in Spain

In 2002 - under the renewable energy plan 2000-2010 - a financing line has been provided by the Official Credit Institute (ICO) and the Institute for Diversification and Energy Saving (IDAE) for renewable energies and for energy efficiency projects (saving and fuel switching in industry, energy efficiency in buildings, etc.). Low interest loans are offered for the maximum of 70% of the investment.

Within the PEEREA region, EBRD has developed a number of financial instruments to finance energy efficiency. TPF is one of the major ones. More recently, the EBRD has been giving higher priority to financing renewable projects.

[26] *Third Party Financing, Achieving its Potential*, ECS, Brussels, 2003.

Voluntary Agreements

Voluntary agreements have proven to be an effective mechanism for encouraging energy efficiency and reductions in GHG emissions, particularly in the industrial sector, but increasingly in all end-use sectors. While voluntary agreements are common in OECD countries, they appear to be hardly ever used in transition economies.

One of their main benefits is that they can be implemented at lower cost and faster compared to mandatory measures, which can often take years to be approved and implemented. According to the IEA Renewable Energy Database[27], there has only been limited use of voluntary agreements for promoting renewable energy.

Voluntary agreements (VAs) do not guarantee success. The design and management of VAs are crucial. There are excellent examples of the effective use of VAs in countries such as the Netherlands, Finland and Japan.

There is a wide range of voluntary actions used to promote energy efficiency, including industrial covenants, negotiated agreements, self-regulation, codes of conduct and eco-contracts. The UK recently started implementing a Code of Practice for Providing Advice, which was prepared by a voluntary Partnership of stakeholders. It is now being implemented by the Energy Saving Trust, the national energy agency of the government. The Partnership, interestingly, is considering expanding into renewable energy at the domestic level. Other examples are given in the text boxes below.

Keidanren's Voluntary Action Plan in Japan

In Japan the Voluntary Action Plan on the environment, coordinated by the federation of Japanese industry Keidanren, is one of the key activities in the industry sector with an impact on energy consumption. The plan is to return CO_2 emissions to levels below 1990 by 2010.

The Action Plan is an entirely voluntary effort in which each industry uses its own discretion, free from any obligation by government or regulatory body. The types of industry commitments under the plan include absolute emission objectives, reduction in overall energy consumption or improvements in the CO_2 or energy intensity of output. The results were not identical in all sectors. Iron and steel industry reduced its energy related CO_2 emissions by 8.7%, and the cement industry with 13.5%.

Voluntary Agreement in Italy

ENEL signed an agreement with the Ministry of the Environment to cut greenhouse gas emissions, an accord which will require an investment of ITL 8 to 10 trillion (US$ 3.8-4.8 billion) by 2006. The announcement was made during the presentation of ENEL´s 1999 Report on the Environment. According to the agreement, emissions of carbon dioxide will be reduced by 20% from 1990 levels as part of a programme that will require all ENEL´s plants to increase production efficiency and invest in renewable resources.

[27] See www.iea.org.

> Energy2000 Programme in Switzerland
>
> On the legal basis of the Energy Decree, the action programme Energy2000 aimed to stabilise total fossil fuel consumption and CO_2 emissions at 1990 levels by 2000. Increased use of renewable energy featured prominently in different parts of the Energy2000 programme. The federal Energy2000 programme rested on three main pillars: voluntary measures to promote energy efficiency and renewables, a favourable legal environment and dialogue between parties. The implementation of Energy2000 rested with marketing departments, one of which dealt specifically with renewable energy. The work of this department concentrated in three areas with associated Action Networks:
>
> - Swissolar is a grouping of five utility and private solar energy associations, and its main purpose is the promotion and marketing of solar energy technologies.
> - The Swiss Wood Energy Association aimed to increase wood's share of the heating market to 6% by 2000.
> - The Swiss Heat Pump Promotion Group which leads promotional efforts such as training, quality assurance and after-sales service.
>
> The budget allocated was: promotional activities (46.5%), R&D (37.5%) and pilot and demonstration projects (16%).

Information/Awareness

Information to the stakeholders in energy efficiency and renewable energy is fundamental in order to create awareness of the available range of technologies, the costs and benefits, best practices and the importance of such measures for meeting national and international objectives. Information and awareness programmes cover a wide spectrum from mass media campaigns, information centres, technical manuals, guides and brochures, labelling and energy audits. They can be used for awareness creation or for providing detailed technical information to actors such as: consumers, energy suppliers, manufacturers, installers, energy managers, investors and decision-makers.

> Renewable Energy Guide in Luxembourg
>
> The Ministry of Environment developed a Renewable Energy Guide in September 2001. This guide, created in collaboration with the Luxembourg Energy Agency, informs about renewable energy technologies, their possibilities and use. It also serves as an information source on methods to apply for subsidies under the government scheme for the promotion of renewable energy sources.

Awareness creation is a key because many consumers have little understanding of the cost-effective potential for improvements for energy efficiency, the techniques to make such improvements or the costs and benefits of local renewable energy systems. Awareness creation is often linked to climate change and the contribution that energy efficiency and renewable energy bring to reducing greenhouse gas emissions.

Billing Information in Austria

According to the Energy Liberalisation/Electricity Act 2000, electricity suppliers in Austria are required to show the primary energy mix used to generate the electricity they supply on their customers' electricity bills. Provincial governments are responsible for ensuring that this information is correct. Electricity suppliers have the option to show the average European energy mix used on the bills instead of the actual domestic energy mix. This requirement provides feedback to promote energy efficiency and to increase the share of renewable energy in electricity generation.

Education/Training/Advice

Education and training are important because of the in many cases rapidly evolving technologies and techniques. Specialists such as builders or installers need to have access to the most recent information on techniques and technologies to improve energy efficiency and to apply renewable energy technologies. In many countries, training is combined with certification so that the public can be assured of a basic quality of workmanship.

There is business training to help developers prepare bankable business plans or for helping third-party financing companies get started. Some countries provide training or education support (often at university level) for architects, planners and other related specialists. There has also been training for improving the capacity of administrations to implement measures or initiatives such as third-party financing, energy planning, Joint Implementation under the Kyoto Protocol, etc.

Integration Options and Benefits

The following Table 3 lists policy instruments promoting energy efficiency and renewable energy and, based on the experience so far, makes an attempt to show the possibilities and benefits of their integration. However, the possibilities for integration should be evaluated carefully taking into account the specific circumstances of a country. A possible list of criteria/success factors is provided in a paper of the Energy Research Centre of the Netherlands[28] and includes: effectiveness, cost-effectiveness, certainty for industry, market efficiency, transparency, transaction cost and administrative capacity, equity (fair distribution of benefits), market conformity. Although these success factors are meant for renewables, they are relevant for energy efficiency policy instruments as well.

[28] Renewable Energy Policies and Market Developments, Energy Research Center of the Netherlands, Oil, Gas & Energy Law Intelligence, Volume 2 – Issue 02, 2004

Table 3. Possible integration and expected benefits from the integration of some policy instruments for promotion of energy efficiency and renewables

Policy instruments	Application for energy efficiency	Application for renewable energy	Possible integration and expected benefits
Regulations and standards			
Obligations/ mandatory targets	Defined % of energy intensity reduction	Defined share of electricity produced from RES	National targets for both EE and RE are usually set at energy strategy level and supported by the legislation. Control on implementation is usually done by the ministry responsible for the energy sector. Targets may also be set on sector, company or installation level, but this requires reliable monitoring and reporting systems. Integration supports achieving targets and improves economic and environmental efficiency.
Portfolio standards (quota system)	No application	Portfolio standards (quota system) on production or consumption (often through distribution companies)	The quota obligations for RE consumption can be effectively combined with EE measures implemented by the distribution companies in the demand side.
Energy certification	Applied for evaluation of the energy performance of buildings	Not specifically applied for RE, but as an element of the evaluation of the energy performance of buildings	Energy Certification of Buildings is mainly intended as a market instrument by introducing transparency for prospective owners and users with regard to the energy performance of buildings on the basis of objective criteria, including both EE and RE application. There can be substantial cost-efficiency advantages from the integrated application of EE and RE certification.
Financial incentives			
Energy/carbon tax	An energy or carbon tax is imposed on energy consumption to stimulate efficiency	Tax exemptions of renewable energy from energy/carbon tax	Taxation of energy consumption (or of its resulting carbon emissions) pays for some of the external costs related to the use of fossil fuels. The tax stimulates consumption reduction, hence energy efficiency. Tax exemption for RE is equivalent to price reduction and is an incentive for RE deployment.
Investment tax credits	Very limited to no application	Applied for consumer-owned renewable systems	Integration of EE criteria in tax credits delivery for RE will lead to higher cost-effectiveness.
Property tax exemptions	Very limited application for installed energy efficiency equipment	Applied on the RE production side to reduce tax payments for project owners	This mechanism can be quite supportive and successful for both EE and RE. It has the advantage that does not provide ready public funding, but reduces taxes to be collected.

Policy instruments	Application for energy efficiency	Application for renewable energy	Possible integration and expected benefits
State grants	Very limited to no application	"Consumer grants" applied as financial incentives to consumers for "new" RES	The targeted groups are consumers – the integration of EE criteria in grants delivery is quite possible. It will lead to better use of public funds.
Special lending instruments (revolving funds, credit lines)	Both national and international such instruments exist	Both national and international such instruments exist	In many cases specific lending facilities address both EE and RE. EE and RE projects compete for funding; higher economic efficiency and financial viability are stimulated.
Third-party financing	Introduced to support financing of initial EE investments of consumers	Introduced to support financing of initial RE investments of consumers	Mechanism first applied to EE and later transferred to RE. In both cases is directed to consumers and allows an integrated approach to make better use of existing institutional and financial capacity. Possible competition between EE and RE initiatives can lead to supporting projects with higher cost-efficiency.
Information/awareness			
Information and awareness programmes and campaigns	Widely applied on all levels	Widely applied on all levels	Integration of most of the programmes is possible and will increase their efficiency.
Energy labelling	Applied mainly for appliances to show level of energy consumption; also intended for buildings	Energy labelling to indicate the renewable origin of energy produced or consumed has still limited application	Integration of energy efficiency and renewables indicators in the labels for buildings is quite possible and desirable to support the promotion of both.
Education/training/advisory			
Specialised education	At university and technical schools	At university and technical schools	Targeted group is one and the same. Integration is normal.
Training	Special courses	Special courses	Target audience for EE and small scale RE generation might be one and the same (local governments, building managers, utility experts, consumers, etc.)
Advisory services	Applied mainly through the establishment of advisory centres or offices	Applied mainly through the establishment of advisory centres or offices	Integration quite possible and desirable – will lead to higher efficiency of advisory services.
Advisory - audits	Applied mainly for industry, but also for public and residential buildings	Rarely applied	Audits may include RE aspects and recommendations of audit reports may refer to the introduction of renewables, thus supporting their promotion.

5.3 Measures Specific to Renewables

There are several measures that are specific to renewables or, conversely, do not directly pertain to energy efficiency. They are directed to support on-grid renewable energy production and include:

- *Green pricing*, which is popular in several countries, basically asks the consumer to pay a premium tariff to ensure that the generator guarantees the product has a specific share of renewables. The first country in Europe to introduce green pricing was the Netherlands and it was followed by Denmark, Germany, Sweden, Switzerland, the United Kingdom and others.
- *Net metering* allows small generators to sell surplus electricity to the grid at a specific price. For example, in Spain generators with an installed capacity of less than 50 MW using co-generation systems or renewable resource systems, or any type of biofuel or non-renewable waste have the right to sell the electricity they generate or their surpluses to the grid at a pre-set price, the value of which is the market price plus a premium according to the type of plant. The premiums are established and decreased on a yearly basis in order to maintain market competition. Several PEEREA countries offer net metering, including Belgium, the Czech Republic, Greece, Italy, Spain, and the UK.
- *Bidding systems* refer to a system that allows winning bidders to sell electricity at a specific price for a pre-determined period of time. For example, in Ireland under the Alternative Energy Requirement (AER) scheme, winning bidders are entitled to a 15-year power purchase agreement whereby the national utility, ESB, buys the electricity output of the winning facility at the bid price. The additional cost of electricity procured under the AER schemes is spread across all electricity consumers. The prices paid by the utility are increased annually in line with the Consumer Price Index. For each bidding a quota is set for the amount of electricity to be sourced from each technology, e.g., wind, hydro, biomass/waste.
- *Guaranteed prices/feed-in tariffs* ensure that generators obtain a pre-determined price for its electricity generated from renewables for a specific period of time. It is often, but not only, linked with bidding systems.
- *Production tax credits* are used to lower the tax burden on the actual production of electricity from renewables. The IEA renewables database only lists Finland and Sweden as providing these.

Price support to electricity production based on renewables as well as for cogeneration has proven to be an efficient promotional instrument, as is shown by the experience in Denmark and Germany. If the price support is set at a sufficiently high level, an almost guaranteed response from the market is received in the form of investments in new capacity. However, such price support schemes are only justified up to the point of making the technologies viable on the market.

6 Conclusion

Integrating energy efficiency and renewable energy into energy strategies provide important contributions to energy security, diversification and other energy goals. They also comprise an important element of environmental and especially of climate change policies.

This report has shown some of the major linkages between energy efficiency and renewable energy, in both policy and implementation terms. Sometimes these linkages have been deliberately created with the intention of having energy efficiency and renewable energy combined into a single policy thrust. In other cases, it has been the result of simple expediency using, for example, one overarching implementation agency to manage both energy efficiency and renewable energy measures.

Linking energy efficiency and renewable energy policies and programmes is a continuous process. There is no absolute starting point and ending point for energy efficiency programmes. Energy markets and prices change, technologies change and more efficient technologies and techniques are constantly coming to the market. Therefore, renewable energy policies and programmes cannot start only after having achieved certain energy efficiency improvements, but there is a need to find a balance between them.

The balance depends on national circumstances: the assessed potential for cost-effective energy efficiency improvements; the actual share of renewables in the energy mix; the potential for an increased share of renewables; the technologies that are readily available on the market; the capacity of the energy service industries (manufacturers, importers, installers, etc.); and the need for new electricity generation or heat production capacity.

The balance also depends on external factors. There are international political commitments favouring increased use of renewables such as the Bonn Declaration in June 2004 or the Johannesburg declaration after the World Summit on Sustainable Development. In the area of energy efficiency there are also commitments, such as to PEEREA and the Aarhus Declaration. EU Member States also have a series of Community-wide policy commitments. Possibly most important now, are the commitments under the Kyoto Protocol to reduce GHG emissions, requiring a combination of emissions reductions through both energy efficiency improvements and renewable energy development.

Table 4 seeks to organise the national strategies and policy actions in the PEEREA countries according to a series of characteristics.

Table 4. Possible Impact of National Characteristics on Attitude and Actions Related to Energy Efficiency and Renewables

Characteristics	**Possible impact on attitude and actions related to EE and RE**
Level of economic development	Countries with a developed economy have the resources to invest in both energy efficiency and renewables on the entire chain from R&D to market deployment. Less developed economies are likely to focus on low cost measures and on encouraging deployment of existing and proved technologies with a focus on energy efficiency.
Import dependency	The higher the import dependency, the more attention is given to both energy efficiency and renewables. Concerns over security of supply may tend to give priority to the use of domestic energy resources, including renewables. This may be detrimental to cost-efficient energy efficiency measures.
Track record in energy efficiency actions	Countries that already invested significantly in energy efficiency and have low energy intensity are likely to focus on the promotion of renewables. This may remove the attention from remaining untapped energy efficiency potentials.
Track record in renewable energy actions	Countries with insignificant investments in renewables may face barriers to increasing the share of renewables in energy supply because of absence of practical experience. However, they may have the largest unexploited renewable potential. Countries, which already invested in renewables, may see renewables as both a domestic opportunity and a possibility for exporting technology.
Environment and Climate Change	Climate Change mitigation is a driving force for both energy efficiency and renewables. The countries with the strongest commitment to GHG reductions are in general developed economies, where the potential for low cost energy efficiency measures is relatively limited; therefore, renewables may attract more policy attention. This may be accentuated by the higher visibility of renewables, combined with their effects on the supply side.
Degree of market liberalisation	In early stages of liberalization both energy efficiency and renewables may be affected negatively. As the market opening progresses and governments introduce new support mechanisms for energy efficiency and renewables, compatible with the market situation, the situation may improve.

In practice the situation in each individual country may combine several of the above characteristics.

There is no simple rule for setting the right balance between priorities and funding of energy efficiency and renewable energy in government policies and programmes. The balance in any country depends on national circumstances and can only be determined following a thorough analysis of the situation.

In many PEEREA countries, the major policy concern is less about the balance between renewables and energy efficiency, but more about the role of energy efficiency **and** renewable energy compared to policies favouring conventional energy supply.

7 Annexes

Annex A. Energy Intensity in ECT Countries by Region, 2002

Energy Charter Countries	TPES (Mtoe)	TPES/GDP (toe/'000 95 USD)	TPES/GDP (PPP) (toe/'000 95 USD)	TPES/Population (toe/capita)
EU-15				
Ireland	15.30	0.13	0.13	3.91
Italy	172.72	0.14	0.13	2.98
Austria	30.44	0.11	0.14	3.78
Denmark	19.75	0.09	0.14	3.67
Greece	29.02	0.19	0.16	2.65
Portugal	26.39	0.20	0.16	2.54
United Kingdom	226.51	0.16	0.16	3.83
Spain	131.56	0.18	0.17	3.24
France	265.88	0.15	0.18	4.34
Germany	346.35	0.13	0.18	4.20
Netherlands	77.92	0.15	0.19	4.83
Luxemburg	4.04	0.15	0.21	9.06
Belgium	56.89	0.18	0.22	5.51
Sweden	51.03	0.17	0.23	5.72
Finland	35.62	0.21	0.28	6.85
OECD/non-EU				
Switzerland	27.14	0.08	0.14	3.72
Japan	516.93	0.09	0.17	4.06
Turkey	75.42	0.37	0.18	1.08
Norway	26.52	0.15	0.21	5.84
Australia	112.71	0.23	0.23	5.71
Iceland	3.40	0.38	0.44	11.82
Liechtenstein	n.a.	n.a.	n.a.	n.a.
New EU members				
Malta	0.89	0.22	0.15	2.25
Cyprus	2.47	0.22	0.20	3.22
Hungary	25.45	0.44	0.21	2.51
Slovenia	6.95	0.28	0.22	3.54
Latvia	4.27	0.60	0.23	1.82
Poland	89.19	0.51	0.24	2.33
Lithuania	8.59	0.84	0.27	2.48
Czech Republic	41.72	0.72	0.30	4.09
Estonia	4.51	0.77	0.32	3.32
Slovakia	18.55	0.74	0.33	3.45
South-East Europe				
Albania	1.94	0.48	0.14	0.62
Bosnia and Herzegovina	4.32	0.63	0.19	1.05
Croatia	8.22	0.34	0.21	1.84
FYR Macedonia	2.54	0.51	0.22	1.25
Romania	36.98	1.03	0.29	1.66
Bulgaria	19.02	1.39	0.37	2.39
CIS				
Armenia	1.94	0.83	0.22	0.63
Georgia	2.56	0.65	0.24	0.49
Kyrgyzstan	2.54	1.11	0.36	0.51
Moldova	2.99	1.70	0.49	0.70
Belarus	24.77	1.19	0.51	2.50
Azerbaijan	11.73	2.25	0.54	1.44
Russian Federation	617.84	1.32	0.59	4.29
Tajikistan	3.25	2.19	0.60	0.52
Kazakhstan	46.46	1.62	0.62	3.12
Ukraine	130.74	2.62	0.62	2.68
Turkmenistan	16.61	3.97	0.82	3.46
Uzbekistan	51.74	2.95	1.41	2.05
Mongolia	n.a.	n.a.	n.a.	n.a.

Source: Information based on Key World Energy Statistics, IEA, 2004

Annex B. Renewable Energy in PEEREA Countries by Region, 2002

Energy Charter Countries	**TPES** (Mtoe)	**Renewables in TPES**		**Share of Main Fuel Categories in Total Renewables (%)**		
		Mtoe	%	Hydro	Geothermal, solar, wind, tide	Combustible renewables and waste
EU-15	**1489.3**	**84.5**	**5.67**			
Sweden	51.0	14.1	27.6	40.7	0.5	58.8
Austria	30.4	6.7	21.9	51.6	1.7	46.7
Finland	35.6	7.8	21.9	11.9	0.1	88.1
Portugal	26.4	3.6	13.8	18.4	3.7	77.9
Denmark	19.7	2.4	12.0	0.1	18.3	81.6
France	265.9	16.6	6.2	31.4	1.3	67.3
Spain	131.6	7.1	5.4	28.0	11.3	60.7
Italy	172.7	9.2	5.3	36.8	39.0	24.2
Greece	29.0	1.4	4.8	17.3	11.4	71.3
Germany	346.4	10.8	3.1	18.5	15.6	65.9
Ireland	15.3	0.3	1.9	27.2	11.7	61.0
Netherlands	77.9	1.2	1.5	0.9	7.9	91.2
Luxemburg	4.0	0.1	1.4	17.2	4.0	78.7
United Kingdom	226.5	2.6	1.2	15.6	4.7	79.7
Belgium	56.9	0.6	1.1	5.1	1.3	93.7
OECD/non-EU	**762.0**	**55.7**	**7.3**			
Iceland	3.4	2.5	72.3	24.4	75.6	0.1
Norway	26.5	12.6	47.5	88.5	0.0	11.4
Switzerland	27.1	4.2	15.3	72.8	3.2	24.0
Turkey	75.4	10.1	13.4	28.7	11.3	59.9
Australia	112.7	8.3	7.4	16.4	1.6	82.0
Japan	516.9	18.0	3.5	39.4	21.7	39.0
Liechtenstein	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
New EU members	**202.6**	**9.6**	**4.7**			
Latvia	4.3	1.5	35.1	14.2	0.1	85.8
Estonia	4.5	0.5	11.6	0.1	0.0	99.9
Slovenia	7.0	0.8	10.9	38.7	0.0	61.3
Lithuania	8.6	0.7	8.1	4.4	1.4	94.3
Poland	89.2	4.1	4.6	4.7	0.3	95.0
Slovakia	18.5	0.7	3.9	63.0	1.3	35.7
Hungary	25.4	0.5	2.0	3.3	17.5	79.2
Czech Republic	41.7	0.8	1.9	27.1	0.0	72.9
Cyprus	2.5	0.0	1.8	0.0	78.7	21.3
Malta	0.9	0.0	0.0	0.0	0.0	0.0
South-East Europe	**72.9**	**6.5**	**8.9**			
Albania	1.9	0.4	22.6	68.7	0.5	30.8
Bosnia and Herzegovina	4.3	0.6	14.7	71.3	0.0	28.7
Romania	37.0	3.7	10.1	36.8	0.5	62.7
Croatia	8.2	0.8	9.2	60.9	0.0	39.1
FYR Macedonia	2.5	0.2	8.8	28.9	5.8	65.3
Bulgaria	19.0	0.8	4.4	22.8	0.0	77.2
CIS	**913.0**	**24.9**	**2.7**			
Georgia	2.6	1.2	48.3	47.0	0.8	52.2
Tajikistan	3.2	1.3	39.4	100.0	0.0	0.0
Kyrgyzstan	2.5	0.9	36.7	99.6	0.0	0.4
Armenia	1.9	0.1	7.4	99.3	0.0	0.7
Belarus	24.8	1.0	3.9	0.3	0.0	99.7
Russian Federation	617.8	17.7	2.9	78.9	0.8	20.3
Moldova	3.0	0.1	2.3	15.0	0.0	85.0
Kazakhstan	46.5	0.8	1.8	91.3	0.0	8.7
Azerbaijan	11.7	0.2	1.5	97.5	0.0	2.5
Uzbekistan	51.7	0.5	1.1	100.0	0.0	0.0
Ukraine	130.7	1.1	0.8	76.2	0.2	23.7
Turkmenistan	16.6	0.0	0.0	100.0	0.0	0.0
Mongolia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Source: Information based on Renewables Information, IEA Statistics, 2004

Annex C. Renewable Energy Utilisation in PEEREA Countries, 2001

Country groups	TPES (Mtoe)	**Transformation** (Mtoe)					**Final consumption** (Mtoe)							% transformation	% final consumption
		Total	Electricity production	CHP	Heat production	Other transforma-tion	Total	Industry	Residential	Services	Transport	Agriculture	Non-specified others		
EU-15	**91.114**	**52.61**	**41.681**	**8.251**	**2.598**	**0.082**	**38.500**	**14.414**	**21.447**	**0.850**	**0.547**	**0.590**	**0.653**	**57.74**	**42.25**
CR&W	55.414	17.83	7.002	8.250	2.495	0.082	37.585	14.413	20.995	0.811	0.547	0.575	0.244	32.17	67.83
Hydro	29.163	29.16	29.163											100.00	0.00
Geothermal	3.570	3.082	3.061		0.021		0.487		0.123	0.008		0.014	0.342	86.33	13.64
Solar/wind/other	2.967	2.538	2.455	0.001	0.082		0.428	0.001	0.329	0.031		0.001	0.067	85.54	14.43
OECD-non EU	**53.593**	**35.91**	**34.121**	**1.51**	**0.216**	**0.064**	**17.682**	**5.985**	**11.180**	**0.331**		**0.186**	**0.001**	**67.01**	**32.99**
CR&W	21.444	6.519	5.591	0.713	0.195	0.02	14.925	5.801	8.980	0.120		0.025		30.40	69.60
Hydro	25.007	25.01	25.007											100.00	0.00
Geothermal	5.930	4.337	3.475	0.797	0.021	0.044	1.593	0.066	1.192	0.183		0.151	0.001	73.14	26.86
Solar/wind/other	1.212	0.048	0.048				1.164	0.118	1.008	0.028		0.01		3.96	96.04
New EU members	**10.278**	**2.669**	**1.477**	**0.68**	**0.473**	**0.039**	**7.609**	**1.832**	**4.683**	**0.439**	**0.029**	**0.537**	**0.089**	**25.97**	**74.03**
CR&W	8.685	1.201	0.06	0.662	0.440	0.039	7.484	1.832	4.646	0.438	0.029	0.536	0.003	13.83	86.17
Hydro	1.416	1.416	1.416											100.00	0.00
Geothermal	0.097	0.007			0.007		0.090		0.002	0.001		0.001	0.086	7.22	92.78
Solar/wind/other	0.080	0.045	0.001	0.018	0.026		0.035		0.035					56.25	43.75
South-East Europe	**6.448**	**2.972**	**2.801**	**0.001**	**0.035**	**0.135**	**3.476**	**0.397**	**2.812**	**0.007**	**0.040**	**0.054**	**0.166**	**46.09**	**53.91**
CR&W	3.618	0.169		0.001	0.033	0.135	3.449	0.396	2.810	0.004	0.019	0.054	0.166	4.67	95.33
Hydro	2.801	2.801	2.801											100.00	0.00
Geothermal	0.027						0.027	0.001	0.002	0.003	0.021			0.00	100.00
Solar/wind/other	0.002	0.002			0.002									100.00	0.00
CIS	**29.224**	**24.53**	**20.254**	**1.816**	**2.383**	**0.080**	**4.691**	**0.632**	**3.168**	**0.037**		**0.159**	**0.695**	**83.95**	**16.05**
CR&W	8.96	4.279		1.816	2.383	0.080	4.681	0.632	3.158	0.037		0.159	0.695	47.76	52.24
Hydro	20.175	20.18	20.175											100.00	0.00
Geothermal	0.088	0.078	0.078				0.010		0.010					88.64	11.36
Solar/wind/other	0.001	0.001	0.001											100.00	0.00

Source: Information based on IEA Statistics, Electronic Version, 2004

8 References

CARBON TRADING IN THE POLICY MIX, STEVEN SORRELL (*SPRU (Science and Technology Policy Research), University of Sussex),* JOS SIJM (*Energy Research Centre of the Netherlands),* OXFORD REVIEW OF ECONOMIC POLICY, VOL. 19, NO. 3, 2003

CREATING MARKETS FOR ENERGY TECHNOLOGIES, IEA/OECD, Paris, 2003

CROSS-COUNTRY COMPARISONS OF ENERGY EFFICIENCY TRENDS AND PERFORMANCE IN CENTRAL AND EASTERN EUROPEAN COUNTRIES, ADEME, Synthesis Report, March 2004

DIRECTIVE 2001/77/EC ON THE PROMOTION OF ELECTRICITY PRODUCED FROM RENEWABLE ENERGY SOURCES IN THE INTERNAL MARKET,

ENDING WASTEFUL ENERGY USE IN CENTRAL AND EASTERN EUROPE, WWF, 2004

ENERGY EFFICIENCY FOR A SUSTAINABLE WORLD, Bernard Laponche, Bernard Jamet, Michel Colombier, Sophie Attali, ICE, Paris, 1997

ENERGY EFFICIENCY IN ECONOMIES IN TRANSITION (EITs): A POLICY PRIORITY, IEA, 2003

ENERGY EFFICIENCY INITIATIVE, ECS, the IEA and the Danish Energy Agency, OECD, Paris, 1998

ENERGY POLICY OF IEA COUNTRIES, Special 30th Anniversary Edition, 2004 Review, OECD/IEA, 2004

ENERGY SECURITY AND CLIMATE CHANGE POLICY INTERACTIONS, William Blith, Nicolas Lefevre, IEA, December 2004

IMPROVING ENERGY EFFICIENCY BY 5% AND MORE PER YEAR?, Kornelis Blok, Ecofys

IN-DEPTH REVIEW OF ENERGY EFFICIENCY POLICIES AND PROGRAMMES, CZECH REPUBLIC, ECS, Brussels, 2004

IN-DEPTH REVIEW OF ENERGY EFFICIENCY POLICIES AND PROGRAMMES, DENMARK, ECS, Brussels, 2004

IPCC THIRD ASSESSMENT REPORT, 2001

NATIONAL COMMUNICATIONS FROM PARTIES INCLUDED IN ANNEX I TO THE CONVENTION, Compilation and synthesis report on third national communications, FCCC/SBI/2003/7

NEW EU MEMBERS FAIL TO EXPLOIT RENEWABLES, EU Energy, Issue 76, 13 February 2004

OIL CRISES & CLIMATE CHALLENGES, 30 YEARS OF ENERGY USE IN IEA COUNTRIES, OECD/IEA, 2004

POLICY RECOMMENDATIONS FOR RENEWABLE ENERGIES, renewables 2004, International Conference for Renewable Energies, 1 – 4 June, 2004, Bonn

POURING OIL ON TROUBLED ECONOMISTS, William Keegan, The Observer, London, October 10, 2004

PROPOSAL FOR A DIRECTIVE ON ENERGY EFFICIENCY AND ENERGY SERVICES, European Commission, DG TREN, December 2003

RENEWABLE ENERGY, Market & Policy Trends in IEA Countries, OECD/IEA, 2004

RENEWABLE ENERGY FOR EUROPE, Campaign for Take-off, Sharing Skills and Achievements (1999-2003), EREC, EUROFORES, INSULA, 2004

RENEWABLE ENERGY POLICIES AND MARKET DEVELOPMENTS, Energy Research Center of the Netherlands, Oil, Gas & Energy Law Intelligence, Volume 2 – Issue 02, 2004

RENEWABLE ENERGY RESOURCE ASSESSMENT, EBRD, September 27, 2002 (pdf)

RENEWABLE ENERGY - THE SOLUTION TO CLIMATE CHANGE, European Renewable Energy Council EREC

RENEWABLES INFORMATION 2004, IEA Statistics

RENEWABLES IN RUSSIA, From Opportunity to Reality, OECD/IEA, 2003

STRATEGIC ASSESSMENT OF THE POTENTIAL FOR RENEWABLE ENERGY IN THE EBRD COUNTRIES OF OPERATION, Stage 1. EBRD, April 22, 2003 (pdf)

THE ROAD TOWARDS AN ENERGY EFFICIENT FUTURE, Energy Charter Secretariat, 2003

THIRD PARTY FINANCING, ACHIEVING ITS POTENTIAL, ECS, Brussels, 2003.