EREC - the European Renewable Energy Council – policy paper for the international conference for renewable energy, renewables 2004

Renewable Energy: a definition

The world's energy supply is largely based on conventional energy sources. Most of these sources of energy, however, will not last forever and have proven to be one of the main causes of our environmental problems. Environmental impacts of energy use are not new but they are increasingly well known, they range from deforestation to local and global pollution.

It is clear therefore, that in due time renewable energies[1] will dominate the world's energy supply system, due to their inherent advantages such as mitigation of climate change, generation of employment and reduction of poverty, as well as increased energy security and supply. Renewable energy technologies are well-suited to respond to the limitations of current energy patterns and contribute to the further modernization of the energy sector.

Renewable sources of energy are in line with an overall strategy of sustainable development. They help reduce the dependence on energy imports, or do not create a dependance on energy imports in countries with increasing energy needs, thereby ensuring a sustainable security of supply. Furthermore renewable energy sources can help improve the competitivness of industries at least in the long run and have a positive impact on regional development and employment. Renewable energy technologies are suitable for off-grid services, serving those in remote areas of the world without having to build or extend expensive and complicated grid infrastructure.

The earth receives solar energy as radiation from the sun, in a quantity by far exceeding mankind's use. By heating the planet, the sun generates wind. Wind creates waves. The sun also powers the evapotranspiration cycle, which allows water to generate power in hydro schemes – currently the largest source of renewable electricity in use today. Plant photosynthesis, which is essentially a chemical storage of solar energy, creates a wide range of so-called biomass products ranging from wood fuel to rapeseed, which can be used for heat, electricity and liquid fuels. Inter-

[1] Any energy resource naturally regenerated over a short time scale which is derived directly from the sun (such as thermal, photochemical, and photoelectric), indirectly from the sun (such as wind, hydropower, and photosynthetic energy stored in biomass), or from other natural movements and mechanisms of the environment (such as geothermal and tidal energy).

actions with the moon produce tidal flows which can be intercepted and used to produce electricity**.** Renewable Energy Sources (RES) are based on the natural and interconnected flows of energy of our planet earth.

Though humans have been tapping into all renewable energy sources (wood, solar, wind, geothermal and water) for thousands of years for their needs (cooking, heating…), so far only a tiny fraction of the technical[2] and economic potential of renewable energy has been captured and exploited for energy usage. Yet, with existing and proven technologies, renewable energy offers safe, reliable, clean, local and increasingly cost-effective alternatives for all our energy needs.

Combined with the improvement of energy efficiency and the rational use of energy, renewable Energy can provide everything fossil fuels currently offer in terms of energy services:

- **Heating and cooling** – solar water heating, solar passive and biomass based space heating for buildings, geothermal heat/ and geothermal heat pumps are entering the market as mainstream technologies. Active solar space heating and cooling for buildings and industry are under development.

- **Electricity** – Electricity from wind power, small-scale hydro and biomass are a market reality. Geothermal electricity has existed for decades and supplies electricity for 30 million people worldwide. Photovoltaics are already cost-effective in niche markets world-wide, while tidal and wave power as well as concentrated solar power will need further research and development before they can be commercialised.

- **Transport fuels** – liquid biofuels like bioethanol and biodiesel produced from agricultural crops, will require better recognition of their low-carbon benefits and their rate of progress will be influenced by decisions taken in other areas of policy such as taxation policy and agricultural policy

Integration of Renewable Energy

The rapid deployment of renewable energy technologies and their larger deployment in the near future, raise challenges and opportunities regarding their integration into energy supply systems. Energy systems aim at meeting the demands for a broad range of services (household and industry needs, transportation, storage …). Energy systems include an energy supply sector and the end-use technology to provide the aforementioned energy services. In the EU and other industrialized countries, the existing energy supply system is mainly composed of large power units, mostly fossil fuelled and centrally controlled, with average capacities of hundreds of MW. Renewable Energy sources are geographically widely distributed and if embedded in distribution networks are often closer to the customers. Locating renewable and distributed generators downstream in the distribution network is known as Distributed Generation.

[2] A study shows that the total available global wind resource technically recoverable is more than twice as large as the projection for the world's entire electricity demand in 2020. Similarly, theoretical solar energy potential corresponds to almost 90,000,000 Mtoe per year, which is almost 10,000 times the World Total Primary Energy Supply (IEA 2003)

Distributed generation involves the use of small, modular energy conversion units close to the point of consumption by a wide variety of producers. In the power sector, utilities have limited experience of interconnecting numerous small scale generation units to their distribution networks and the possible level of renewables penetration depends mostly on the existing electrical infrastructure considered. Bringing on land the power produced from a large offshore wind farm is (economically) only possible when a strong electric grid exists and sufficient electricity grid capacity is available. Other cases exist where a completely new energy infrastructure with the specific purpose of allowing very high penetration levels, up to 100% electricity from renewables, has been set up.

This decentralised energy generation, close to the end customer, differs fundamentally from the traditional model of energy system of large power stations generating centrally controlled power. This approach is new, replacing the concept of economy of scale for large units by economy of numbers (production of small units in large quantities)[3]. Far from being a threat, distributed generation based on renewable energy offers opportunities. It can

- Reduce the transmission and distribution losses as well as transmission and distribution costs[4]
- Provide customers with continuity and reliability of supply[5]
- Stimulate competition within renewable technologies to improve their competitiveness
- Be implemented in a short time due to the modular nature of Renewable Energy Technologies

Distributed generation is based, to a large extent, on the development and integration of Renewable Energy. This concept also involves energy efficiency and demand side management measures at the customers' end. Renewable Energy development and increase of energy efficiency are strongly interdependent. The European Union has always stressed the pressing need to renew commitment both at Community and Member State level to promote energy efficiency more actively. In the light of the Kyoto agreement to reduce CO_2 emissions, only improved energy efficiency with increased use of renewables will play a key role in meeting the EU Kyoto target economically. In addition to a significant positive environmental impact, improved energy efficiency will lead to a more sustainable energy policy and enhanced security of supply, as well as to many other benefits.

The experience in some successful states in terms of RES electricity deployment shows that some minimum requirements are needed, such as:

- an attractive long-term, stable and effectice financial framework

- a coherent market support mechanism adapted to each renewable energy technology

[3] Weinberg 1995; Ianucci and others 1999, World Energy Council 2001
[4] The IEA alternative scenario (WEO, 2002; WEIO 2003) predicts savings of about 40% for the transmission grid and 36% for the distribution due in particular by the increased use of distributed generation energy.
[5] This argument is a major driver when you take into account the recent black out in the United States and Italy.

- removal of administrative barriers through the implementation of uniform planning procedures and licensing systems

- guarantee of a fair grid access and non-discriminatory tariffs

- least-cost network planning.

The European Union has to follow up the implementation of existing supoprtive legislative or non-legislative measures that are already adopted on the European level. They have to be transformed into national policy as foreseen by the EU. If necessary additional measures on the EU level have to be taken.

For the heating sector the situation is different. The Administrations should take framework initiatives – if necessary, legislative proposals – to accelerate the fulfilment of the potential of three key technologies – modern biomass heating, solar heating and geothermal heat. These initiatives could include targets for specific technologies, or requirements for suppliers of heating oil and gas to supply wood pellets and biogas as well as non-discriminatory market access for Heat and Cold from Renewable Energy Sources and a financial compensation for the macro-economic benefits of Renewable Energies. The installation of suitable financial support schemes in Europe, which create a high level of security of investment and thus enable a broad supply of Heat and Cold from Renewable Energies and stimulate the regional creation of value.

For the EU the adoption of future Financial Perspectives for 2007-2013 is the opportunity for the enlarged Union to express its political determination to change course and direct its efforts towards sustainable energy. This is the moment at which the Union can allocate the resources needed to achieve its goals in this field.

Supplementary action is needed on four fronts on EU level :

First, boost large-scale investment across the EU in new and best performing technologies. There is a growing need to find new, pro-active ways to move promising innovative technologies, following successful demonstration, into large-scale application.
To achieve this, a new financial instrument is needed, operating at EU level, tailored to the diversity and specificity of the renewables and energy efficiency sectors. This instrument should support the first market replications of just-proven technologies of European interest. In this way the Union will share the risk that is involved in valorizing RTD results.

Second, a future Community programme “Intelligent Energy Europe, 2007-2013” should also strengthen support for action at local and regional level. The main aim is to enable citizens to make informed decisions about energy and help to remove non-technological barriers to clean energy: institutional capacity, public awareness, available technology at affordable prices, well-trained specialists and effective mechanisms for the exchange of know-how and best practice. A better focus is also needed for sharing European experience and technologies with third countries.

Third, it is necessary to strengthen support and accelerate the pace of European support for technological development and demonstration in renewables and energy

efficiency under the Seventh Framework Programme for Research and Technological Development. It is crucial to increase research and industry cooperation in order to optimise R&D results.

Fourth, it is necessary to capitalize on the important role that energy plays in sustainable development and share the responsibility with other Community policies and by that strengthen the deployment of RES in countries outside the European Union. A coherent strategy for the deployment of renewables in development countries should be formulated by the industrialised countries.

Clean energy policy shares fundamental goals with a wide range of Community policies: enhancing competitiveness and cohesion for growth and employment, ensuring access to basic goods and services, and promoting the EU as a sustainable development partner.[6] Renewable energies and energy efficiency can do a great deal to address the challenges that other policies face. A coordinated approach is needed across the range of Community policies that have energy impacts.

The Union's future financial framework for 2007-2013 needs to ensure that explicit provisions are made in these policies so that clean and efficient energy concepts are a visible part of their priorities, strategies and commitments.

The Community's main financial instruments – notably the future structural and cohesion funds, the financial support made available through the Community's international co-operation programmes, and the Common Agricultural Policy – all need to be mobilised. [7]

Apart from measures on the EU level, an international policy framework in favour of renewable energy has to be agreed on.

Necessary Policy Measures on the international level

To make a significant increase in the share of renewable energy to energy supply become reality advanced policy measures have to be adopted globally. Governments from all over the world need to implement necessary minimum policy measures to guarantee the further deployment of renewable energy technologies and additional commitments on the international level have to be made.

Minimum requirements are as follows :

<u>Establishment of legally binding RES-targets</u>
The states that are currently actively promoting renewable energy sources should set up legally binding targets for renewable energy sources in their governing areas. The mandatory targets can also be complemented by financial incentives in the respective countries. This too, would be an effective policy to address security of supply, technology development, employment, climate objectives.

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[6] Communication from the Commission to the Council and the European Parliament "Building our Common Future: Policy challenges and Budgetary means of the Enlarged Union 2007-2013", COM(2004) 101 final of 10.2.2004

[7] COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT, The share of renewable energy in the EU, Commission Report in accordance with Article 3 of Directive 2001/77/EC; evaluation of the effect of legislative instruments and other Community policies on the development of the contribution of renewable energy sources in the EU

Awareness of RES

Many decision-makers and politicians are not aware of the many results that can be derived by renewables. Therefore, Information campaigns are necessary as a tool to provide first-hand information and increase awareness towards the advantages of RES in the climate change debate. Additionally, governments should be informed how RES projects can help them to reach their binding targets of CO_2 reductions under Kyoto.

More emphasis on RES-projects in development policy

In the current development policy, the developing countries' governments put little emphasis on RES. One of the main aims should be to create sustainable development in developing countries (access to energy in order to fight the vicious circle of poverty, which 2 billion people are still in at the moment, and to foster economic development without this putting pressure on the environmental equilibrium). The target can only be achieved with the use of renewable energy sources.

Support from International Financial Institutions

A special focus needs to be set on financial institutions, such as the World bank, international export credit agencies or regional development banks. Financial resources should be mobilised to help developing countries to carry out their obligations in the field of sustainable development. Funds (small- and medium-sized funds) should be provided for projects in the field of renewable energy sources. A significant part of financial institutions' resources should go to the funding of RES projects for climate change purposes.

Change of subsidies-policy

The social and environmental costs of polluting energy are not internalised in current prices of conventional energy. A lot of countries worldwide pay (direct or indirect) subsidies to conventional energy. If this kind of policy is changed, renewable energy sources will be even more competitive.

Research and Development

The direct public spending on research and development in the energy sector in the industrialized countries should be increased significantly. A shift for energy research and development priorities should be reached rapidly away from fossil energy and energy from nuclear fission towards renewables and efficiency.

Ratification of Kyoto-Protocol

All efforts should be made to ratify the Kyoto-Protocol and set targets for the period after 2012. After having the Kyoto protocol in place, additional measures and targets for reducing greenhouse gases need to be set. Renewable energy should be set as a priority for all CDM projects

If the EU would set a target of 20% of renewables by 2020 and this target would be met – an ambitious but clearly feasible target- renewables will deliver the following benefits only in the EU :

Investments

The implementation of new policies to promote renewable energy sources will have a considerable impact on the amount of investments made in this sector. In order to reach the target of 20% by 2020 an investment of €443 billion in renewable energy is needed over the period 2001 – 2020.

Investments (in billion €)

	2001-2010	2011-2020	2001-2020
Wind	55	101	156
Photovoltaic	10	66	76
Biomass	44	45	89
Hydro	11	9	20
Geothermal	4	7	11
Solar Thermal	16	75	91
TOTAL RES	140	303	443

Avoided fuel costs and avoided external costs

Increasing prices in oil and gas supply due to limitation of the resources can, to a large extent, be covered through the avoided fuel costs by using cost free fuel or low cost renewable energy sources. Wind, PV, Solar thermal and hydro power has zero fuel input costs as the resource is free and supply is endless. Additional renewable energy eliminates direct fuel costs for the lifetime operating plant. Moreover, the external costs to society derived from burning fossil fuels or from nuclear generation are not fully included in energy prices. These costs have both a local and a global component, the latter mainly related to the consequences of climate change. There is a lot of uncertainty about the magnitude of such costs, and they are difficult to identify and quantify. The table shows a higher and a lower calculation of avoided external costs through the use of renewables together with the avoided fuel cost. [8]

Avoided fuel costs and avoided external costs (in billion €)

	2001-2010		2001-2020	
	External	Fuel	External	Fuel
Wind	9,4 - 24	12,9	40,2 - 102,8	63
PV	0,2 - 0,5	0,2	2,7 - 6,8	4,3
Biomass	16,7 - 42,7		62,6 - 160,1	
Hydro	2,2 - 5,6	3,1	7,5 - 19,1	11,5
Geothermal	0,6 - 1,4	1,5	2,5 - 6,3	7,3
Solar Thermal	1,3 - 3,4	2,3	11,2 - 28,8	29,7
Total RES	**30,4 - 77,6**	**20**	**126,7 - 323,9**	**115,8**

CO_2 emission savings.

Renewable Energy provides the leading solution to climate change. By providing carbon-neutral sources of power, heat, cooling and transport fuels, renewable energy options offer a safe transition to a low carbon economy. The table shows that the CO_2 savings due to RES development during the period 2001-2010, will be 320 Million tonnes per year in 2010. This amount represents 95% of the EU Kyoto

[8] The figures used for the calculation of the external costs are based on a European Commission project, the “Extern-E” project.

commitment of reducing Green House Gas emissions (GHG) by 8% between 1990 and 2010. By 2020 the CO_2 reduction due to RES will be 728 Mt/year, representing a decrease of 17,3% of the total GHG emissions in 1990 in the EU-15.

	2010	2020
Wind	99	236
Photovoltaic	2.2	24
Biomass	176	326
Hydro	23	35
Geothermal	5.8	15
Solar Thermal	14	92
TOTAL RES	**320**	**728**
% of total EU 15 GHG (Greenhouse Gases) emissions in 1990	**7.6 %**	**17.3 %**

Employment

Using renewable energy technologies creates employment at much higher rates than many other energy technologies. There are economic opportunities for new industries and new industrial and craft jobs through production, installation and maintenance of renewable energy systems. The table shows the employment growth with respect to the year 2000 in the RES industry and includes both the direct and indirect employment. The job losses in the conventional energy sector have already been subtracted.

	2010 jobs FTE	2020 Jobs FTE *
Wind	184,000	318,000
Photovoltaic	30,000	245,000
Biomass	338,000	528,000
Biofuels	424,000	614,000
Small Hydro	15,000	28,000
Geothermal	6,000	10,000
Solar Thermal	70,000	280,000
TOTAL RES	**1,067,000**	**2,023,000**

** Full time employment*

EREC - European Renewable Energy Council

EREC - the European Renewable Energy Council - is the umbrella association of the leading European renewable energy industry, trade and research associations active in the field of photovoltaics, small hydropower, solar thermal, biomass, wind and geothermal energy.

EREC's members

- EPIA - European Photovoltaic Industry Association
- ESHA – European Small Hydropower Association
- ESTIF - European Solar Thermal Industry Federation
- EUBIA - European Biomass Industry Association
- EWEA - European Wind Energy Association
- EUREC Agency - European Renewable Energy Research Centres

And associate members

- AEBIOM – European Biomass Association
- EGEC – European Geothermal Energy Council

The Renewable Energy House

EREC shares its office with several of its members associations in the Renewable Energy House (rue du Trône 26, 1000 Brussels), the central meeting point for renewable energy actors in the political heart of Europe.

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