

FOCUS ON RENEWABLE ENERGY

Renewables Move Up The International Agenda

As this month's European Renewable Energy Conference opens in Berlin, *Crispin Aubrey* explains the background to a major international initiative launched over sixteen months ago at the "earth summit" in Johannesburg.

This January's conference in Berlin will be one of the most important in recent years for the European renewable energy community. Up for debate will be some of the crucial issues if renewable sources are to make more progress, especially how they can establish a stronger position in the energy market.

Among the questions to be answered over the three day event, officially titled the European Conference for Renewable Energy: Intelligent Policy Options, are: How can Europe achieve its ambitious renewable energy targets, and encourage other regions of the world to follow suit? What political frameworks, regulation and incentives are needed if renewables are to take off as a serious challenge to existing conventional energy sources? And what lessons can be learned from the European experience so far, including the success story of wind?

The origins of the Berlin conference go back to September 2002 and the World

Summit on Sustainable Development in Johannesburg, South Africa. Tens of thousands of delegates and observers assembled to debate the fundamental question as to how sustainable development can successfully coincide with economic growth. But whilst progress on other issues could hardly be described as dramatic, one initiative did sow the seeds for forward movement in the field of renewable energy.

Coalition of the willing

At the end of the summit the Plan of Implementation agreed by delegates included the following commitment - that the signatories would "...with a sense of urgency, substantially increase the global share of renewable energy sources with the objective of increasing its contribution to total energy supply". No specific figures or targets were included, however.

Given that progress at Johannesburg was not as fast as had been hoped, towards the end of the two week gathering the European Union's represen-

tatives therefore announced the formation of a coalition of countries committed to increasing the use of renewable energy "through quantified, time-bound targets".

"The World Summit has shown that energy, like water, is at the very core of the development agenda," said the EU's Environment Commissioner Margot Wallstrom and then EU President, Hans Christian Schmidt, the Danish Environment Minister, in a joint statement. "But for development to be sustainable that energy needs to be clean. Increasing the use of clean renewable energy will have multiple benefits for rich and poor countries alike, from cutting the emissions that are changing the global climate to improving the health of millions in the developing world who have to breathe the smoke of their wood-fired stoves."

The "coalition of the willing", as it was described – a clear reference to those prepared to take some action over sustainable energy as opposed to standing



on the sidelines – drew immediate interest in Johannesburg from a range of countries in Latin America, Africa and the Caribbean, as well as the core 15 EU states. Twenty-four countries as well as the European Union supported a joint declaration committing themselves to work together to “substantially increase the global share of renewable energy sources, with regular reviews of progress”. The basis for this would be “clear and ambitious targets set at a national, regional and hopefully global level”.

Brussels conference

Back in Brussels, Commissioner Wallstrom reflected on what the EU’s delegation had achieved in Johannesburg, especially in a climate which, post-September 11, she described as considerably less optimistic than the atmosphere surrounding the original Rio earth summit a decade before. “This coalition, called ‘the OPEC of renewables’ by one NGO, will keep up pressure on the unwilling and should give a boost to the development of renewable energy throughout the world,” she said. “Significantly, it will set a renewable energy target representing a floor as opposed to a ceiling. The energy issue won’t go away!”

The first international conference of what was by then officially titled the Johannesburg Renewable Energy Coalition was held in Brussels last June. More than 150 delegates attended, including ministers and government officials as well as private sector representatives. Among them were ministers from Botswana, Brazil, Germany, Iceland, the Netherlands, New Zealand, Norway, St. Lucia, Uganda and the UK. Philippe Maystadt, President of the European Investment Bank, also attended. Appropriately, the conference coincided with the European Commission’s annual Green Week. By then also, the list of countries supporting the initiative had risen to over 80.



Photo: EREC

The Road to Bonn

■ Regional Meetings

Brussels, Belgium	June 2003	1st International JREC Conference
Sonderburg, Denmark	September 2003	Preparatory Meeting for Europe
Brazil	October 2003	Preparatory Meeting for South America and the Caribbean
Nairobi, Kenya	November 2003	Preparatory Meeting for Africa
Berlin, Germany	January 2004	European Conference for Renewable Energy



Brussels

Proposed for 2004

Middle East (Yemen), Asia (Thailand)

■ World Conference

Bonn	June 2004	International Conference for Renewable Energies – Renewables 2004
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Bonn

Johannesburg Renewable Energy Coalition Strategic Priorities

■ Summary of the priorities set by JREC at its initial conference in Brussels.

A commitment to set targets which assure the accountability of policies to promote renewables.

Actions to stimulate the exchange of experience, adoption and implementation of accompanying policies, such as trade based systems for renewable energy certificates, carbon credits and feed-in tariffs.

The critical importance of stimulating regulatory frameworks conducive to the development of renewable energies.

The importance of internalising the external benefits related to the use of renewable energy, such as the mitigation of climate change, the protection of human health, the efficient use of natural and energy resources, and to establish a market value for these benefits. In this context, energy subsidies and trade related matters need to be addressed.

The responsibility of industrialised countries to further develop markets for renewable energy technologies in order to bring down costs. This will ease investments in both developing and industrialised countries.

The importance of looking at the broad portfolio of sustainable renewable energies, including wind, solar, biomass, geothermal, hydropower and other technologies. Sustainable biomass based solutions are particularly important for developing countries.



Johannesburg

Financing instruments

The importance of focusing on renewable energy investments that are financially viable and manage risk appropriately.

An increased role for market-based solutions, while recognising the particular circumstances of developing countries and the role of public funds, including the Overseas Development Agency, as a complementary financial resource.

The need to facilitate closer cooperation between the finance world and project developers, and to exchange best practice.

The attraction of equity fund constructions in which the public as well as the private sector participate.

The importance of transparently managing equity funds to enhance their credibility and sense of ownership by the investors and the general public.

The importance of a regional approach in the use of funds.

The Bonn Agenda

Renewables 2004 will address the leading question: How can we substantially increase the proportion of modern renewable energies in industrialised and developing countries? The conference will focus on policies for active support of renewable energies, removing barriers to expansion of renewable energies, and developing markets for them in both industrialised and developing countries. In particular the conference is expected to address the following themes:

- Advantages, benefits and potential of renewable energies
- Strengthening financing for renewable energies from all sources
- Creating a more effective governance and policy environment
- Building capacity, knowledge and institutions.

From "Renewables 2004: Basic Information about the conference", Secretariat of the International Conference, Bonn 2004

The expected outcomes of Renewables 2004 are:

- International action plan
 - National and regional targets set on a voluntary basis
 - Actions and commitments in the area of market development, finance, R&D cooperation, etc.
- Declaration (including follow-up)
- Policy paper with guidance on good policy for renewable energy
- Conference report

Addressing the conference, Germany's Environment Minister, Jürgen Trittin, stressed the most important task facing the newly-formed coalition – the need to determine concrete national and regional targets not only for the immediate period up to 2010, but for 2020 and beyond. These were "an important prerequisite to secure stable framework conditions for private sector investment," he said. Germany has not only shown the way through its own national renewables targets (see "Europe's Renewable Energy Ambitions", p. 25) but committed itself at Johannesburg to invest € 500 million over five years in support for renewable energy projects in developing countries.

The Brussels event also agreed a series of regional conferences, workshops and two international conferences to be held during the remainder of 2003 and early 2004, culminating in a World Renewable Energy Conference. This will take place in Bonn this June.

Latin American commitment

Some progress towards establishing regional targets has already been made. At the regional conference for Latin American and Caribbean countries held in Brazil last October, it was agreed that efforts should be made to achieve a goal for at least 10% of the region's energy to be supplied by new renewables by 2010.

Further steps forward are expected in Berlin this month, including discussions about a new renewables target for Europe in 2020. The existing European Union target is for 12% of energy by 2010 (see "Europe's Renewable Energy Ambitions", p. 25).

The culmination of this process will be in Bonn this June, when the decisions and recommendations from the various regional meetings will be brought together.



Moving south:
Wind farm in New Mexico

Photo: GE Wind

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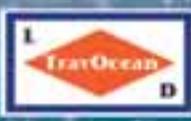
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European Conference for Renewable Energy: Intelligent Policy Options

Berlin Provides Focus for European Vanguard



Three days of debate at the European Renewable Energy Conference in Berlin will be focused on how Europe's renewables industry can form the vanguard for a global shift in energy production patterns – vital if the world is serious about combating climate change.

Political commitment to this venture is evidenced by the list of opening speakers. These include Jürgen Trittin, the German Environment Minister, Loyola de Palacio, Vice-President of the European Commission and Mechthild Rothe, MEP and President of Eufores, the European Renewables Forum. The event is organised by the European Commission in collaboration with the European Renewable Energy Council, Eufores and the International Scientific Council for Island Development.

Although centred on the present European Union members, the discussion will also encompass the prospects for the accession states scheduled to join later this year, non-EU states such as Norway and Switzerland and candidate countries such as Turkey.

The conference is divided into three themes. On the opening day the focus

will be on the achievements of the European Commission's Campaign for Take-Off, a series of initiatives aimed since 1999 at kick starting renewables in a number of different contexts. These range from the use of renewable energy in an urban environment to the progress by some communities to obtain 100% of their energy needs from green sources (see "Navarra: Moving Towards 100% Renewables", p. 26). Culmination of this session will be the award of this year's Campaign for Take-Off Awards, signalling outstanding success by organisations, businesses and communities.

Day two will look at the progress being made by renewable energy across Europe, including how best to overcome administrative and market barriers. From the experience in different countries, which have been the most successful support schemes? The final question of the day will be how a level playing field can be achieved for renewables alongside a market dominated by existing conventional fuels.

The final day is devoted to discussing the establishment of targets for renewables in Europe in the period up to 2020. It is the outcome of this session that will be taken forward to the World Renewable Energy Conference in Bonn five months later.



Photo: Valerie Pettijean

Europe's Renewable Energy Ambitions

Europe is at the forefront of worldwide renewable energy development and has significant experience in the formulation of proactive policy measures. Renewables are seen not just as contributing to sustainable development and security of energy supply but as part of the solution to many economic and environmental problems - from providing secure jobs to combating the effects of climate change.

Since the end of the last century, demand for energy in Europe has been steadily growing at a rate of between 1 and 2% per year. At the moment, the share of renewable energies in the EU's energy mix is about 6%, but there are ambitious targets to increase this contribution. The renewables included in the EU's definition are wind, solar, geothermal, wave, tidal, hydropower, biomass and landfill gas.

■ European Union Targets

- Now 6% of primary energy from renewables
- 2010 Target 12% of primary energy (22% of electricity) from renewables

■ Germany Targets

- Now 8% of electricity from renewables
- 2020 Target 20% of electricity from renewables
- 2050 Target 50% of primary energy from renewables

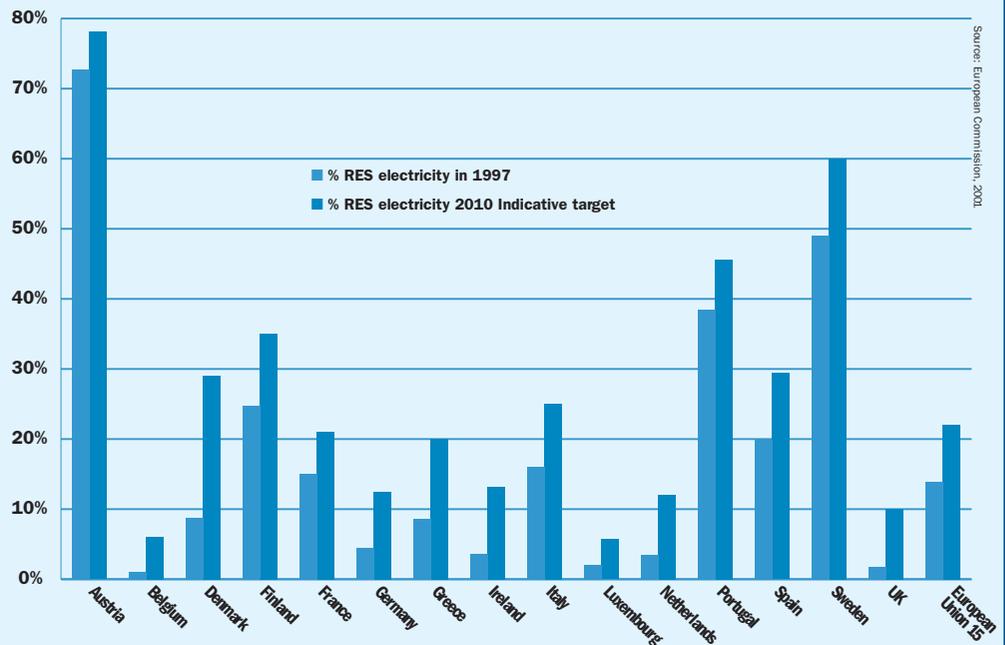
Navarra: Moving Towards 100% Renewables

The Spanish region of Navarra, located at the western end of the Pyrenees, is an excellent example of a region moving towards 100% renewable energy supply. With a population of 550,000, it is already counted among Europe's pioneers in wind energy development. The Navarra Energy Plan (1995-2000) paved the way for 40% of the region's electricity needs to come from wind energy by 2000, nearly double the original target. By 2002, renewables were producing 55% of the electricity consumed in the region. This increase was achieved as a result of the clear objectives in the Energy Plan, by broad social acceptance of wind energy developments and by the efforts of private promoters.

Targets in the Navarra Energy Plan for 2005 envisage a further doubling of renewable electricity capacity, including a doubling of installed wind capacity and an expansion in the contribution from both solar photovoltaic and solar thermal generation. The overall aim is for green electricity to cover 97% of consumption.

EU Member States' Renewables Targets

■ RES-e Directive targets EU-15, rising from 14% in 1997 to 22% in 2010



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European Conference for Renewable Energy, Berlin - Outline Programme

Monday 19th January

CONFERENCE OPENING (9.00-12.30)

Klaus Wowereit, Mayor of Berlin
Mechtild Rothe, MEP, President of EUFORES
Jürgen Trittin, Federal Minister for Environment, Germany
Loyola de Palacio, European Commission Vice-President, Commissioner for Energy and Transport

Renewable Energy Sources:

Policy Framework and Progress in the EU
Günther Hanreich, Director, European Commission,
DG Energy & Transport
Arthouros Zervos, President, EREC

SESSION 1:

THE CAMPAIGN FOR TAKE-OFF 1999-2003 (14.00-18.00)

SHARING SKILLS AND ACHIEVEMENTS TO FOSTER RENEWABLE ENERGY DEVELOPMENT IN EUROPE

Panel 1a: Renewable Energy Sources in Cities –
How feasible is it to develop renewable energy generation in an urban environment?

Moderators: Soeren Moeller, Deputy Mayor of Odense, President, Energie-Cités;
Mariàngels Pérez Latorre, Deputy Head of Unit, European Commission, DG Energy & Transport

Panel 1b: Renewable Energy Sources

Deployment at Regional and Local Level – From dependency to security of supply: how far and fast can regions improve their energy mix?

Moderators: Michael Geissler, Secretary General, FEDARENE; Dominique Bidou, Président, Association Haute Qualité Environnementale

Panel 1c: Paving the way for 100% Renewable

Energy Based Communities & Islands – utopia or ambitious reality?

Moderators: Cipriano Marin, Vice Secretary General, INSULA; Melim Mendes, Regional Agency for Energy and Environment of the Autonomous Region of Madeira

2003 AWARDS CEREMONY OF THE RENEWABLE ENERGY CAMPAIGN FOR TAKE-OFF (19.00)

Tuesday 20th January

SESSION 2:

IMPLEMENTATION OF RES POLICIES IN EUROPEAN MARKETS (9.00-18.00)

Panel 2a: Producing Renewable Electricity

– What is being achieved and what are the best approaches for overcoming administrative and market barriers?

Moderators: Rainer Hinrichs-Rahlwes, Director General, Federal Ministry for Environment of Germany; Luc Werring, Head of Unit, European Commission, DG Energy & Transport

Panel 2b: Supporting Renewable Electricity in the Market

– Which are the best support schemes for RES electricity in Europe?

Moderators: Hermann Scheer, President of EUROSOLAR, Member of the German Parliament; Roberto Vigotti, ENEL Green Power/Chairman of the Eurelectric working group on R&D

Biofuels for the transport sector: the real start in Europe now?

Hans-Josef Fell, Member of the German Parliament
Javier Salgado, CEO, Abengoa Bioenergía

Panel 2c: Renewable Heating & Cooling

– What are the common factors and barriers influencing the growth of European markets for solar, biomass and geothermal heating and cooling?

Moderators: David Taylor, CEO, Sustainable Energy Ireland; Karl Kellner, Head of Unit, European Commission, DG Energy & Transport

Panel 2d: Renewable Energy

– How to create a level playing field?

Moderators: Juan Fraga, General Secretary, EUFORES; William Gillett, Deputy Head of Unit, European Commission, DG Energy & Transport

Wednesday 21st January

SESSION 3:

LOOKING FORWARD, HORIZON 2020 (9.00-12.30)

Panel 3a: Targets and Scenarios for the Development of Renewable Energy Markets up to 2020

Moderators: Anders Wijkman, Member of the European Parliament; Corrado Clini, Director General, Ministry for Environment of Italy

Panel 3b: From Rio to Kyoto and Johannesburg

– the spotlight has turned towards renewable energy sources

Moderators: Klaus Töpfer, Executive Director, UNEP; Jos Delbeke, Director, European Commission, DG Environment

CONFERENCE CLOSURE (12.30-13.30)

Conclusions and recommendations for International Conference for Renewable Energy in Bonn, June 2004

Jorgen Henningsen, Principal Advisor, European Commission, DG Energy & Transport
Eryl McNally, MEP
Heidemarie Wieczorek-Zeul, Federal Minister for Economic Co-operation and Development, Germany
Representative of Irish Presidency
Margot Wallström, Commissioner for Environment

Conference venue the
Berliner Congress Center



Photo: bcc Berliner Congress Center

New Analysis Projects 20% Renewables by 2020

A longer term assessment of the potential for renewable energy sources in Europe, including a major contribution from wind, is being presented at the European Renewable Energy Conference in Berlin. This is a summary of the findings.

New projections show that use of renewable technologies could expand to satisfy 20% of Europe's energy demand by 2020, a substantial increase from their present level. Taking electricity generation alone, the proportion contributed by renewables would by then have reached almost 34%.

The analysis was carried out on behalf of the European Renewable Energy Council, the umbrella group representing renewable industry associations. It is being presented at the Berlin conference by Arthouros Zervos, President of both EREC and EWEA.

This is the first time that the European renewable energy industry has taken coordinated action to deliver a complete market analysis and projection as far ahead as 2020. Up to now, the horizon has been fixed at 2010, the year established by the European Union for its current renewables target. This new analysis argues, however, that if progress can be achieved to add 6% of additional renewables over thirteen years (1997-2010), then a further 8% over the following ten years (2010-2020) is feasible.

The analysis assesses actual industrial growth patterns seen in the renewable energy sector so far and builds on these to produce a realistic target for what the industry can deliver. Only the existing member states of the European Union are included, mainly because comparable data on the ten new countries scheduled to join this year is not readily available. Figures for the current and historical installed capacity of the various renewable sources are taken from the Eurostat database.

Photo: EHN



Solar and wind:
both sectors are ahead of EU growth targets

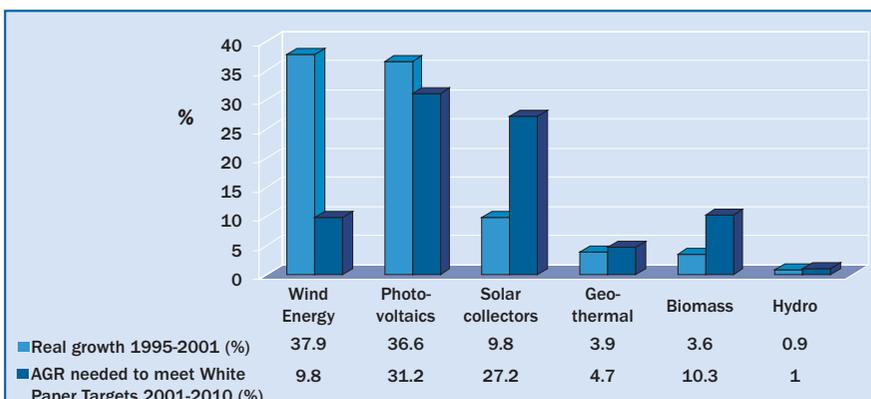
White Paper targets

Existing targets set out in the 1997 European Union White Paper foresee a doubling of the share of renewables in total energy consumption, to reach 12% by the year 2010. The White Paper also identifies individual targets for each technology. The first question posed by the EREC paper is therefore whether

these shorter term expectations will be realised.

The EREC analysis in fact shows that some sectors are already in line with, or have moved well beyond, the expectations of the White Paper. These include wind, hydro, geothermal and PV (photovoltaics). These technologies should therefore be able to reach their 2010 targets, with wind energy likely to do so well in advance. The relative growth rates needed by each technology to achieve the 2010 targets can be seen in Figure 1.

Figure 1: Average annual growth rates (AGR) needed to meet EU White Paper targets for 2010.



Taking electricity alone, the study estimates the contribution needed from each renewable technology to achieve the target for 22% of supply by 2010. The 2001 level was 15.3%, according to Eurostat statistics. In fact, renewable electricity grew at an annual rate of 4.8% between 1997-2001, and will only need to increase that rate to 5.7% over the period up to 2010.

To reach the overall target for renewable energy, the report indicates that specific support actions should be taken soon to encourage some technologies, such as biomass and solar



collectors, that are lagging behind. But taking a full perspective it can be seen that any overestimation in the expected output from the biomass and solar collector industries should be balanced out by a clear underestimation in the contribution from wind.

Projections to 2020

Looking forward, the analysis shows that if the present state of market progress is continued, and with ongoing strong political support, then renewables will continue to expand their contribution beyond 2010. Based on relatively conservative annual growth scenarios for the different technologies, the overall contribution of renewables to Europe's energy consumption could reach 20% in 2020.

Taking electricity alone, the proportion contributed by renewable sources in 2020 looks even more impressive. By then the contribution from the five main technologies – wind, hydro, PV, bio-

mass and geothermal – will have reached 33.8%. The largest input to this total will come from wind, which by that stage is projected to have reached an installed capacity of 180,000 MW.

These large increases in capacity also mean that renewables will dominate the introduction of new generation plant in Europe. In the period 2001-2020, renewables are expected to account for over half (52.5%) of all new generation capacity in the EU, and in the final period of the analysis, from 2011 to 2020, this proportion will rise to 61%.

The annual growth rates and installed capacity required to reach these 2020 projections, divided by technology, can be seen in Table 1 – Projected increase in renewable electricity generation capacity up to 2020. The relative increase in the contribution from each technology can also be seen in Figure 2 – Projected increase in renewable electricity production up to 2020.

Clean and secure generation

In the background to this analysis, the arguments in favour of further expansion of renewable energy are underlined. Renewables are essential in the campaign to tackle climate change, are uniquely well-suited to respond to the limitations of current energy patterns and contribute to the further modernisation of the energy sector.

As indigenous sources, renewables also help reduce Europe's dependence on energy imports and have a positive impact on both regional development and employment. The European renew-

able energy industry already has a turnover of € 10 billion and employs – 200,000 people.

Benefits of the 2020 projection

The benefits of substantially increasing the share of renewable energy in the EU by 2020 are also spelled out in the report. These include a considerable industrial investment in the technology, the economic value of both avoided fuel and external costs, a reduction in greenhouse gas emissions and a major increase in employment.

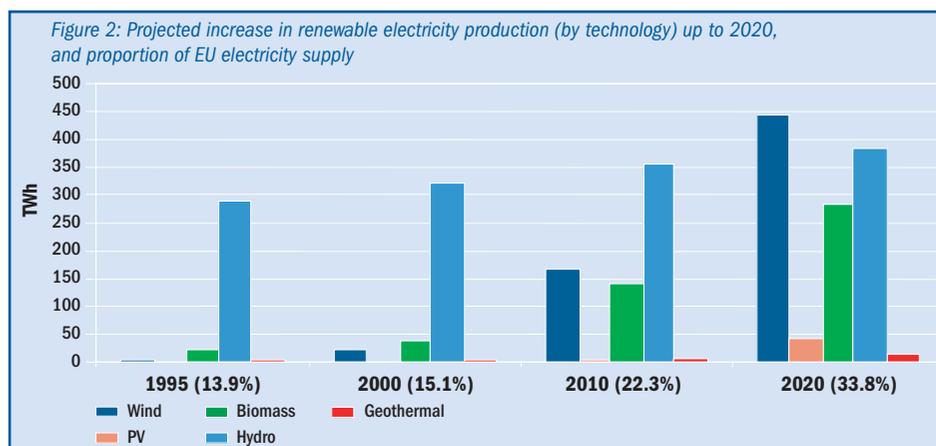
Investment value

In order to reach the projected target a total investment of € 443 billion will be needed from 2001 up to 2020. Wind energy represents the highest proportion of this figure (see Table 2), but will also contribute the most new capacity.

Avoided fuel and external costs

The effect of rising oil and gas prices, as supplies become more limited, can to a large extent be balanced out by the use of free or low cost fuel sources. Wind, PV, solar thermal and hydro power all have zero fuel input costs. The external costs to society resulting from the use of fossil fuels or nuclear generation, not fully included in energy prices, can also be mitigated by the use of renewables. There is still uncertainty about the magnitude of such costs, and they are difficult to identify and quantify. The EREC analysis therefore uses a range in its calculation of the avoided external costs resulting from the use of renewables, based on the findings of the European Commission's "Extern E" project.

The total figure for avoided fuel costs over the period 2001-2020 would amount to € 115.8 billion, over half of that coming from wind energy. For external costs, the study shows the cumulative savings over the same 20 year period falling in a range between € 126.7 billion and € 323.9 billion. At the higher level, the value of the avoided fuel and external costs would together amount to almost as much as the total investment in renewables over the same period.



Reduced greenhouse gas emissions

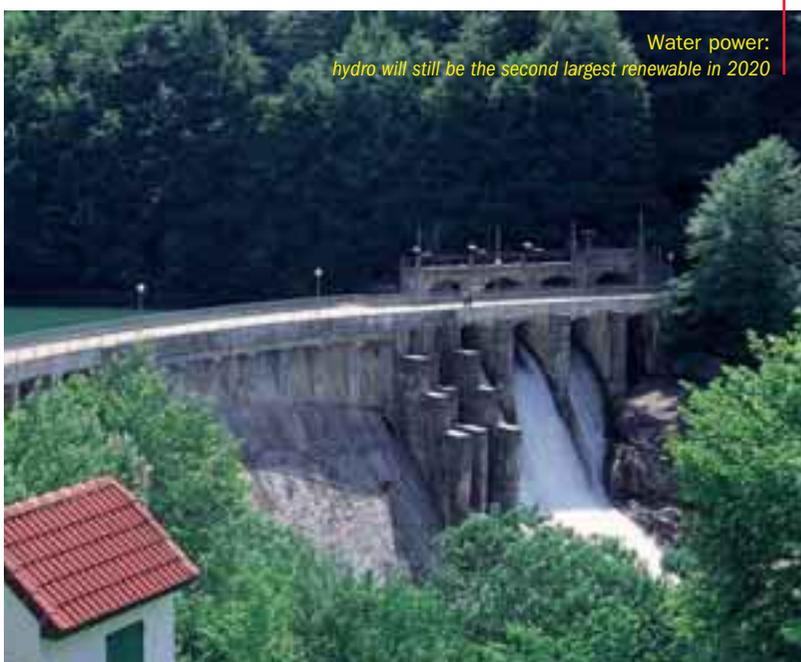
By providing carbon-neutral sources of power, heat, cooling and transport fuels, renewable energy options offer a safe transition to a low carbon economy, the report concludes. The EREC analysis shows that the reduction in carbon dioxide emissions as a result of renewables development would have reached 320 million tons per year by 2010 (see Table 3). This represents 95% of the EU's Kyoto commitment to reduce the level of greenhouse gas emissions by 8% between 1990 and 2010. By 2020 the reduction in CO2 contributed by renewables would have reached 728 mt/year, representing a decrease of 17.3% from the 1990 level.

Employment

Using renewable sources creates employment at much higher rates than many other energy technologies. Industrial and craft jobs are created right through from manufacture and production to installation and maintenance. The analysis shows that by 2010 the number of full-time jobs created by the European renewable energy sector would have risen to over 1 million (see Table 4). By 2020 this would have doubled to more than 2 million.

Finally, the EREC study points out that targets are an important element in any policy making initiative. Without the targets set down in the renewables White Paper, for instance, the European Union would not have implemented the necessary directives on both renewable electricity and biofuels that followed in its wake. Energy investments are long-term, planning for the future needs to begin well in advance, and establishing projections such as those presented in Berlin is a vital first step.

Information: A briefing paper on these new projections for renewables in Europe up to 2020 is being launched at the Berlin conference by EREC – see www.erec-renewables.org for further details.



Water power:
hydro will still be the second largest renewable in 2020

Photo: EHN

Renewables in Europe - The Key Findings

- The White Paper target of 12% renewable energy by 2010 will be achieved if specific support actions are taken soon.
- The target for 22% of electricity from renewables will be met if measures set out in the EU Renewables Directive are fully transposed and some additional measures are taken.
- Industry analysis shows that a contribution from renewables to total energy consumption of 20% by 2020 is feasible.

Table 1: Projected increase in renewable electricity generation capacity (by technology) up to 2020.

TYPE OF ENERGY	1995 EUROSTAT	2001 EUROSTAT	ANNUAL GROWTH	PROJECTION	ANNUAL GROWTH	PROJECTION	ANNUAL GROWTH
			RATE 1995-2001	2010	RATE 2001-2010	2020	RATE 2010-2020
Wind	2.5 GW	17.2 GW	37.9%	75 GW	17.8%	180 GW	9.1%
Hydro	87.1 GW	91.7 GW	0.9%	100 GW	1.0%	109 GW	0.9%
Photovoltaics	0.04 GW	0.26 GW	36.6%	3 GW	31.2%	35 GW	27.8%
Biomass	6.1 GW	8.7 GW	6.1%	27 GW	13.4%	54 GW	7.1%
Geothermal	0.5 GW	0.65 GW	4.5%	1 GW	4.9%	2 GW	7.1%

Table 2: Projected investment in renewables up to 2020

	2001-2010	2011-2020	2001-2020
	Billion Euro	Billion Euro	Billion Euro
Wind	55	101	156
PV	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

Table 3: Projected savings in carbon dioxide emissions up to 2020

	2010	2020
	Mt/year	Mt/year
Wind	99	236
PV	2.2	24
Biomass	176	326
Hydro	23	35
Geothermal	5.8	15
Solar thermal	14	92
TOTAL RES	320	728

Table 4: Projected growth in employment in renewable energy up to 2020

	2010	2020
	Jobs (FTE)	Jobs (FTE)
Wind	184,000	318,000
PV	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

EREC - European Renewable Energy Council

EREC is the umbrella organisation of the leading European renewable energy industry and research associations active in the sectors of photovoltaics, wind, small hydropower, biomass and solar thermal:

- EPIA (European Photovoltaic Industry Association)
- EWEA (European Wind Energy Association)
- ESHA (European Small Hydropower Association)
- EUBIA (European Biomass Industry Association)
- ESIF (European Solar Industry Federation)
- EUREC (European Association of Renewable Energy Research Centres)

Objectives

EREC is committed to the following objectives:

- To provide information and training on renewable energy sources.
- To provide information and consultancy on renewable energies for political decision-makers at a local, regional, national and international level.
- To publish information material on renewable energy sources.
- To encourage studies on the economics, techniques and feasibility in the field of renewable energy sources for the member associations, external organisations, as well as public and private institutions.
- To co-operate with renewable energy organisations from all over the world.
- To promote European exports of equipment and products, and promote the industrial protection of European renewable energy technologies on global markets.
- To strengthen export initiatives and promote trade, while generally assisting the associations, the federation members of EREC and the renewable energy world.
- To enlarge industrial export services with commercial publications, commercial indicators and seminars etc.



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Wind Turbine Coating Systems

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The Renewable Energy House

Several member organisations of EREC share the same working location, at the Renewable Energy House in Brussels. These are ESHA (European Small Hydropower Association), ESTIF (European Solar Thermal Industry

Federation), EUREC Agency (European Association of Renewable Energy Centres Agency), EWEA (European Wind Energy Association) and EUFORES (European Forum for Renewable Energy Sources).

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Europe's Renewables Portfolio

Technology

Description

Status

Wind



Extensive use of wind turbines in clusters both on land and offshore.

The fastest growing electricity generation technology. In specific locations with favourable conditions it is already cost competitive. Impressive annual growth rates of more than 35% between 1995 and 2000 have made Europe the frontrunner in wind energy development.

Hydro



Small hydro schemes on fast flowing rivers and streams now generally preferred to large dam schemes.

With a lifespan of 50 years + and relatively low operating and maintenance expenses, small hydro costs can be as low as 3 €cents/kWh. Hydro plants also provide baseload capacity.

Biomass



Fuels available include forestry residues, dedicated energy crops such as willow or miscanthus and the gas extracted from agricultural wastes.

There is a huge untapped potential in Europe for biomass electricity, which can provide baseload capacity. Generation costs vary depending on the type of technology used and the investment costs of both power plant and fuel supply.

Solar PV



Photovoltaic modules incorporated in building roofs and facades, usually grid-connected, or as separate stand-alone arrays.

The market for grid-connected PV rooftop systems is the fastest growing application. Cost reduction is a key issue, and R&D is especially important for further improvements. European PV technology is cutting-edge on the world market.

Solar thermal



Extensive use of solar panels for water heating. Arrays of mirrors also installed to concentrate the sun's rays, resulting heat used to generate electricity.

The European solar thermal water heating market grew in the 1990s by over 13% per year, with Greece, Austria, Denmark and Germany the leading countries. Systems are simple and easy to integrate into buildings.

Geothermal

Heat from beneath the earth's surface used to provide both hot water and power.

An important benefit of geothermal power plants is that they can operate 24 hours per day, providing baseload capacity. Their potential in Europe is not as great, however, as in Asia and South America.

Biomass/ biofuels



Range of crop-based fuels used for both heating and transport.

For heating purposes, modern, automatic biomass boilers and stoves using wood chips or pellets are very efficient and reliable. Fast growing energy crops are also in use across Europe.

In large scale installations biomass is ideal for co-firing with other fuels.