Campaign for Take-Off

Renewable Energy for Europe (1999-2003)

SHARING SKILLS AND ACHIEVEMENTS

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1999 - 2003

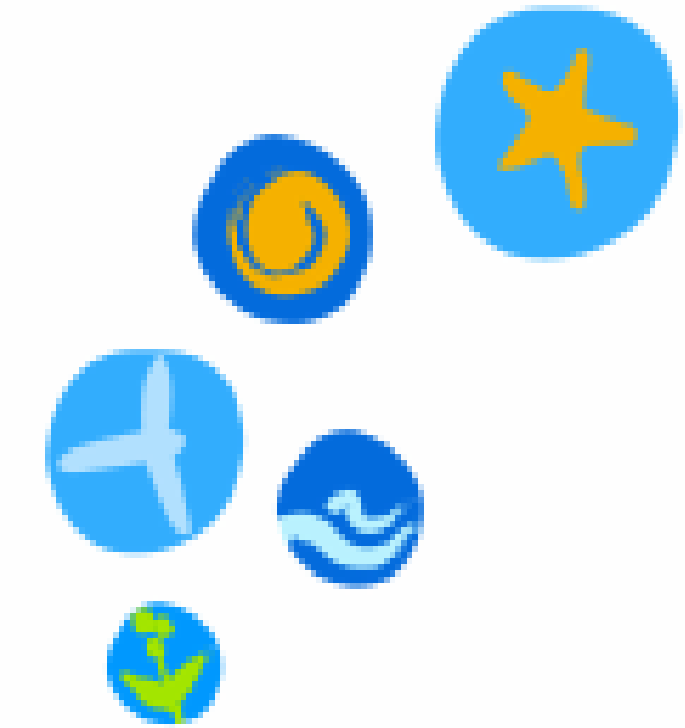
Purpose of the publication

As the Campaign for Take-Off (CTO) came at the end of its implementation in December 2003, a consortium formed by EREC (European Renewable Energy Council), EUFORES (European Forum for Renewable Energy Sources), and INSULA (International Scientific Council for Island Development) was entrusted by the European Commission, Directorate General for Energy and Transport, with the impact assessment and the organisation of the CTO Closing Conference.

This publication gives an overview of the main features and best performances achieved during the last five years (1999-2003), period of implementation of the Campaign for Take-Off (CTO). It further presents a general overview of key-success factors for renewable energy sources (RES) implementation, and showcases the most relevant initiatives of which one can draw crucial lessons.

The main purpose of this Guide is to share valuable experience and increase replication potential through the dissemination of the results to key actors who should find inspiration through this document and learn from the lessons from previously implemented initiatives to replicate them in their own sphere of potential actions, therefore contributing to speed up the RES market penetration and increase public awareness for RES. Key actors include local, regional and national bodies, including decision-makers and private entrepreneurs who show interest in safeguarding their environment and security of energy supply by more investment and better planning and foresight in the Renewable Energy area.

This publication is a practical and orientating document for the identification of experiences, where the expressed opinions and contents are responsibility of the authors and not necessarily reflect an official position of the Commission on the subject.



Published by
EREC (European Renewable Energy Council), INSULA (International Scientific Council for Island Development) and EUFORES (European Forum for Renewable Energy Sources).

A great number of people have provided information and/or guidance during the conception and redaction of this publication. In particular, we would like to thank the CTO partners and other RES initiative co-ordinators, who have been very helpful and shared their valuable experience. Without their support, this work would not have been possible. They substantially contributed to disseminating the results of the Campaign for Take-Off and thereby to the uptake of renewables in Europe.

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INDEX

Campaign for Take-Off

Short Overview

The Campaign for Take-Off (CTO) was the first European promotion campaign for RES launched in 1999 and concluded in December 2003. It has been an essential part of the strategy outlined in the "White Paper for a Community Strategy and Action Plan on renewable energy sources", as it was designed to kick-start the implementation of this legislative document. The White Paper sets an indicative target of 12% for the contribution for renewable sources of energy to the European Union´s energy consumption by 2010, and contains a comprehensive strategy and action plan setting out the means to reach this objective. The key sectors identified by the CTO correspond to mature technologies which are considered crucial in achieving the White Paper's RES goal but which need an initial stimulus to accelerate and substantially improve their market penetration, thereby developing economies of scale and, consequently, reducing costs.

The Campaign for Take-Off aimed to facilitate the success of the strategy as a whole by stimulating the necessary trend towards increased private investment in renewables in a visible manner, with an emphasis on near-market technologies - solar, wind and biomass. The CTO was expected to have reached its goals by 2003, i.e. to set out a framework for action to highlight investment opportunities and attract the necessary private funding which is expected to make up the lion's share of the capital required. The Campaign also seeked to encourage public spending to focus on the key sectors, which is expected, in the process, to trigger private investment as a result. Lastly, the CTO is known for its communication strength by launching several types of promotional activities.

Further to the Commission's White Paper, the following legislative and programme expenditure have played a key role in reaching the CTO objectives:

- The Directive on the Promotion of Electricity produced from Renewable Energy Sources, adopted in September 2001, which enabled, for the first time, concrete national indicative targets to be agreed with the Member States to sustain a substantial increase of renewables electricity, passing from 14% in the year 2000 to 22,1% in EU-15 (21% in EU-25) by 2010;
- The Directive on the Energy Performance of Buildings, intended to realize the cost-effective improvement of energy efficiency and increased use of renewable in new and existing buildings across the EU Member States;
- The Directive on the promotion of biofuels' use for transport, adopted in May 2003, which sets a substantial but achievable increase of biofuels consumption (2% by 2005 and 5,75% by 2010) as a proportion of total petrol and diesel consumption;
- The Directive on fuels taxation adopted by the end of 2003 to determine an overall tax system for the taxation of energy products, with a view to improving the functioning of the internal market, encouraging behaviour conducive to protection of the environment. Member States may apply total or partial exemptions or reductions in the level of taxation to energy products used under fiscal control in the field of pilot projects for the technological development of more environmentally-friendly products or in relation to fuels from renewable sources, including biofuels.
- The 5th Framework Programme contains a major demonstration component, together with associated measures, related to RES. Two key actions related to RES are proposed in the Framework Programme:

Key Action 1: Cleaner Energy Systems, including Renewable Energies and

Key Action 2: Economic and Efficient Energy for a Competitive Europe.

The development of technology closely linked to the market is essential for the large-scale implementation of RES. The demonstration part of the 5th Framework Programme will reduce risks associated with a change of scale of RES and accelerate their market penetration.

- The 6th RTD Framework Programme of Research and Technological Development (2002-2006) adopted in 2002 allocates 810 million Euros to technological progress in the field of new and renewable energy sources and energy efficiency across the European Union and the Accession Countries;
- ALTENER was a Community programme that focused exclusively on the promotion of renewable energy sources. It was part of the Energy Framework Programme, being until this moment a strong instrument to support and monitor the Community. Strategy on RES and, consequently its Campaign for Take-Off. Support to the Campaign under ALTENER provided funding for the promotional actions (advertising support for the Campaign for Take-Off, developing project implementation plans, identifying candidates for specific actions such as the "100 communities", developing specific marketing ...).
- The Intelligent Energy for Europe (2003 – 2006) multi-annual energy program that entered into force in August 2003 and that is intended to support the European Union's policies in the field of energy as laid down in the different legislative documents such as the White Paper on Transport and other related Community legislation.

The CTO was designed to act as a catalyst for the development of promising key sectors in the field of renewable energy sources: solar, wind and biomass technologies. The signal was meant to be a growing use of renewables, drawing attention to investment, innovation and sustainable labour market perspectives. In order to translate this signal to market actors in tangible objectives, the following targets were set for each key sector:

- 1,000,000 kW_p photovoltaic
- systems.
- 15 million m^2 of solar thermal collectors.
- 10,000 MW of wind turbine generators.
- 10,000 MW_{th} of combined heat and power biomass installations.
  1,000,000 dwellings heated by biomass
- 1,000 MW of biogas installations.
- 5 million tonnes of liquid biofuels.

These targets proposed to be attained by 2003 correspond to a limited share (between 15% and 25%) of the overall 2010 objective put forth in the White Paper for the sector in question. This share takes into account the 1999 status of development of the particular sector, the highest percentage (25%) for example, being set for wind energy.

In the context of the CTO, the activities to be implemented in these key sectors, were, since the beginning of the Campaign, classified according to: regional level, local, city, isolated or rural areas, national, industry and island, as well as "100% community" types in three levels - rural, islands and city.

For each type of territory an estimation of the capacity to be installed has been made and the indicative costs of each application in the territory concerned have been estimated. These costs included the average unit cost during the period of the Campaign and the total investment needed.
It was estimated that the renewables capacity promoted in the Campaign required investment funding of around Euro 30 billion with some 75-80% coming from private sources. Therefore strong commitment from industry and other potential investors was crucial to the Campaign.

In 1999, the European Commission established the scope and the implementation rules for the CTO introducing the comments and contributions received from the Council and the European Parliament. The Campaign for Take-Off was decided to be a means to raise interest among industry, investors and the public, as well as to be a visible vehicle to enable the uptake of RES in Europe. The Campaign investment opportunities were highlighted by promotional activities, completed with public funding, both organized in a way to focus on the key sectors in order to increase the impact and visibility of the concerted efforts.

At the same time the cooperation with the Member States's action is seen to be a crucial point for the success of the campaign. Therefore the coordination between the EU, national and local levels of implementation of the RES objectives, in particular the relevant programmes and projects at these levels, are seen to be part of the Community-wide Campaign for Take-Off and can therefore benefit in practice from the various promotional activities. By this the CTO intended to

help raising the profile of national, regional and local programmes and projects, giving widespread publicity and adding a European dimension to national RES promotion, while at the same time, the cooperation between the Community and the Member States contributed to trigger and complement private capital through their activities. At the stage of designing the CTO, the Member States were invited to provide information on existing and planned RES policies and programmes, as well as to communicate their preferences for sectors to be given priority under the CTO.

The promotional measures: Among them, the "Renewable Energy Partnership" is one of the principal instruments to involve the various actors in the implementation of the CTO. The specific actors identified as being able to play an important role in promoting and contributing to the Campaign include the following ones: national governments; the regions; municipalities and their distribution utilities; authorities in charge of public procurement; energy agencies; RES developers and consumers associations; town and country planning bodies and architects; industry, including utilities and energy service providers, oil companies, and motor manufacturers; industry associations; farmers associations; forest-based industries and co-operatives; financial institutions; domestic and external trade associations; non-government associations.

Complementary public funding: As a basis for the estimation of the amount of public funding necessary to trigger the total investment covered by the Campaign, the ratio between the total RES investment made in the EU in 1998 and the estimated total public support has been used. The total investment is estimated to be in the order of 4 billion EURO and the public support under national and Community programmes is estimated at 1,5 billion EURO.
Given that the Campaign for Take-Off concerns only mature technologies where significant decrease in costs can be expected through increased market penetration and, thus, economies of scale, an average public support in the range of 20-25% was considered to be appropriate for the key sectors of the CTO.
The conclusion is that an indicative public funding support of 7 billion EURO over the lifetime of the Campaign would be needed to trigger the total funding amount of 30 billion EURO necessary to achieve the goals of the Campaign.

Estimated indicative public support for the CTO in the EU (1999-2003)

Campaing Key Sectors	Estimated Total Investment Costs billion EURO	Range of Support %	Average rate of Support %	Estimated Total Public Funding billion EURO (indicative)
PV inEU	2.85	35-80	45	1.2825
PV in Developing Countries*	(2.45)	-	-	-
Solar Collectors	4.7	0-30	15	0.705
Wind Turbines	10.1	10-40	20	2.02
Biomass CHP	5.5	20-60	30	1.65
Domestic heating	4.4	0-20	10	0.44
Biogas	1.2	20-40	25	0.3
Biofuels	1.25	30-70	50	0.625
Total	30.05			7

Source: Energy for the Future / Renewable Sources of Energy (Community Strategy Action Plan) - EC
*Support primarily in the form of loans

The following actions were the core of the Campaign for Take-Off:

CTO Renewable Energy Partnership: the major tool to reach CTO objectives

The Renewable Energy Partnership has been developed to involve key actors in the Campaign. A Renewable Energy Partnership also strengthens the necessary co-operation at Community level.

Though not entailing legally binding obligations, joining the Partnership required strong commitment and a substantial contribution to the objectives of the CTO. Joining proceeded through a Declaration whereby the institution, organisation or company in question stated its willingness to contribute to the CTO and described the substance of its contribution.

Depending on the nature of the Partner, contributions may have taken the form of investment or promotional programmes in the key renewable energy sectors forming part of the Campaign, or other support measures aimed at raising interest among industry, investors and the public and increasing the market penetration of RES.

CTO RENEWABLE ENERGY PARTNERSHIP

Eligibility criteria:

In principle, every institution, company or organisation, both public and private, that contributed to the Campaign had the possibility to join the Partnership. Administrative procedures and guidelines were such as to allow a wide membership of serious contributors to the Campaign.

However, in order to maintain the credibility of the Partnership, the following criteria have been followed:

General guidelines:

1. The "programme" put forward had to focus on RES, exclusively or partly, and on the key sectors of the CTO.
2. The "programme" had to be approved and launched or at least a deadline for launching fixed.
3. Although size was not a determining factor, the "programme" should have nevertheless made a substantial local, regional, national or international impact.
4. The "programme" had to be proposed by the main promoter. The "promoter" could be municipalities, regional or national authorities, private organisations, associations or companies or a group of them.
5. The Partnership "promoters" had to submit a detailed description of the "programme" they wished to propose as a contribution to the Campaign. From this description it must have been clear that the planned actions fulfilled the criteria contained in the guidelines.
6. As regards the verification of whether the declared projects in fact materialised, a reporting requirement (relatively light) was foreseen for the "promoters".
7. Compliance with Community, national and local regulations were compulsory for any action and project to be undertaken in the framework of the "programme".

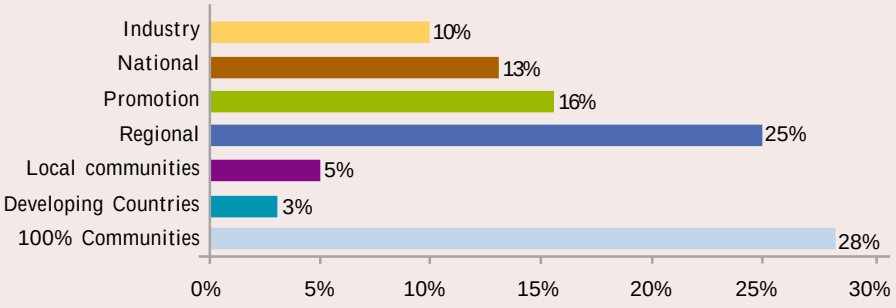
Partnership proposals submitted directly to the Commission:

Proposals for a RE Partnership arriving directly to the Commission were assessed and approved or rejected according to the principles agreed (guidelines see above).

The Commission sent new RE Partnership candidates lists to MS representatives in the RES Working Group. The lists were updated on a regular basis (six months).

Participation:

During the period 2000-2003, 125 renewable energy programmes and projects involving more than 700 partner organizations in the European Union – municipalities, agencies, technological institutes, regional authorities, national institutions, universities and enterprises – joined the Campaign as Renewable Energy Partners and thereby expressed openly their willingness to contribute to its objectives. Organisations and authorities from the Accession Countries joined the Campaign at an early stage with successful initiatives at local level or through joint initiatives with other European Union organizations.



CTO promotional tools for Renewable Energy Partners:
Renewable Energy Partners were encouraged to use the Campaign logo, to be included in the RE Partnership Catalogue and participate in the Campaign Awards. In addition "progammes" covered by RE Partnerships were disseminated at EU-wide level in the Campaign Advertising. The various actions are specified below.

RENEWABLE ENERGY FOR EUROPE
Campaign for Take-Off

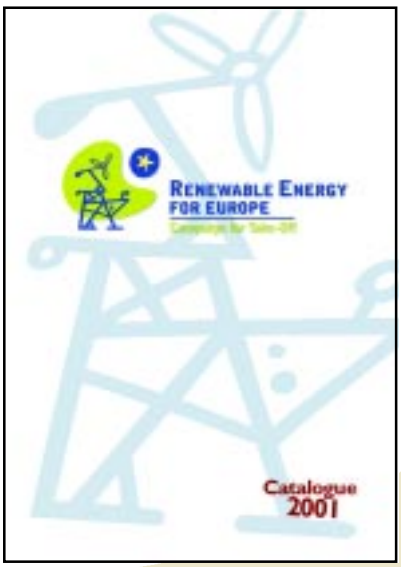
Partners could use the logo of the CTO and their relevant activities could be included in the other related promotional activities, such as the CTO Awards, the annual CTO Catalogue, Advertising activities, etc.

The catalogue of Partners having made such a Declaration, including a description of their specific contribution to the CTO was published widely (brochure, Internet etc.). The Partnership also included the planned monitoring of the relevant programme or action.

A logo was created to symbolize the EU-wide approach of CTO - a single Campaign at Union level in order to bring all projects joining the Campaign together under the same logo. This logo was used by all partners contributing to the Campaign in their programmes, projects and other activities. Programmes and projects eligible to use the logo were those that fell under the criteria specified in the key sectors of the Campaign and the "100 communities".

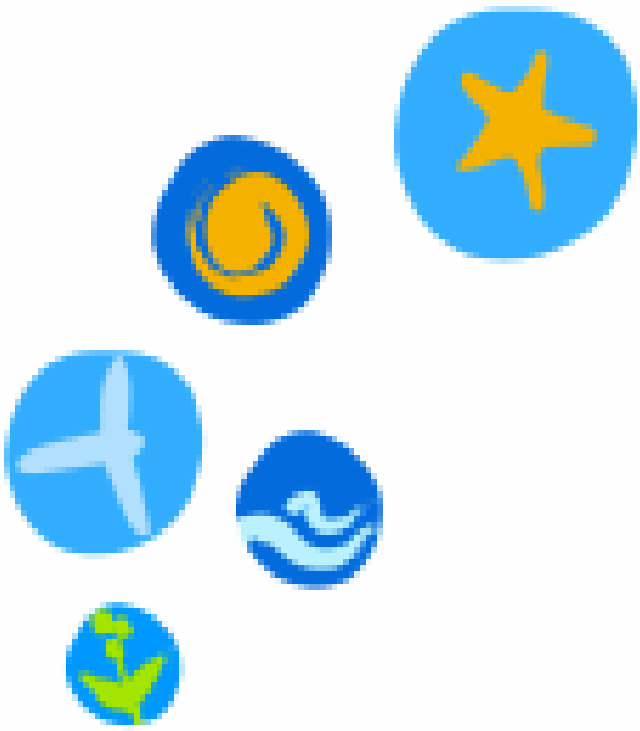
A catalogue funded by ALTENER has been published about once a year by the Commission summarizing the Partners's programmes and projects joining the CTO and documenting the results, on the basis of data collected by national partners, and made available to the public both in paper and electronic format.

The Campaign for Take-Off has granted awards to highlight "best practices" of the RE Partnerships in accordance with criteria carefully set and agreed. Awards were attributed to a variety of different types of Partners.



Events and publishing:
Two conferences were organized to bring together members of the Partnership to share experience in all of the key sectors. The first one took place in Toulouse from 23-25 October 2000, the second one was the European Conference for Renewable Energy – Intelligent Policy Options (19-21 January 2004, Berlin). These conferences offered the opportunity to share experience among partners and promote best practice and synergies.

CTO awards ceremony 2004



Towards Sustainable Energy Communities

Energy options are often the core of both the development model and each community's strengthening capacity. In the case of RES, choice does not depend exclusively on the degree of technological maturity, market conditions, or tax policies, but there are other factors also involved, such as involvement of actors, management and partnership capability, decision model, and proximity to energy solutions of each community's specific requirements and possibilities.

Within the framework of the different solutions based on renewables featuring the "100% Communities" idea included in the Campaign, energy resources and supply, beside being characterised by thermal and electric vectors, they also, seeing it as a service, emphasise aspects of energy security and quality, and especially the possibilities to strengthen the endogenous development capacities of each community. Renewable Energy projects are close to the final energy consumer and in the course of the implementation of the Campaign they developed close links with sectors such as agriculture, tourism, clean transport, or water production. A proximity that is now creating new prospectives with better quality of life and environment, respecting each community's means and features.

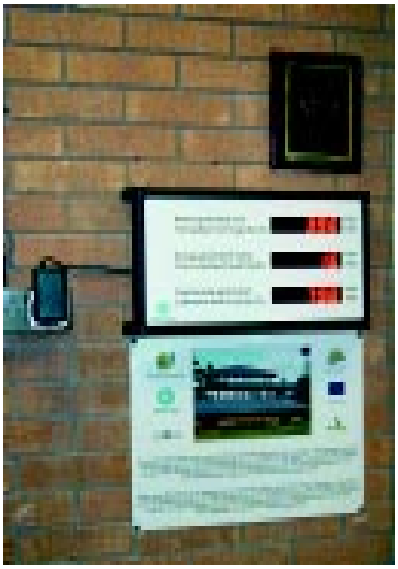
There is a large variety of communities differing in terms of size, population density, living standards, climatic conditions, building styles, cultural patterns, resource availability and, of course, energy system characteristics. The characteristics for local, regional (including rural areas), city, or islands communities are important to understand in order to increase successful RES showcases and increase possibilities of their replication.

Renewable Energy Sources deployment at regional and local level

Europe's regions and their local communities are the closest to the final energy consumer. When it comes to renewable energy sources, the work of regional authorities and municipalities is therefore of outstanding importance. Due to their decentralised nature, many renewable energy technologies are closer to the end consumer than conventional energy technologies and can therefore be particularly well promoted on both regional and local levels. Furthermore, they represent an excellent opportunity for wealth creation in urban and remote areas through the creation of jobs and income for the local population.

In order to further promote renewable energy sources and demand management, integrated energy planning at local and regional level, incorporating a mix of legal, regulatory, financial, communication and training measures is necessary. Many regions in Europe already apply such an integrated approach which contributes to increasing the security of supply and minimises the external energy dependence. This is especially relevant in times of liberalisation of energy markets, where the decentralised approach is gaining in importance. An increasing number of representative cases are emerging in Europe, leading to substantially high RES shares, even designed to reach 100% of local energy supply and, resulting from this, to the stimulation of the local/regional economy, while improving the environment. Cross-border cooperation between regions of different countries of the European Union and its Accession States has brought forward fruitful synergy effects, promoting best practices and sharing lessons learnt towards a common objective.

In recent years, the European Commission has been placing an increased emphasis on capacity building at regional and local level, through the creation of regional and local energy agencies. The first agencies date back to the late 1980s and early 1990s. Nowadays, the Commission is working with around 250 local and regional energy agencies spread all over Europe, with the objective of developing and implementing a combined energy efficiency and renewable energy strategy for their respective fields of activity.



Renewable Energy Sources in Cities

Nearly 80% of the European population live, work, and use leisure facilities in cities, and almost the half in cities with more than 50.000 inhabitants. Nearly 70% of the energy consumption occurs in cities. The development of sustainable energy strategies in urban areas is clearly a priority. It is not only the large numbers of energy consumers which is at stake, but also the quality of the urban environment which is of fundamental concern, and for which the implications go far beyond the local community. Apart from environmental considerations, a local sustainable energy policy can have major impacts on employment, social cohesion, participation of civil society, and economic development, as well as on urban governance.

Examples have shown that proactive RES policies in cities can substantially increase the share of RES, thereby improving living conditions and contributing to reaching the objectives outlined by the United Nations in the AGENDA 21 initiative. In Europe, implementation of Agendas 21 as vector of RES penetration relies on the excellent support of the *European Sustainable Cities & Towns Campaign*, developed after the approval of the Aalborg charter.

More recently, there have been clear signs of a political commitment towards more integrated policies and concepts aiming to convey sustainable energy strategies into city policies. Such commitments aim at demonstrating the benefits of a high degree of decentralised energy supply through recourse to new and renewable energy sources, in combination with a conscious application of leading energy efficiency measures in the various end-use sectors. Recent European legislation in the energy field, such as the Directive on the Energy Performance of Buildings, pushes forward this integrated approach, and should open the opportunity for more efficient consumption through ambitious urban rehabilitation.

Several large urban areas across Europe have demonstrated an outstanding level of excellence with regard to the integration of sustainable energy concepts, including renewable energies. Both in the North and the South of Europe, several examples illustrate how far awareness of and commitment to renewable energy solutions can make cities improve in their energy planning and resource management. Politicians, planners, developers and citizens are all key stakeholders in this process, and can help to achieve a genuine change in the urban energy scene. This session will present examples of successful achievements in sustainable strategies, discuss barriers and challenges, assess the impact of policy frameworks and come up with future needs for public intervention on the level of municipal authorities, Member States frameworks and European intervention.

Paving the way towards 100 % RE based communities & islands

Modern societies are seeking to implement integrated development models and infrastructures that will accommodate social and economic requirements and expectations, respect the environment and that will be sustainable. The integration of all these, sometimes conflicting, elements is a complex issue and calls for the guidance provided by successful examples of a manageable size, and that can point the way forward for larger units. Local energy communities can pioneer the application of the integrated measures which are required to attain our global commitments and, as a result, become excellence-models for the dissemination of such concepts around Europe. An increasing number of communities in Europe are committed to reach renewable energy shares which go far beyond the EU global objectives: they do not speak of 12% RES share, but are working to achieve 100% Renewable Energy supply.

Islands and isolated rural communities, particularly in the remote or outermost regions of Europe are at present highly challenging laboratories for the development of 100% RES solutions, due to their scale, highly costly or lack of conventional resources, abundance of renewable resources, need of future energy reliability and the environmental and economic impacts caused by importing conventional energy.

Communities and islands aiming towards 100% RES are today facing

the double challenge of firstly having to consolidate their recently attained achievements, and secondly to demonstrate that they have the capacity to contribute to the large-scale deployment of renewables at a European level.

In Europe some pioneer Communities have shown the way, and through the Campaign for Take-Off, a number of pilot communities - regions, cities, and islands aiming at 100% renewable energy supply, have become Partners with the European Commission. These should serve as credible pacemakers showing to other communities the right way to achieve large-scale development of 100% RES projects. Their initiatives and strategies represent in many respects the most successful future energy policies based on renewables. They serve as essential references in the search for solutions to the complex problems and challenges brought by technological innovation, favourable markets, appropriate regulations and social participation and facilitate the consolidation of renewables-based scenarios.

Overview on market developments in CTO sectors

In this section, a brief overview of the market development for each of the three renewable energy sectors in the past 10-12 years and projections for 2010 is provided and contrasted. Looking at the annual growth rates between 1995 and 2001 one can conclude that some sectors are far beyond or well in line with the expectations of the CTO objectives. Wind, for example, reached the CTO target "10,000 MW" in 2000 and will most likely reach the White Paper target in 2004. At the end of 2003, the surface of European installed solar thermal capacity has reached the 15 million m^2 objective of the Campaign for Take-Off. On the other hand some sectors such as biomass lie further behind the expectations.

Wind

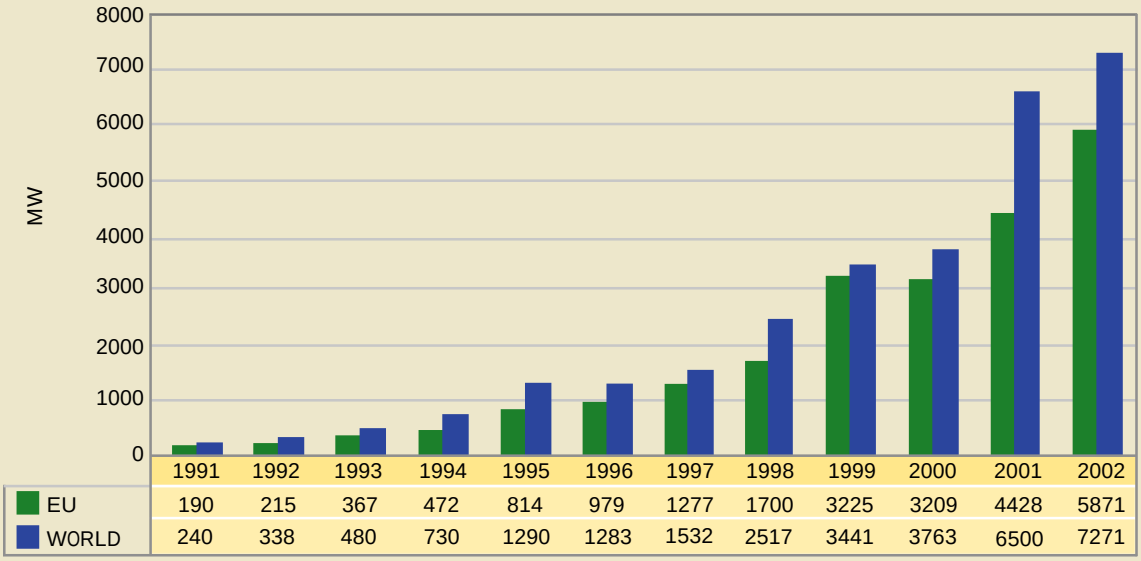
Global wind power capacity has quadrupled over the past five years, growing from 7,600 megawatts (MW) at the end of 1997 to more than 31,000 MW at the end of 2002. Around 7,000 MW of new wind power capacity was installed globally in 2002 - enough to power 16 million average European homes. In other words, the capacity installed in 2002 was roughly equivalent to the entire cumulative global capacity in 1997.

As is apparent in Figure 1, 85% of this capacity was installed in the European Union (5,870 MW), representing a 33% increase in installed capacity per annum over the previous year, which saw 4,430 MW of new capacity. The European market has grown by an average 35% per year over the past five years, and by the end of 2002, total installed capacity had reached 23,000 MW in the EU15. In terms of conventional fuel replaced by wind power, the electricity production from these 23,000 MW is equivalent to burning 20 million tonnes of coal in a conventional power plant. Figure 2 demonstrates the total installed capacities of EU15 countries.

Germany, Spain and Denmark accounted for almost 90% of the capacity installed in 2002. With 3,247 MW, Germany accounted for 55%, reaching a total of 12,001 MW by the end of 2002, enough to meet 4.7% of national electricity needs. Spain followed with 1,493 MW to reach a total of 4,830 MW. Denmark installed 497 MW to reach 2,880 MW, enough to meet 20% of the country's electricity needs. The Netherlands (217 MW) and Italy (103 MW) also reached three-digit figures for installation in 2002.

Figure 1

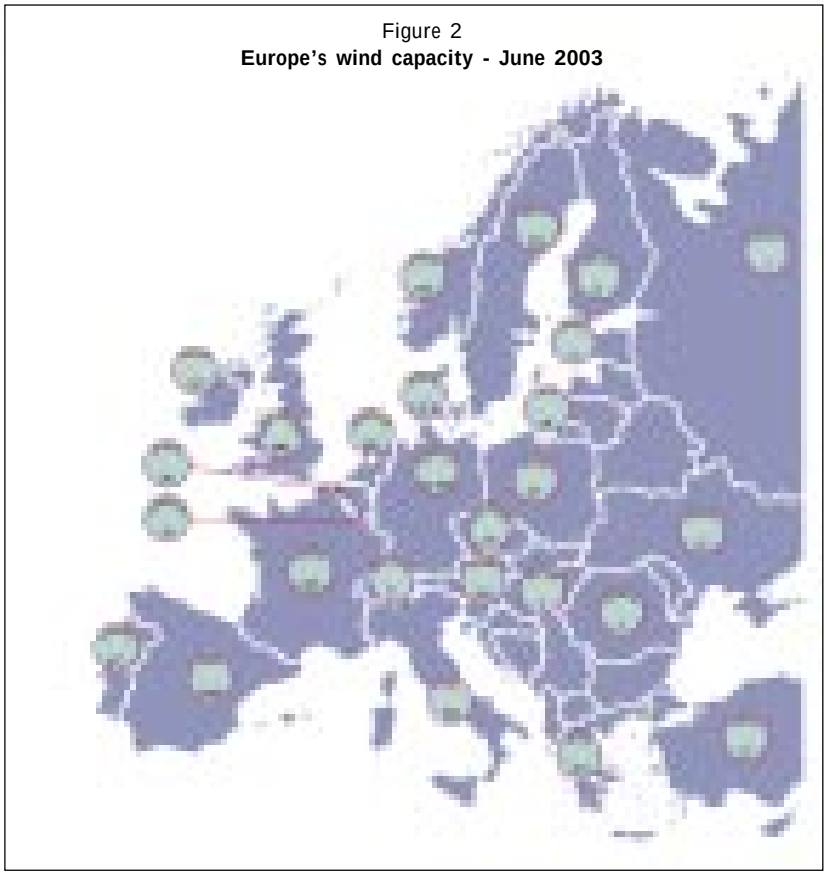
Annual installed wind electricity generation capacity in Europe and the world 1991 – 2002



	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
EU	190	215	367	472	814	979	1277	1700	3225	3209	4428	5871
WORLD	240	338	480	730	1290	1283	1532	2517	3441	3763	6500	7271

Source: European Wind Energy Association, 2003

Figure 2
Europe's wind capacity - June 2003



Source: European Wind Energy Association, "Wind Directions"

Market development within Europe

Every country in the EU15 has installed grid connected wind capacity. Outside the EU 15 but still in the European geotraphical area, markets exist in Norway and Switzerland in Western Europe, and in Ukraine, Poland, Latvia, Czech Republic, Russia, Hungary, Estonia, Romania and Turkey in Central and Eastern Europe.

European Union electricity consumption in 2002 amounted to 2,533 TWh. By December 2002, sufficient wind capacity was installed to provide approximately 2% of this electricity consumption, or approximately 50 TWh.

Table 1
Installed Wind Power Capacities by Member State (MW)

	1996	1997	1998	1999	2000	2001	2002	2003 (June)
Austria	10	20	30	34	77	94	139	219
Belgium	4	4	6	6	13	31	44	56
Denmark	842	1,129	1,443	1,771	2,417	2,489	2,880	2,916
Finland	7	12	17	39	39	39	41	41
France	6	10	19	25	66	78	145	220
Germany	1,552	2,081	2,875	4,442	6,113	8,754	12,001	12,836
Greece	29	29	39	112	189	272	276	354
Ireland	11	53	73	74	118	125	137	137
Italy	70	103	180	277	427	697	788	800
Luxembourg	2	2	9	10	10	15	16	16
Netherlands	299	319	361	433	446	493	688	803
Portugal	19	38	60	61	100	125	194	217
Spain	249	512	834	1812	2235	3337	4830	5,060
Sweden	103	122	174	220	231	290	328	364
United Kingdom	273	319	333	362	406	474	552	586
EU-15	3,476	4,753	6,453	9,688	12,886	17,313	23,056	24,626

Source: European Wind Energy Association, 2003

Solar Thermal

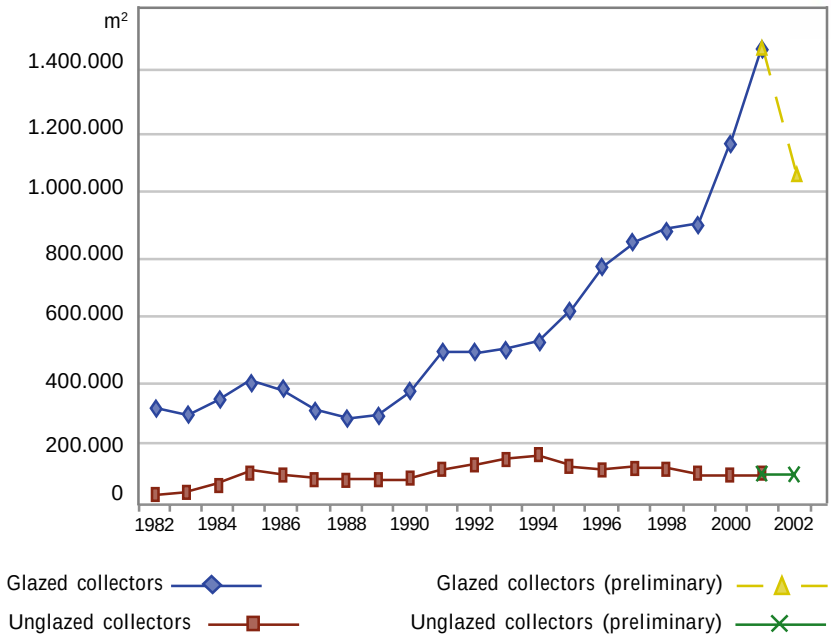
The solar thermal market in the EU has more than doubled compared to the mid 1990s and is three times bigger than in the late 1980s. Between 1990 and 2001, the average yearly market growth has been 13.6%. Apart from other renewables, no other energy sector has grown faster than solar thermal in the last decade. Since 2000, the market has clearly passed the mark of 1 million m2 newly installed collectors per year. After a significant contraction in 2002, mainly originated in Germany, a new peak over 1.5 million m^2 is expected for 2003.

Figure 3 shows the main trends in the market for glazed collectors (flat plate and evacuated tube). In the late 1980s, the market suffered in most countries, mainly due to low fossil fuel prices but also because of quality problems in solar thermal systems. From the early 1990s, the market started to recover, thanks to higher quality products and installations as well as to significant financial incentives to investment in some countries. Table 2 shows the installed capacity country by country, in 2001 - the last year for which final data are available. Taking into account the last estimates, the surface in operation at the end of 2003 was roughly 11.9 million m^2, corresponding to an average of 32 m^2 per 1,000 inhabitants. During the decade from 1990 to 2000, the cumulated surface in operation tripled, growing every year by 11.6%.

An estimated 1.7 million m^2 of unglazed collectors in operation at the end of 2003 must be added. The total surface in operation is therefore 13,6 million m^2. The analysis country by country refers to glazed collectors only, because in most countries reliable data on unglazed collectors are not available. Also, their energy output is more difficult to be estimated. Unglazed collectors for swimming pools are a separate technology and represent a minor market in Europe.

Figure 3

Development of Solar Thermal market volume in the UE



Source: ESTIF, 2003 "Sun in Action"

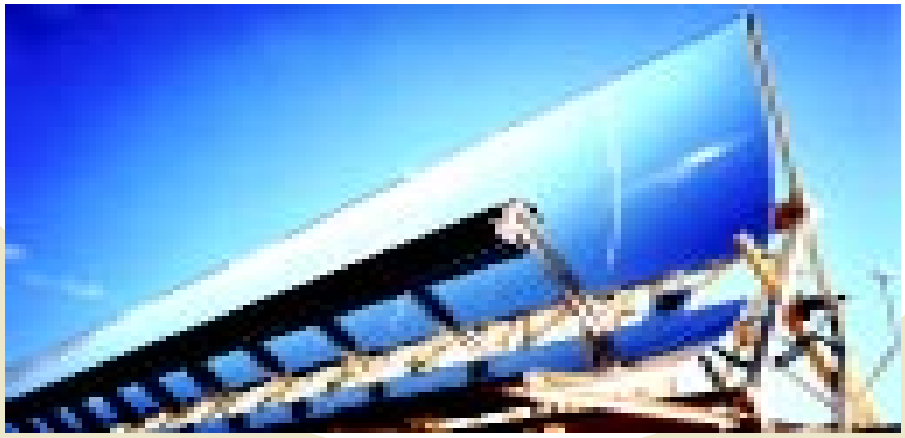


Table 2

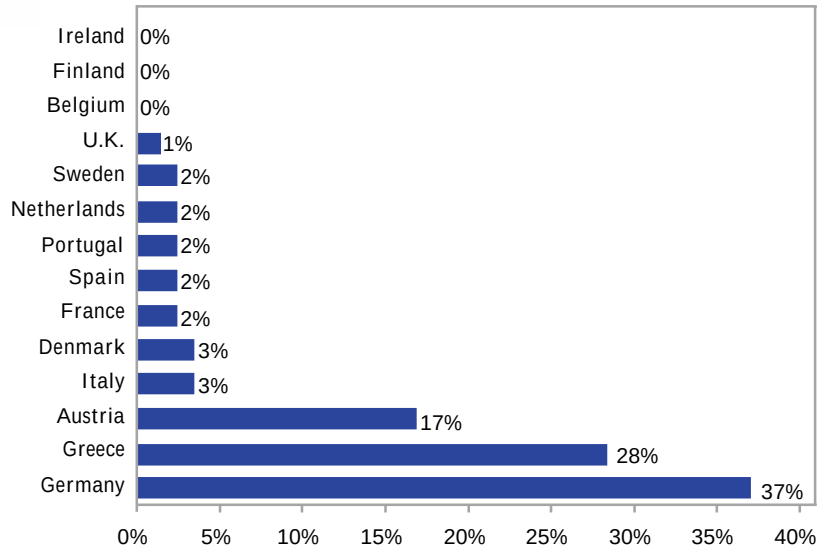
Installed solar thermal capacity in the EU14 - Glazed collectors only

	2001			
	Newly installed	In operation	In operation per head	Energy output
	m^2	m^2	m^2/1,000	MWh
Belgium	4,481	26,534	3	11,156
Denmark	26,150	271,120	51	108,476
Germany	900,000	3,634,000	44	1,480,650
Greece	175,000	2,790,200	264	1,082,598
Spain	46,357	224,666	6	135,800
France	38,500	230,750	4	138,450
Ireland	270	3,325	1	1,496
Italy	49,327	335,212	6	236,262
Netherlands	30,537	203,877	13	85,628
Austria	160,080	1,651,814	203	583,743
Portugal	6,000	210,963	21	126,578
Finland	1,110	7,220	1	2,170
Sweden	21,970	158,226	18	47,638
UK	15,230	119,420	2	52,309
EU14	1,475,012	9,867,327	26	4,092,954

Source: ESTIF, 2003 "Sun in Action II"

Figure 4

National shares of the EU solar thermal area in operation



Source: ESTIF, 2003 "Sun in Action II"

Solar Photovoltaic

Germany is clearly the leading country, representing, alone more than 80% of the grid-connected market in Europe, a direct result of the support schemes launched some years ago. Total installed capacity has increased from 189 MW_p in 2001 to 278 MW_p in 2002, of which 92% was grid-connected. The Netherlands came second in Europe with an installed capacity of 28.31 MW_p and a growth of 38% over 2001. In Italy, 1.25 MW_p of on-grid PV was installed in 2002, whilst the volume of decentralised systems (off grid) reduced, dropping by 6% of the total installed capacity.

Spain maintained its fourth position in 2002, new installed capacity of 3.7 MW_p (including 2.6 MW_p linked to the grid), brought Spain's total capacity up to 19.3 MW_p. France, the only other European country to have crossed the benchmark of 15 MW_p of installed capacity, registered an additional capacity of 3 MW_p in 2002. Growth in Austria is also interesting.

According to Arsenal Research, a member of the IEA-PVPS, Austrian installed capacity increased by 50% within the space of one year (from 6.7 MW_p in 2001 to10 MW_p in 2002).

The cumulative capacity of all European Union Member States had reached 391.6 MW_p by the end of 2002, an increase of 109.3 MW_p over the previous year. Applications connected to the grid now account for a substantial majority. From 77% of cumulative capacity in 2001, they accounted for more than 80% by the end of 2002.

The European market is still very much centered on Germany and the real implication and involvement of certain countries of the European Union like France, Italy and Spain is sometimes difficult to define.

Table 3

PV capacity installed in EU, 2001 and 2002

	Total installed capacity in 2001 (MW_p)			Total installed capacity in 2002 (MW_p)		
	Grid-connected	Off-grid	Total	Grid-connected	Off-grid	Total
Germany	175.0	14	189.0	258.0	20.0	278.0
Italy	9.1	15	24.1	10.4	12.4	22.8
Netherlands	16.2	4.3	20,5	23.7	4.6	28.3
Spain	5.3	10.3	15.6	7.9	11.4	19.3
France	1.0	12.7	13,7	1.5	15.2	16.7
Austria	4.7	2.0	6,7	7.9	2.2	10.0
Sweden	0.1	2.9	3,0	0.2	3.1	3.3
Finland	0.2	2.6	2,8	0.1	2.9	3.0
United Kingdom	2.2	0.5	2,7	3.6	0.6	4.3
Denmark	1.3	0.2	1,5	1.4	0.2	1.7
Portugal	0.5	0.9	1,4	0.3	1.2	1.5
Greece	0.3	0.8	1,1	1.0	1.3	2.4
Belgium	0.1	0.1	0.2	0.5	0	0.5
Total EU-15	216	66.3	282.3	316.5	75.1	391.6

Source: EurObserv'ER, "Barometer of Photovoltaic Energy", Paris, 2003

Biomass

Biomass is available in a variety of forms like solid or wet biomass, vegetable oil or sugar. These raw materials can follow several conversion routes using chemical, thermal or biological processes. Finally biomass/ bioenergy can be classified according to its end use as follows.

Heat production: Combustion of wood for heat production is the main bioenergy route in the world, with a constant drive for the improvement of efficiency and pollutant emissions. Several systems can be considered depending on the size. Small scale heating systems for households will typically use wood logs or pellets. Medium scale users will typically burn wood chips in grate boilers while large scale boilers will be able to burn a larger variety of fuels, including wood waste, refused derived fuel.

Electricity and cogeneration of heat and power: Combustion is also the main option for the time being but new technologies are emerging like gasification[1] and in the medium term pyrolysis[2] that offer advantages namely in terms of efficiency and logistics.

Biogas from anaerobic digestion[3] is mainly used on site for cogeneration applications. The solid and liquid residues from the process are often used as fertilisers on farm land.

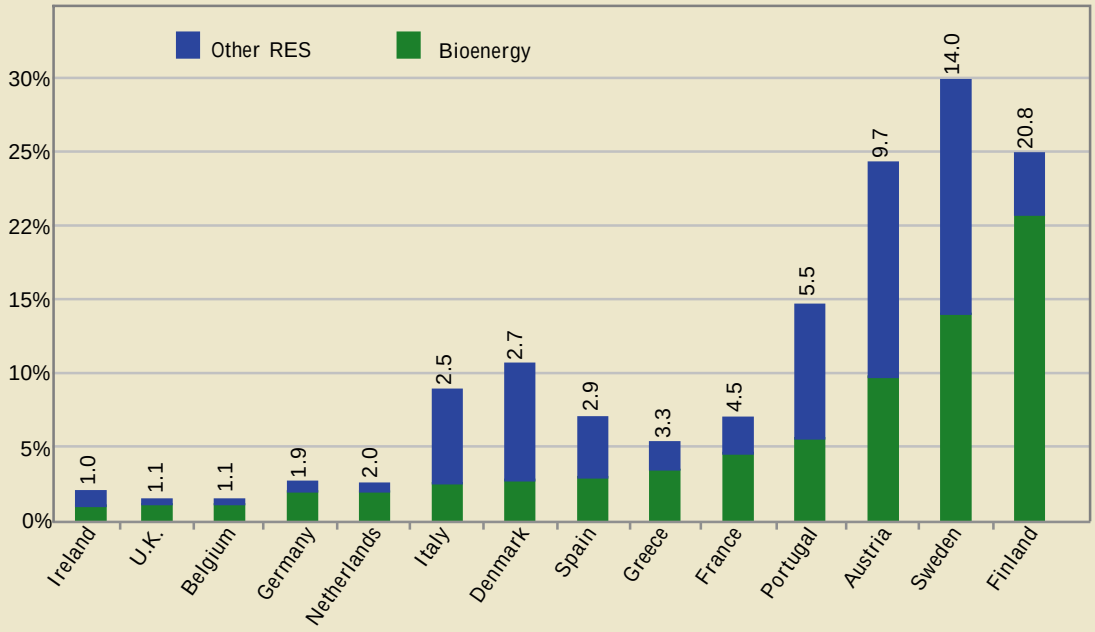
Liquid biofuels: Vegetable oils methyl esters, or biodiesel, can be used both blended with fossil diesel and in pure form. Use in blends between 2 and 30% does not require any modification of the engine. Some minor modifications might be necessary when using it at 100%. The acceptance by car manufacturers is increasing. Pure vegetable oils can also be used in blends or in pure form but in this latter case adaptations of engines are necessary.

The present biomass contribution to the total world energy demand approaches 14 – 15 % (1,2 billions toe/ year) with a much higher contribution (38%) in developing countries for heating and cooking needs. The potential ranges from 2 up to 27 billions toe[4]. It depends particularly on the future population growth, the efficiency of food production, the availability of degraded land, the productivity of biomass and competing end use of biomass (biomaterials) and other competing land use options.

In 2000 bioenergy contributed to 51 Mtoe, still representing a tiny proportion of the White Paper objective In terms of percentage Finland, Sweden and Austria are leaders in Europe while Finland, Germany and Sweden are the most important contributors to increase the share of bioenergy for Europe. These countries have the most favourable conditions for bioenergy development, mainly due to appropriate steering instruments which make bioenergy competitive with fossil fuels.

Figure 5

Share of renewable energy source (RES), of which bioenergy, in 2000 [5]

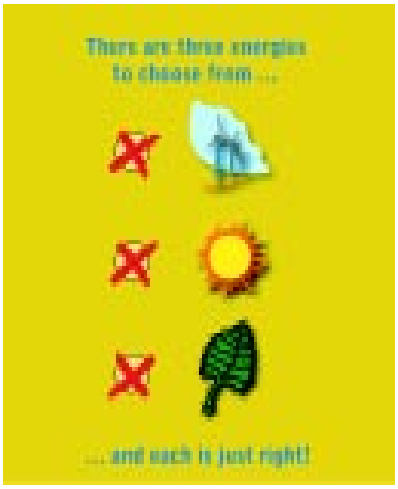


Source: EUBIONET, 2003, "Biomass survey in Europe", EUBIONET Summary report, www.eubionet.vtt.fi, 29p

Wood fuel

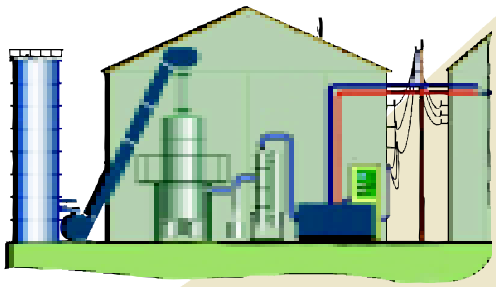
The sector of wood supply has changed over the last years in Europe with an increasing international trade due to large scale users especially in Northern Europe. Trade of biofuels covers wood waste, pellets and wood chips to reach a level of about 1 Mtoe per year in 2002/2003, compared to insignificant volume 10 years ago. The largest volume is traded from Baltic states to Nordic countries, but also from Finland to other Nordic countries, and within central Europe (especially Netherlands, Germany, Austria, Slovenia, Italy)[6].

During the recent past years, the market for pellets has increased sharply with almost 2 million tons in 2002. 115 pellets production plants have been identified in Europe in 2003 for a capacity exceeding 3 Million tonnes. Pellets are also imported from USA and Canada. Sweden and Denmark are the biggest users but the market is also growing quickly in Austria, Italy and Germany. Pellets are used in large scale CHP plants to substitute coal and in individual heating systems.



Biomass for electricity

The market : The EU directive for renewable electricity (2001/77/CE) adopted in October 2001 states indicative targets per country to reach on average 22 % of renewable electricity in 2010 against 13.9 % in 1997.

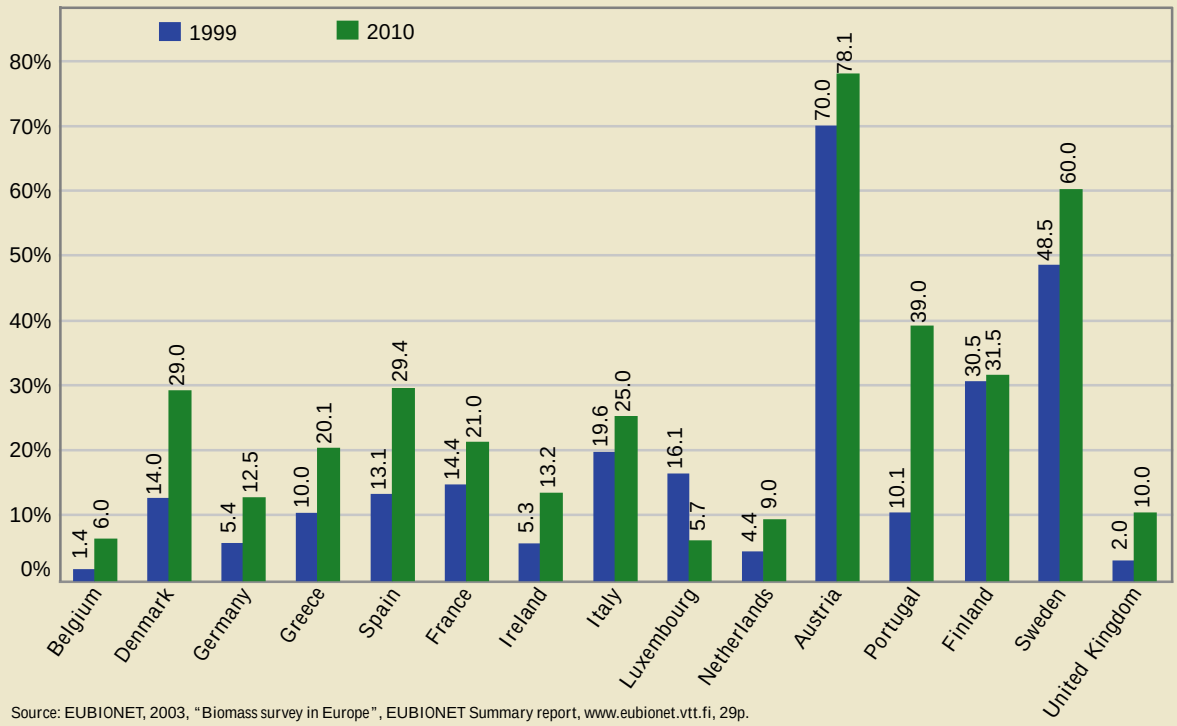


Biomass for heat

The market: Heat represents 90% of the use of solid biofuels which makes it a key market for bioenergy, and as well for renewables, as it represents the important share (50%) of the total energy demand in Europe[7]. Several experts and associations have pointed out the lack of appropriate legislation tools and policies to support market development, specially a directive on heat would be welcome. The market is more developed where biomass is competitive with fossil fuels due to the taxation systems and where district heating systems are operating, like in Scandinavian countries and more recently in Austria. Cogeneration of heat and power is developed on a large scale in Finland (7,370 MW thermal in 2000 Eurobserv'ER 2001) and Sweden. The Finnish Alholmens Kraft plant is the largest biofuelled cogeneration plant in the world (240 MWe, 550 MWth).

Figure 5

Electricity from renewables in 1999 and indicative targets for 2010 (%)



Source: EUBIONET, 2003, "Biomass survey in Europe", EUBIONET Summary report, www.eubionet.vtt.fi, 29p.

Biomass for liquid biofuels

The market: after the twentieth century has seen other fuels, especially petrol and diesel, developing more widely that biofuels (despite known for a long time), due to the large and cheap supply of their main feedstock, crude oil, nowadays liquid biofuels applications are expanding again. This is partly due to European and national environmental, energy and agricultural policies.

The Commission Green Paper for the security of energy supply (November 2000) introduced the objective of 20% of traditional fuels substituted by alternative fuels for toad transport by 2020.

As mentioned above the White Paper on RES mentions a target of 18 Mtoe for 2010.

A Directive for promoting liquid biofuels (2003/30/CE) has been adopted in May 2003 with indicative objectives for members states. The minimum level of biofuels as an energy proportion of all gasoline and diesel sold on the market is 2% by the end of the year 2005 and 5.75% by 2010 (corresponding to about 18-20 Mtoe). Member States should also be able to apply reduced rate on excices duties for pure or blended biofuels with the directive on fuels taxation.

The liquid biofuels market has developed significantly since 1995 (Table 4) but major efforts have to be invested in order to reach the White Paper goals.

Table 4
Liquid biofuels in the EU (Mtoe)

	1995	2000
Biodiesel	0.28	0.70
Bioethanol	0.08	0.20
	0.36	0.90

Source: Kopetz H., 2003, "Bioenergy in Europe", in: proceeding of Bioenergy 2003 conference, 2-5 September 2003, Jyvälkylä, Finland, p 21-24.

References

[1] Gasification is a thermal treatment of biomass with an oxydation agent (air for example) with a limited amount of oxygen, that results in mixtures of gases (containing CO and H_2) that can be used for energy purposes.

[2] Pyrolysis is a thermal degradation of wood in absence of oxygen (dry wood is heated up to 500-600 °C in a very short time in flash pyrolysis) resulting into a liquid, or bio-oil.

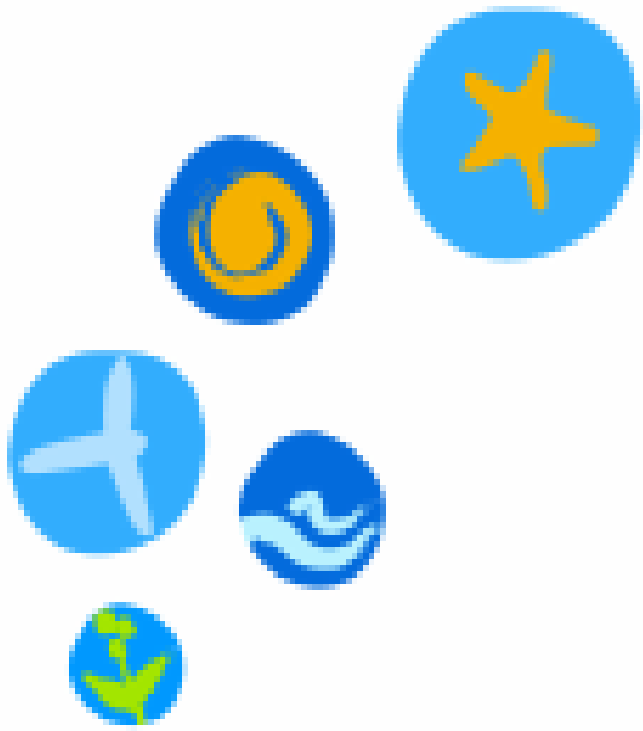
[3] Anaerobic digestion is a biological process that converts biomass into biogas in absence of oxygen. The gas consists mainly of methane and carbon dioxide.

[4] Hoogwijk M;, Faaij A., van den Broek R., Bernedes G., 2002, "The global potential of biomass energy", in : proceeding of the 12th conference on Biomass for Energy, Industry and Climate Protection, 17-21 June 2002, Amsterdam, The Netherlands, p 27-30.

[5] Kopetz H. gives other figures : 17,3% bioenergy for Sweden and 10,8% for Austria. (in : Kopetz H., 2003, "Bioenergy in Europe", in : proceeding of Bioenergy 2003 conference, 2-5 September 2003, Jyvälkylä, Finland).

[6] AEBIOM, 1999, "The European heat market and the Kyoto protocol", position paper by the European Biomass Association (AEBIOM), available on : www.ecop.ucl.ac.be/aebiom, 19 p.

[7] Alakangas E., Vesterinen P., 2003, "Trade of solid biofuels in Europe", in : proceeding of Bioenergy 2003 conference, 2-5 September 2003, Jyvälkylä, Finland, p 129 – 134.



CTO Reference Initiatives

CTO Impact assessment Methodological approach

Representative CTO-related initiatives and projects have been selected taking into account that one of the Campaign's basic objectives was to create scenarios favourable to the development of RES within the European Union, based on the possibility to share Skills and Achievements of the partnerships which have been joining the campaign since its beginning. The initiatives, programmes, and projects included in this study comply with a general, pragmatic criterion of the overall project: to have some reference elements available to analyse the effect of the Campaign, as well as a reference range of pilot experiences contributing to RE consolidation and promotion.

Selected experiences also include aspects related with the barriers intervening against RE development, public acceptance, and markets stability.

Taking into account the above considerations, the following different groups of criteria have been superimposed to proceed to the selection of initiatives.

RE Sectoral coverage

A first criterion identifies those projects that have significantly contributed to Renewable Energy Technology key sectors, for which specific targets had been set during the campaign in the areas of Solar Thermal, Solar PV, Wind energy and Biomass. Furthermore, different technological sectors of application and market niches have been taken into account:

- Privately owned wind turbines (<2 MW)
- Small commercial wind farms (<5MW)
- Large commercial wind farms (5-100 MW)
- Utility owned wind farms (5-100 MW)
- Wind niche markets
  Stand alone, wind-diesel, wind-desalination, telecommunication, ice production, hybrids)
- Domestic hot water production (2.4-10 m^2)
- Large collective solar systems
  Hospitals, hotels, collective housing, sport facilities (>100 m^2)
  Space heating (20-50 m^3)
- District heating (>500 m^2)
- Air conditioning and industrial process heating
- PV building facades
  Commercial buildings, Institutional public buildings, Tourism, Sport, recreational Facilities

- PV Roof top systems
  - Individual houses, Apartments, Buildings, Schools, Tourism, Sport Facilities
- Combined heat and power
  - small scale <1MW
  - medium scale 1-20 MW
  - large scale >20 MW
- Dwellings heated by biomass
  - individual domestic heating (logwood, woodchip, pellet systems)
  - central heating units
  - district heating plants
- Biogas installations
  - large centralised plants
  - farm scale plants
- Biofuels

Type of Community

Considering that, in addition to the key sectors, a stated goal of the CTO as presented in the White Paper was the identification of "100 communities" aiming at 100% of RES supply, this criterion was introduced to include those initiatives representative of the different categories into which the "100 communities" are subdivided:

Urban communities: they include projects and programmes of interest already developed: blocks of buildings, neighbourhoods in residential areas, villages, towns, large cities.

Rural communities: programmes developed in small rural areas, provinces, and regions.

Isolated communities: isolated areas, islands (small, medium, large), and autonomous areas, acting as laboratories for feasibility analysis and development of experiences aiming at 100% RES.

Dimension and Geographical coverage

The idea to reach the highest representativity of EU Member States was based not only on a criterion of proportional distribution, but it also complied with the need to show different realities of both market conditions and potential resources within the European Union. Furthermore, a number of initiatives were chosen from Central and Eastern European Countries.Territorial dimension was also taken into account in the selection process, through including reference actions at national, regional, and local levels. The most appropriate territory for each segment was also identified.

Type of Partnership and actors involved

This criterion of selection aimed to guarantee a wide representation of initiatives, according with the type of partnership and the variety of different actors capable to take part in each process: industry (including utilities and energy service providers, oil companies and manufacturers), RES developers, national and regional governments, local authorities, energy agencies, authorities in charge of public procurement, consultants, engineers, architects, planners, farmer associations and co-operatives, associations and agents of relevant sectors (industry, tourism, services), non-governmental associations, financial institutions...

Other initiatives were selected because of the specific interest they have with regard to the creation of new partnerships in favour of RES, such as those in the tourism sector or the emerging water-energy binomial.

Actions and actors involved in RES promotion have been taken into account as an independent segment.

Criteria concerning content

With regard to the contents of each programme, project and initiative, the following quantitative and qualitative aspects have been considered as selective criteria:

- Substantial RES development: The initiative contributed significantly to RES development and/or has given a positive impetus in the respective area.
- Energy and environmental impacts: Obtention of environmental benefits or correction of impacts, including best practices of integration.
- Replication potential: The initiative can be relatively easily replicated, especially those bringing new solutions for sectors with great potential. The approach can be adapted to different contexts; the initiative is of model character and can serve as an example for other actors who are potentially interested to take action in the field of RES in general or a specific technology in particular.
- Strong involvement of target group or direct impact on society: The people concerned by the initiative are involved in the project. The degree of implication is evaluated.
- Visibility of approach: The initiative is presented in a highly visible way and it is well documented, so that it is possible for other interested parties to obtain information and have access to its follow-up.
- Innovative financing concept: The financing aspect of the initiative is clear and innovative.
- Barriers: Development of projects giving important information on existing barriers and their possible overcoming.

Selection and evaluation

More than 300 cases throughout Europe have been analysed in the first phase of the selection process. Those initiatives illustrate most relevant actions (projects, programmes and initiatives) with high replication potential and measurable results, taken at the different levels, that contribute to speed up RES market penetration in Europe. Through a matrix appli-

cation of the evaluation criteria, a representative sample of cases has been selected.

Final selection

The same methodology was applied for the final selection of initiatives which are documented in the final chapter of this guide. In this second stage, some more exhaustive information was obtained through in-depth interviews with the initiators of the respective projects. Box 2 contains an overview of the main topics covered by the questionnaire , which contributed to confirm and complete the information of the projects. It has to be considered that a few relevant and high quality initiatives have not been included, because an important criterion in the selection process was the high "replication" potential, among which only initiatives with a high degree of "will" to share their experience for replication in other European countries and regions were taken into account.

The last chapter of the guide contains a synopsis of each selected initiative, including the presentation of the main motivations, the enabling factors and the challenges faced during the implementation of the project.

The matrix (Box 1) shows the final selection of initiatives, giving an overview of the different sectors and areas where they have been developed.

Box 1

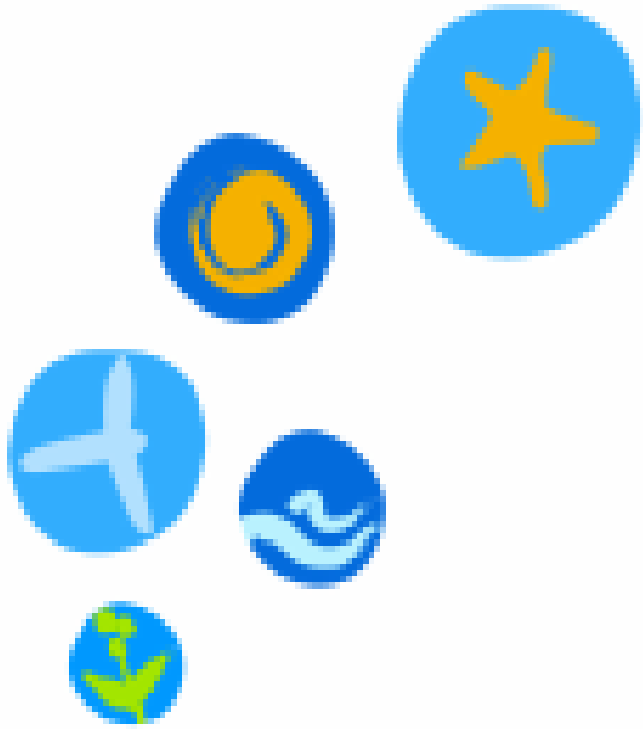
			Solar Thermal	Wind	RES	PV	Biomass	Region	Local level	City	Rural	Nationallevel	Industry	Island	Promotion
1	Upper Austria: a model for a RE region	Austria			■				○						●
2	Fischer: biomass powered factory	Austria						■					●		
3	Eeklo sustainable energy project	Belgium			■					○					
4	Soltherm Walloon action plan	Belgium				■			○						
5	Lüchow-Dannenberg	Germany			■							●			
6	Kronsberg, an innovative building area	Germany			■						○				
7	Paul-Löbe-Haus - Berlin	Germany					■				○				●
8	Lübow–Krassow: 100% RES region	Germany			■				○						
9	Hotel Victoria - Freiburg	Germany			■								●		
10	Munich RES & RUE alliance	Germany			■						○				
11	Pellworm 100% RES	Germany			■									●	
12	Ærø: a renewable energy island	Denmark			■									●	
13	Ålborg: clean city - green city	Denmark			■						○				●
14	Samsø: Danish renewable energy island	Denmark			■									●	
18	ADEME Sustainable Energy Project	France			■							●			●
19	Pietarsaari: biofuel CHP plant	Finland					■			○					
20	Crete: RES large scale implementation	Greece			■									●	
21	Varese Ligure 100% RES	Italy			■							●			
22	Chieti: RES and Agenda 21	Italy			■				○						
23	Italian sustainable islands programme	Italy			■									●	
24	Heinerscheid wind farm	Luxembourg		■						○					
25	Delft 100 Blue Roofs project	Netherlands					■				○				●
26	Soltherm Europe initiative	Netherlands				■									●
27	Madeira Green Hotel. 100% RES	Portugal			■									●	
28	Alqueva multipurpose project	Portugal			■				○				●		
29	Gotland renewable energy island	Sweden			■									●	
30	Växjö fossil fuel free	Sweden				■		■			○				
31	Barcelona renewable 2004	Spain			■						○				
32	Navarre Renewable Energy Plan	Spain			■				○						
33	Molins de Campos (Majorca)	Spain		■										●	
34	Tenerife-ITER. RES and bioclimatics	Spain			■									●	●
35	El Hierro 100% RES	Spain			■									●	
36	Biosphere Hotels	Spain				■							●		●
37	Lausanne Solar City	Switzerland					■				○				
38	Powys RE Development Plan	United K.			■					○					
39	Isle of Wight	United K.			■									●	
40	Warmia–Mazury. Biomass for energy	Poland						■	○						
41	Poland - From coal to biomass	Poland						■	○						
42	Slovenia. Increasing the use of biomass	Slovenia						■				●			
43	Ingalina-Didziasalis: biofuel heating	Lithuania						■			○				
44	Trhove Sviny biomass heating system	Czech Rep						■			○				
45	Bulgaria–National Programme on RES (NPRES)	Bulgaria			■							●			

Box 2

It was the objective of the in-depth interview carried out to understand the underlying motivations and driving forces to initiate and implement the RES actions. The set of questions covered the following topics:

- Direct energy, environmental, economic and social objectives of initiative
- Motivations to launch the initiative
- Difficulties encountered
- Facilitating elements
- Impact on public opinion
- Involvement of key-target groups in the starting and implementation process
- Lessons learnt
- Replication potentials and achievements
- Perception of the RES situation

The outcome of this analysis is documented in a one-page description for each case study and is supposed to spread information about the crucial elements for success of RES projects and to encourage replication of RES project implementation.



Achievements and Lessons drawn from the CTO

Experience accumulated during the Campaign has to be analysed under two criteria. Firstly by comparing results with the objectives outlined, in particular those regarding RES coverage, RES market development and technological capability, without forgetting aspects related with innovation in all its dimensions, a constant feature of CTO. Secondly, CTO allowed exploring new dimensions in the framework of an integrated view for the development of renewables in Europe. Therefore, lessons that can be extracted also involve other dimensions dealing with the role and promotion of renewables, with regard to their social, economic, and environmental sides.

The analysis of the initiatives demonstrated in general that the local communities benefit from promoting and developing the market penetration of RES. Several Community priorities and concerns such as environment, job creation, local and regional development for a strong economic and social cohesion have been positively influenced by it. As well, the main energy policy issues such as the security of supply, the improvement of the energy balance and the reduction of energy dependency, the environmental implications of energy production and use and competitiveness have benefited from the uptake of RES.

Starting from an in-depth analysis, main successes and barriers in relation with CTO objectives are shown, grouped into lines of action and most important factors, and glossing these conclusions with the relevant references of the cases selected.

Objectives in key sectors

As we could observe in the chapter addressing market analysis for each of the three renewable energy sectors, the degree of accomplishment of the initiative's objectives has been variable in each of these areas, with outstanding results recorded in most of the initiatives, including wind energy, and several spectacular actions in the implementation of solar thermal in some geographic regions that exceeded the initial objectives.

With regard to the objectives outlined in each initiative, we can conclude that the most decisive factors for success have been:

- Project supported through a solid technological proposal and with a good feasibility analysis.
- High degree of cooperation and integration of the several actors involved in each initiative.
- High public acceptation of the initiatives.

On the contrary some problems have been detected in those initiatives depending on unfavourable factors such as:

- Starting from little realistic or unachievable objectives.
- Conflicts in the implementation of unripe technological solutions.
- Existence of adverse market conditions or scarce confidence in investments.
- Low technical skill.
- Loss of the political support guaranteed at the starting moment.
- Economic changes or crisis at local or regional level.

Among the examples that show the influence of these factors in relation with the objectives outlined in each initiative, we can mention the following ones.

In the Upper Austria case, the proactive attitude of the regional government, together with the confidence obtained in previous phases, allowed to develop the ambitious Energy 21 strategy, which set the target of reaching 1,000,000 m² of solar thermal collectors by 2010 - equalling nearly 1 m² per inhabitant. Of this objective, it has been achieved 0.47 m²/1000 until this moment, which is a good indicator of success. However, in the case of the Walloon Region (Belgium) setting an objective of 200,000 m² of solar thermal collectors installed by 2010, those targets were quickly considered not to be realistic. Experience showed how important it is to concretise the objectives, differentiating long-term strategies from immediate phases. This is the case of a few large-scale initiatives, where an ambitious strategy aiming at 100% RES was designed, but without differentiating explicitly the phases to follow, which could bring to a loss of confidence.

Main motivations to launch the initiatives

Among the main motivations that contributed to launching CTO initiatives, the following need to be emphasised:

- Relying to main actors' good knowledge basis of the capacity to exploit the existing RES potential.
- The determining role of Sustainable Development Plans in several initiatives with a special emphasis on Agenda 21 development.
- Existence of clear political commitment, an action plan which comprises a mix of measures targeting at different market actors.
- Establishment of new environmental objectives by the different activity sectors, especially industry and building: fuel replacement and reduction of emissions.
- Clear will to generate new local jobs.
- Marketing qualification and improvement of some activity sectors in the framework of clean production. This would also be the case of tourist sector.
- Existence of local environmental conscience and reaction of population and social collectives against high-impact conventional energy sources.
- A view of RES as new vector for economic diversification, especially for rural areas.
- A need for productive reconversion of some areas.
- Contribute to meeting the EU´s Kyoto targets for CO_2 emission reduction.
- Determination of objectives in energy policies at national or regional level.
- Creation of new market niches, e.g. production of electricity or heat starting from RES at competitive prices.
- To reduce dependency on energy imports

Exploitation of RES potential in competitive conditions has been a determining factor in initiatives with high public participation such as those of Eeklo or Heinerscheid, basically oriented to a common exploitation of wind resources, or in those where,

such as in the Region of Warmia, wood fuels represent a very important potential.

Solid political decisions have in a few occasions been the catalyst for ambitious projects such as the "Fossil Fuel Free" of Växjö, where the municipality unanimously decided to stop using fossil fuels. A similar case was the Ingalina initiative (Sweden), where the regional administration set the objective to reduce the use of heavy fuel oil (mazout) and to start to use local fuel as biomass. Political will is also expressed through exemplary behaviours that can be used as a reference, such as the Paul Löbe Haus, which can be considered as an example of coherence in public action criteria regarding building, supporting the principle of preaching through examples. Processes of sustainable urban renovation supported by the administration are a different side of this dimension, as it is demonstrated by the Barcelona 2004 project.

Environmental motivation is clearly identified in cases such as the Munich initiative, where the RE Partnership created involves the members of the already existing "Munich Ecology Alliance", which included craftsmen' organisations, industry, NGOs, banks, administrative authorities, as well as the municipal utility company and the Munich Energy Agency. One of the key factors in Austria and Germany is also the opposition to nuclear power rising in the 80s from a majority of citizens, which helped to a large extent to prepare the ground of action for a local RES initiative. At Lüchow we see how the initiative arises from a growing debate concerning the possible building of a final disposal of nuclear waste in a small village of the district.

The framework created through sustainable development plans and putting into practice local Agendas 21 have been other important vectors towards new initiatives within CTO, as well as important vehicles for RES development in Europe. It is worth mentioning here the case of Ålborg, based on promoting environmental awareness since the initiative "Clean City - Green City", the energy dimension of Isle of Wight's Agenda 21, the long-term plan for energy sustainability on Götland, the Agenda 21 of Chieti, or the El Hierro 100% RES initiative, which based its programme on the planning strategy arisen from its declaration as a UNESCO Biosphere Reserve. These motivations are complementary to the initiatives seeking to redirect development models in crisis, such as the successful case of Varese Ligure with its Sustainable Project.

Availability of technical reconversion or technological opportunities also played an important role. Several cases benefited from the fact that the traditional heating systems were coming to the end of their life, and that it was therefore the right time to make a decision on the new heating system and to propose a more environmental energy system at the same time. This is for instance the example of the industry Fischer who needed to replace its 30 year-old system of a steam boiler in conjunction with a back-up boiler, fired by heavy heating oil to supply the heat demands.

Most initiatives included the creation of new jobs as an initial factor of motivation. The experience in several areas showed that this was right. For example, the German district of Lüchow-Dannenberg with its high unemployment rate and facing the difficult situation of educated people leaving the district chose to re-activate the formerly successful agriculture and forestry sectors, mainly by promoting biomass, using among others a clever system of a central biogas installation to provide electricity to 5000 households using waste products coming from the starch factors and from the nearby farmers. The example of Ærø shows another interesting motivation based on the idea of creating a stabilised niche of green jobs.

Market reasons, such as production of electricity at a competitive price, have been determining factors in cases such as the development of the Biofuel CHP plant at Pietarsaari, and in special circumstances such as is-

lands or regions isolated from the grid, where RES turn to be the best solution because of its nature.
With regard to the establishment of RES programmes with precise objectives, we need to mention the case of the State-Region contracts (CPER) to promote RE and EE measures in the French overseas departments. The Navarra Energy Plan is also an excellent example of sustainable energy policy with a regional scope, where very ambitious objectives have been achieved in each phase. In a first stage, in the year 2000, the 40% of the region's electricity needs was covered by wind energy – nearly doubling the original target. In 2002, installed renewable energy capacity produced 55% of the electricity consumed. This boost was achieved by the clear objectives of the regional Energy Plan, broad social acceptance of wind energy facilities, and private promoters. The Navarra Energy Plan Targets for 2005 foresees yet again a doubling of RES electricity capacity, including the doubling of wind installed capacity and expansion in solar photovoltaic and solar thermal generation – aiming towards a 97% green electricity coverage by 2005.

Innovative aspects

Aspects regarding innovation in all its dimensions, both technological and not, have decisively marked the contents of the Campaign with very creative and viable solutions.
With regard to financing, appearance or generalisation of new concepts and solutions stand out, such as:

- Development of new public private partnerships schemes with a high social participation for RES exploitation.
- Appearance of very imaginative and effective communitarian financing systems.
- Generalisation of tools such as Guaranteed Solar Results (GSR) and Third Party Financing.
- Reorienting exceptional tax instruments towards RES sector.

Other factors to be emphasised are:

- Opening energy-related decision-making to citizen's consultation.
- Technological innovation in the implementation of RET in new activity sectors, beside energy.
- Innovating commitment of the industrial sector to develop specific solutions.
- Generalisation of quality and environmental standards as a vector of innovation.
- Development of multi-functional and integrated solutions.

In a state of technological maturity, financing aspects and organisation of viable partnerships generally require the highest doses of innovation in the field of renewables. Importantly enough is the investment decisions that depend both on the level of financial support and on the stability of promotion schemes, since investors require a return on their investment with an acceptable level of risk. This implies that support mechanisms should not be changed too frequently, and that they should be underwritten for an adequate period of time to secure the expected returns on investment, in order to encourage new investments in renewable electricity generation.

The Soltherm-Europe initiative is an excellent case of innovation with regard to the generalisation of viable financing and partnership solutions, having made use of private-public pooling, solar contracting, Guaranteed Solar Results (GSR), and Third Party Financing.

Independently from the support systems chosen at national level, public private partnerships are an effective means of bundling among other financial resources. There is also the possibility to involve the local community in a private-public pooling, by offering shares with high enough dividends, offering direct economic benefits and give the feeling to the community that it owns at least a part of the RES installation. One of the most successful cases is probably the one of the municipality of Eeklo. Situated in the Flemish region of Belgium, this municipality offered the possibility to deliver direct benefits to the residents through selling them shares at 250 Euro each and with 6% dividends. The other successful example is the one of the rural area of Powys who sold shares from the community wind turbine. This served not only to generate income but also to raise local confidence in the turbines through participation.

On the same line we can mention community's participation in the Heinerscheid Wind Farm. The interested parties founded the Wandpark Gemeng Hengsicht S.A. with a capital of 3,200,000 Euro, divided into 12,800 shares at 250 Euro each. The local council is the legal holder of 22.5% of the shares and aims to sell 20% to the local community. This keeps the community involved with and concerned for the success of the wind farm.

Likewise, in Slovenia a private-public pooling enabled to involve local community directly into several biomass-based district-heating systems, largely sponsored by UNDP and GEF. At the same time a Biomass Energy Fund was set up to distribute project funds to those applying through calls for tender. On Æro, the wind turbines and some of the district heating projects are funded by the sale of shares directly to the island residents. The same philosophy reigns in the El Hierro 100% RES project.

A supportive programme of guaranteed quality standards and certification showed to be a successful innovation in two cases in particular: ADEME developed in the framework agreement (2000-2006) with the 26 regions of France annexed to the State-Region contracts (CPER) a programme of support of RE technologies and EE measures. In order to allow a long-term sustainable market development, it was important to demonstrate that the programme offered guarantees thorough quality standards and certification, thus enabling the partnerships through the CPER contracts to have the RE sectors structures, organised and certified.

On its side, the Walloon Regional Government of Belgium developed a voluntary "Soltherm" agreement (among what a "Soltherm" qualification system for SMEs to develop their know-how) for producers and installers to ensure quality, as a means to prepare supply and demand to match and choose solar thermal for the water systems.

Especially in the industry, implementation of environmental measures can be very challenging and brings many benefits in return. This can be economically more profitable in some cases, and at the same time offers the opportunity to make the company known. A well-known case is the Fischer factory (world leader in ski and aeroplane components) who became the first factory worldwide to have been able to cover its heat and cooling needs with a tri-generation biomass plant. This has been enabled by an "energy contracting" arrangement concluded between the operator of the biomass plant and the ski producer.

In the building sector we find very innovative aspects in some initiatives such as the Paul-Löbe Haus that demonstrated the importance of considering the multi-functionality of PV systems. In this sector the exemplary experience of Kronsberg, an innovative building area, stands out for the concerting system developed. The concerted approach in this case took place among the Council, the environmental and consumers groups, as well as with investors, architects and housing companies, resulting in the design of an energetically sustainable city with parameters comparable to standard market costs.

Implementation of energy solutions based on renewables started to be turned into a factor of innovation for competitivity in emerging sectors with high potential such as tourism. The Biosphere Hotels experience, redrew hotel certification systems and quality standards including renewables as a compulsory requisite, combining therefore accommodation quality with RES. At a local level, we find the Green Hotels experience of Madeira, where a new tourist concept including renewables as a fundamental aspect of marketing and accommodation quality is promoted. A similar single case is the Hotel Victoria in Freiburg, which differentiates the RES dimension in its offer, an impor-

tant factor that contributed to its international recognition through the achievement of several international awards.

Within the innovation framework, the campaign brought new and imaginative alliances in the support of renewables. This is the case of the "Molinos de Campos" project on the island of Majorca, which aims to recover more than one hundred old windmills, developing an advanced technological project for its reconversion in wind farm connected to the grid. This solution will generate a triple effect: heritage and traditional landscape recovery, development of a new tourist product and energy valorisation of windmills.

Finally, one of the most outstanding effects arisen under the Campaign is the development of 100% RES initiatives, which have been basically carried out on islands, such as Götland, Samsø, Ærø, Pellworm, and El Hierro. This last case is a really isolated island, non-connected to the grid, where an ambitious project based in the combination of wind energy and a hydropower solution for storing and generation. It is a project that includes in its conception a new, future dimension of the renewables in Europe: water production through RES-powered desalination.

CTO's innovating experience is then advancing towards a new dimension, situated beyond the conception of the traditional energy market, and made concrete through the contribution of RET solutions as factor of competitivity in multiple activities and as quality indicator in important sectors such as industry or in the conception of the urban habitat.

Enabling factors

The most frequent factors that allowed the development of RES objectives in local communities have been:

- Support of national, regional, or local authorities to initiatives included in the Campaign.
- Creating «demand» for sustainable energy products and services: energy information and awareness raising, energy advice.
- Identification and awareness creation of availability and exploitation capability of local resources.
- Promotion of measures regarding the supply side: training & education, R&D, quality control.
- Support by local and regional institutions for the development of pilot initiatives.
- Market liberalization, e.g. facilitating the direct sale of electricity to private consumers.
- Public awareness support by international initiatives such as Climate Alliance or Sustainable Cities, including recognitions by International organisations.
- Technical support was provided by the Energy Agencies.
- Support to the development of feasibility studies by local authorities. Demonstration of good examples to promote market access.
- Readily accessible procedures to support decision-making (from pre-diagnosis to guidance, from diagnosis to preliminary study or project).
- People's commitment at all levels.
- Existence of favourable legislation, including tax measures.

Several enabling factors to be considered are referenced within the "White Paper for a Community Strategy and Action Plan", which includes a guide for any local initiative in its first steps of implementation. Furthermore, many analysed projects befitted from a financial contribution through the ALTENER programme of the European Commission, as well as through similar projects such as SAVE and THERMIE, which played an essential role in the starting of several CTO initiatives. Together with the mentioned communitarian programmes, complementary support by national governments and local authorities have been essential factors at the time to guarantee the final result of the initiative, as it was clearly shown in far-reaching cases such as the initiative of Varese Ligure.

In several cases the patronage coming from an energy agency or organization enables to have advisory capacity in the implementation phase of a project. This was the case for the Isle of Wight (UK) who benefits from the advisory support of the Götland Energy Agency of Sweden for instance in the implementation of its target to reach 67 MW from renewables by 2010. Or also the two Lithuanian towns Ignalina and Didziasalis that were able to install a biofuel boiler and district heating thanks to the support of the Swedish National Energy Administration (STEM) who was implementing the Swedish International Climate-Related Energy Program.

Existence of legislation favourable to RES, including tax measures, clearly demonstrated their efficacy and capability to create a critical market mass in some European countries (e.g. Renewable Energies Act by the German Government). Nevertheless, experience accumulated during the CTO allowed discovering that some legislative initiatives at local and regional level can play an equally useful role. This would be the case of the Barcelona Renewable 2004 initiative. Since July 2000, the Barcelona City Council has implemented a law concerning the use of solar energy. According to this «solar by law», all new buildings as well as those subject to

general refurbishment, are obliged to use solar energy for 60% of their sanitary hot water supplies. The Universal Forum of Cultures Barcelona 2004 has been used as international showcase of this initiative, and the Forum site has been designed complying with this law on energy sustainability. A similar operation of support has been carried out in Kronsberg, on the occasion of the World Exposition, which meant a large scale launching of the project. Another example of favourable proactive legislation that should serve as an example to other regional governments is found in Flanders, where transportation of Green Electricity over the low-voltage distribution net is free of charge.

In some cases, a technical constraint on the traditional energy system used can play in favour of RES. For example, in Germany, solar thermal was introduced in the context where water systems were coming to the end of their life, and therefore needed to be replaced or drastically revised. This created a niche for solar thermal water systems with a peak at this precise moment of sudden high need.

Technical support provided by the Energy Agencies, showed to be a determining factor for the success of experiences such as the project of energy source diversification carried out by the Provincial Agency of Chieti. This way allowed demonstrating that it is more interesting sometimes to rely on the support of local agencies than on a direct contribution to projects, such as on Götland and Pellworm, or in the case of Austria, where more than 15,000 energy advice sessions are carried out annually.

Beside technical assistance, a major factor of success has been the promotion of actions based on citizens' participation within the project development process. In the Samsø projects, importance is placed on people's commitment at all levels, especially politically, technically, and financially. Bodies responsible of the initiative, Foreningen Samsø Energi-og Miljøkontor and Samsø Energiselskabet, which were established to promote participation of residents, play an important role in this process. For example, Samsø Energiselskabet consists of representatives of Samsø municipality, the Commercial Council, the Farmer's Association, and Foreningen Samsø Energiog Miljøkontor, and its secretariat widely provides general information. Residents take both benefit from and responsibility for projects by participating them.

Public awareness support, starting often from transnational initiatives, has been an essential enabling factor in experiences such as the one of

Lüchow, the RES & RUE Alliance in the city of Munich, or the Solar City initiative in Lausanne.

In some rural areas of Europe, the economic situation is under stress: educated people leave the countryside to find more attractive jobs in bigger urban centres. The farming and forestry sectors suffer from the hard economic conditions. It can be very opportune to look to develop RES locally available, and make the region less dependent on energy imports, reactivated the local economy and favourable impacts on the job situation. Such a case is Lüchow-Dannenberg, where an "energy and climate protection" discussion group proposed to use the wind and biomass locally available. Especially use of biomass helped the forestry and the farming sectors a lot.

Challenges

The most relevant challenges detected can be grouped in the following categories:

- Economic barriers.
- Technical barriers
- Lack of public awareness.
- Reticence by citizens' movements and local authorities to some RET's environmental and landscape impacts, such as wind energy.
- Complicated planning procedures.
- Complex or misdirected subsidy policies.
- Actual economic problems and the resulting tax policy.

One of the main obstacles to the uptake of RES is definitely the economic cost. It is clear that the increases in production capacities lead to significant reductions of costs. However this takes a long time and does not solve the immediate problem of having RES still being in average a more expensive source of energy than conventional energy. The section "innovative aspects" mentioned above gives an overview of some tools used for the financing of the initiatives. Below is an attempt to remind the different levels of programme and legislation support existing (European, international, regional), and the section also stresses a few important criteria

Already well-established sources of financing to overcome the economic barrier are the Member States' support schemes, the possibility to make use of European aid (such as benefiting from the financial support coming from the ALTENER and SAVE programmes as well as the Intelligent Energy for Europe Programme (2003-2006), also from international aid (such as from the World Bank/GEF programme, Development banks, non-governmental organizations, etc..), and lastly from other types of public funding such as regional funds.

Several of the initiatives presented in this project indirectly benefited from European financial support programme in the past, mainly under ALTENER II. The Intelligent Energy Programme for Europe (2003-2006) will take over for the next years.

As for World Bank/GEF funds, in Poland, a joint implementation initiative aligned on the Kyoto instruments to reduce greenhouse gases led to the replacement of two old coal-burning tanks with a wood fired heating system.
Economic challenge can otherwise be overcome if local energy communities take clear long-term commitment to massively develop RES (often up to 100%): if investors are well informed of this plan and of the solid measures accompanying such an objective, securing returns on investment, they feel encouraged to invest in RES.
This is a particularly interesting option for isolated areas, such as islands or remote rural areas, which need otherwise to import conventional energy at a higher cost than average cost in the rest of the regions.
The ways to overcome those barriers at local and regional level can be to offer *tax relief schemes*. However this solution has proven to be successful for investments by householders in small scale renewable electricity generators, but do discourage investments by developers who do not become the final owners of the renewable electricity generators, and therefore cannot claim the tax relief at the time of their investment.
In the sector of biofuel transport, the Directive on biofuels recently adopted gives the possibility to apply fiscal advantages for encouraging the use of renewable energy and improving energy efficiency in their countries, therefore this should enable to integrate RES in the transport sector too, a sector often still neglected.
A number of financial incentive schemes are beginning to emerge at a national or regional level in the EU in the heating and cooling sector. At local level new approaches are being developed, such as the solar ordinances which have been approved by numerous Spanish municipalities, and these could for example be used as a model to be followed in other countries.

Beside the above considerations, other major barriers in developing RES-electricity in Europe are:

Administrative procedures for planning and building approvals:
A long and complicated administration procedure can impede a project developer to start the implementation administrative body. Sometimes, the waiting period can be several years. A way to overcome this barrier is to clarify the responsibilities of the different authorities in charge to give their opinion during a RES licensing process, or also to put the custom through that "no response" received within a time frame is considered to be a positive answer. The legislation framework needs to be adapted accordingly to issue guarantees of origin, to ensure transparency of grid connection costs, and to facilitate access to electricity grids at each of the required voltage levels

Technical Barriers – Grid Issue:
In some cases grid access was difficult to achieve. However, the Directive on the promotion of electricity produced from renewable energy sources in the internal electricity market has ruled out the path to follow to accomplish the full integration of renewable energy in the existing grid system in Europe. The Directive requires member states to take the necessary measures to grant guaranteed access to the transmission and distribution of electricity from renewable energy sources. Where appropriate, member states have to give priority access to renewable energy sources. Furthermore European-wide, network operators will be obliged to set up transparent cost calculations for distribution. The fees have to be non-discriminatory.

Political challenges:
The initial monopoly is still important in some countries, despite the statements that the liberalization process of the electricity market is on-going. In Varese Ligure, for instance, it was difficult to install the wind turbines because of the need to find agreement with the national utility. Another element playing a key role in a few countries is the strong anti-RES lobby such as coming from the nuclear and other conventional energy fuels. There is no need to say that the political will depends if the local population is sufficiently motivated to push forward renewable energy projects.

Lack of public awareness:
All projects demonstrated that the local level is the driving force, the

place where the actual realization of the project occurs. For this, the ground needs to be prepared by creating a positive perception of RES and of a particular project, while addressing the underlying motivations of the action such as protection of the environment, security of supply and mostly also the positive impact on employment for the region.

To achieve the broadest spread of awareness, all groups or individuals, who might have an impact on renewable energy projects currently or in the future, should be targeted through a variety of awareness strategies. Some of the most often used actions are as follows:

- The future generation - the *school children* - should be at the centre of awareness building activities.
- The *local press* should be involved at an early stage. In general local press relies on information from their surroundings. Therefore a standard press release including information about the CTO and its underlying motivations could be drafted and distributed by the local project partner. The project partner should add project specific information.
- The local players responsible for the project realization should inform *the local politicians* as well as the *national and European politicians* of their constituency of the project in order to build the bridge from the local level to the national and European level in the political sector and to further generate interest in renewable energy sources.

Furthermore, other local players such as Municipalities, NGO's, political parties, and citizens should be addressed to ensure a maximum of agreement and awareness building.

Replication potential

Replication is an essential facilitating mechanism to spread the positive information about local RES projects, contributing to raise awareness. One of the biggest contributions of CTO to the promotion of renewables in Europe has precisely been the huge potential of replication of the initiatives and projects launched, as well as the development of appropriate instruments to guarantee dissemination through specialised networks or centres. At this level, CTO has been one of the best showcases to promote this dimension.

With regard to replication, the most showy and effective cases have been those involving islands, where it was clearly shown that islands such as Samsø, Pellworm or Götland, which developed a considerable activity in their environment, in parallel to the development of each initiative, leading to an extensive reply through replication with similar projects. Their effect was so important that it went beyond the European borders. The projects of Samsø and Götland have been looked up by and replicated in very far regions such as Japan, Australia, and Pacific Ocean islands. A similar effect was produced by the El Hierro 100% RES initiative, whose wind-hydropower project has already started being replicated on Crete and Madeira.

Some indicators of the important replication potential of CTO initiatives

can be shortly seen in the following cases:

- EEKLO project is a replication of many others of its kind in Germany and Denmark.
- Many municipalities, including Copenhagen, have taken up the Ålborg model.
- The responsible hotels network (BH) considerably enlarged its field of action in only two years, also relying on the support of the campaign "A New Sun for Tourist Destinations" carried out by ICAEN.
- Extension of the experience of Varese Ligure to seven more municipalities.
- Heinerscheid initiative generated a large process of consultations by other municipalities, and a similar project is being carried out near Kehmen.
- Delft's 100 Blue Roofs experience had quick and important repercussions on cities such as Rotterdam and The Hague.
- After the Växjö Fossil Fuel Free declaration, the initiative was followed by several cities, in Sweden and in the rest of Europe, and the experience is now being implemented by the Iwate Prefecture (Japan).
- Inspired by the example of the PV stadium of Lausanne, another PV stadium was inaugurated in 2002 in Basel.
- In the case of Trhove Sviny, the model project helped to start similar projects in Czech republic and was replicated in many towns and villages.
- The experience of Kronsberg is not only a basic reference for Germany and other countries, but it is at present an actual standard in the innovation of building areas.
- The case of Austria (cf. Gleisdorf case study) shows that it is equally important to set up networks inside of a region by motivating key political actors of communities to set up a discussion group and bring local population together to commonly find solutions to install RE systems in their municipality.

The function of replication of successful CTO initiatives is strengthened through the activities of specialised centres and the work of networks. ITER is an excellent examples of the first case, as well as the Soltherm initiative that has also developed reference databases on replicable projects.

European networks such as enabled through the CTO Renewable Energy Partners network, or also other networks specialised in one type of community or technology for instance (ex: Energie-Cités, a European network of sustainable cities; or FEDARENE, a European network of regional energy and environment agencies; or also INSULA, the International Scientific Council for Island Development) has proven to play a crucial role in accelerating the demonstration of successful RES community examples. It is more and more crucial to create bridges with the newly acceded countries that look for advice and patronage in the implementation of their own projects.

Regional and national energy agencies represent another vector of replication. They offer consultancy advise to the local population to ensure local results. They can also play a coordinator role to implement RES in all regions of a country. ADEME has been able to use the contractual framework offered by the 26 regions of France annexed to the State-Region contracts (CPER) to implement its actions at local levels, while spreading the successful experiences to the rest of the regions of France more efficiently and at a lower cost.

With the ManagEnergy program the European Commission created a European wide network and thus, exchange of information. ManagEnergy promotes co-operation between local and regional energy agencies through workshops, study tours and online events on energy saving and renewable energy. The website features details of over 400 energy agencies and another 500 organisations, who can provide valuable expertise and advice on established energy projects and technologies.

CONCLUSIONS OF THE EUROPEAN CONFERENCE "RENEWABLES 2004" - BERLIN

Sharing Skills and Achievements to foster Renewable Energy Development in Europe

The following text is the result of presentations and debates that took place during the Conference "Renewables 2004", within the specific session dedicated to the CTO.

The "European Conference for Renewable Energy – Intelligent Policy Options" is organised at the end of the Campaign for Take-Off, the ambitious public awareness campaign launched by the European Commission in 1999 to foster the development of renewable energy sources in Europe.

The Campaign for Take-Off sets quite ambitious targets for each of the renewable energy sectors to serve as benchmarks for decision makers and planners, to disseminate successful initiatives in Europe, to spread best-practice and raise critical awareness of decision makers at local, regional, national and European level.

The Campaign for Take-Off was a co-ordinated tool to implement recent EU legislation affecting renewable energy development, such as:

- White Paper "Energy For the Future: Renewable Sources of Energy"
- Green Paper: Towards a European strategy for the security of energy supply
- Directive on the Promotion of Electricity produced from Renewable Energy Sources
- Directive on the energy performance of buildings
- Directive for the Promotion of biofuels' use for transport

It was designed to act as a catalyst for the development of promising key sectors in the field of renewable energy sources. At the end of the Campaign, it is evident that the set objectives were reached or even surpassed in some sectors (wind, PV), whereas others are still lagging behind (solar thermal, biomass). Wind, for example, reached the CTO target of "10,000 MW" already in 2000.

In the context of the Campaign for Take-Off, the activities to be implemented in these key sectors were, since the beginning, classified according to: regional level, local, city, isolated or rural areas, national, industry and island as well as "100 community" types in three levels - rural, island and city.

125 renewable energy programmes and projects involving more than 700 partner organisations in the European Union and in Accession Countries have joined the Campaign for Take-Off as Renewable Energy Partners in 2000–2003 and thereby expressed openly their willingness to contribute to its objectives. These lighthouse initiatives serve as credible pacemakers showing to other communities the right way towards a sustainable energy future.

Accordingly, the CTO Session at the Berlin conference was structured as follows:

Panel 1a: Experience in the utilisation of Renewable Energy Sources in cities – How feasible is it to develop Renewable Energy generation in an urban environment?

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?

Panel 1c: Paving the way towards 100 % Renewable Energy based communities & islands: utopia or ambitious reality?

In each of these panels, high-level panellists contributed with their experience and know-how to identify the key-elements for successful RES implementation in the respective areas. They discussed the motivations and difficulties encountered in the implementation of renewable energy projects as well as shared lessons learnt with the conference delegates.

The discussions clearly showed the importance of the regional and local level as due to their decentralised nature, many renewable energy technologies can be particularly well promoted on these levels.

Furthermore, it was well illustrated that in order to further promote renewable energy sources and demand-side management, integrated energy planning incorporating a mix of legal, regulatory, financial, communication and training measures is crucial.

Apart from environmental considerations, a decentralised sustainable energy policy can have major impacts on employment, social cohesion, participation of civil society and economic development.

In islands and remote rural communities, which are often confronted with high costs or a lack of conventional resources and the related environmental problems, 100 % RES solutions are being successfully developed to guarantee security of supply and contribute to the protection of the environment as well as economic welfare.

The analysed cases all demonstrate that integrated policies and concepts aiming at increasing the share of renewable energy sources in combination with a conscious application of leading energy efficiency measures in the various end-use sectors are the most successful. Recent European legislation in the energy field, such as the Directive on the Energy Performance of Buildings, pushes forward this integrated approach.

Any further action or campaign should therefore reflect this integrated approach and cover both the demand and supply side. The newly launched "Public Awareness Campaign for an Energy Sustainable Europe" will embrace both energy efficiency and renewable energies and will allow partners to join the common effort of implementing programmes and initiatives in Europe and beyond.

Planning ahead Public Awareness Campaign

Future challenges under the new Campaign for an Energy Sustainable Europe

Carrying further the lessons learnt from the Campaign for Take-Off (1999-2003)

Observing the reach and importance of the initiatives within the CTO, we can confirm that it has been a fundamental element of the strategy outlined in the White Paper on Renewable Energy Sources. It also played a major role in bringing the tools adopted at Community level to the local level, such as the Renewable electricity Directive, the biofuels Directive, or the more recent ones regarding energy performance buildings, energy services and co-generation. On the one hand the new Public Awareness Campaign to be launched in the frame of the newly multi-annual Community programme "Intelligent Energy for Europe" (2003-2006) will continue what has been developed under the first Campaign, that is to say raising the awareness of decision makers at local, regional, national and European level, spreading best-practice, ensuring a strong level of public support and stimulating the necessary trends towards an increase in private investment in renewables. On the other hand, the new Campaign also contains some additional elements: first of all, the 25 Member States as well as the candidate countries will be targeted to implement the Campaign. The new campaign extends its scope to cover the promotion of energy efficiency and enlarges its approach to embrace new promotion methods and effective communication tools.

The reasons for having a new Campaign after the first one ended in 2003 are even more important now, with the strengthened political framework that formally encompasses and more closely links renewable energies to rational use of energy. Both elements are equally important to the measures adopted during the last years in the fields of energy security, sustainable development and environmental objectives. However, in order to facilitate the successful implementation of the new Public Awareness Campaign, it is crucial to keep in mind some key aspects that were brought to our attention by the previous Campaign and things that need to be taken into account when preparing the next milestones for further penetration of both clean energy and increase in sustainable use of energy via the new Campaign.

Key political aspects as core conditions to the next Campaign

Fostering the uptake of renewable energies

The Campaign for Take-Off was designed to act as a catalyst for the development of promising key sectors in the field of renewable energy sources by setting objective targets for 2003. The Campaign is considered having been highly successful in providing clear benchmarks for progress and policies and for providing clear signals for decision makers at all levels to take up similarly ambitious targets. Set objectives were reached or even surpassed in some sectors (wind, PV), whereas others are still lagging behind (solar thermal, biomass). Wind is the most successful example, since it has already reached the CTO target of "10.000 MW" in 2000. Nevertheless, on the other extreme, we find an unequal development in sectors such as solar thermal where, for example, the huge differential existing between some countries and regions is not justified by market reasons or by exploitable potential. Acting upon the factors that lead to these gaps in the development of RES will be then a task of the new Campaign.

Energy Planning and targeting

Pioneer regions, cities, and municipalities in Europe owe their success in achieving a genuine change in their energy supply mix to reliable, coherent, and ambitious energy plans covering a coherent portfolio of the main parameters determining energy-related decision making. It was well illustrated that an integrated energy planning incorporating a mix of legal, regulatory, financial, communication, and training measures is crucial in order to further promote renewable energy sources and demand-side management. It was acknowledged that a European Campaign is an effective tool to raise awareness on these parameters, to showcase those pioneer programmes and initiatives and to stimulate replication. With regard to planning, some conventional views of the energy sector have hindered integration of energy sustainable solutions and maximum penetration of renewables, because of the lack of effective connections with the development of different sectoral policies.

Integrating policies and concepts for sustainability

A substantial increase in the use of renewable energies is essential to achieve sustainable development at local, national, European, and global levels. To increase the use of renewables forms part of the strategy of the European Union for sustainable development, climate change prevention, economic growth, and social cohesion.

On this line, it is already clear that energy dimension is the core of several fundamental options influencing sustainable development. As an example, relationship existing between RES and RUE and the introduction of coherent policies in key sectors of sustainable development, such as transport, building or water, is more and more evident.

Evaluation of the CTO projects demonstrates that integrated policies and concepts aiming at increasing the share of renewable energy sources in combination with a conscious application of leading energy efficiency measures in the various end-use sectors are highly successful. European legislation in the energy field, such as the Directive on the Energy Per-

formance of Buildings, or newly designed support areas, such as the 6th RTD Framework Programme's CONCERTO area and horizontal areas of the Intelligent Energy-Europe Programme, promote and support this integrated approach.
The CTO has also shown that it is necessary to integrate all dimensions of renewable energy development (social, political, environmental, educational, and sectoral dimensions) in the framework of the different sustainable development options, and not only the purely technological or market ones.

Developing the potential of renewable energy generation in urban environments

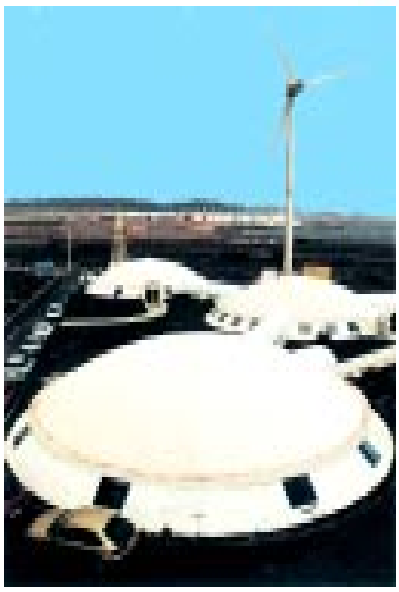
Urban areas represent the largest group of energy consumers in Europe. Several large urban areas across Europe have demonstrated an outstanding level of excellence with regard to the integration of sustainable energy concepts, including renewable energies. It has been shown that improving living conditions, as well as qualification and regeneration of declining areas, are objectives linked to RES implementation, for instance in the framework of the development of Local Agendas 21. The discussion agreed that planning sustainable energy strategies with a short- medium- and long-term perspective is an urgent priority for decision makers, in order to provide clear signals to the private sector and those facilitating investment. Integrated concepts covering all main commodities, public services and building standards, which include energy efficiency and renewable energy equipment, were presented and strongly recommended by the City Authorities. Progressively, a new integrated conception of habitat prevails, where renewables play a new, fundamental role, always within the framework of the basic objective aiming to increase the welfare of European citizens.

Improving the energy mix at local and regional level

The close involvement of citizens in energy decisions and the creation of extensive partnerships between the different actors involved were demonstrated to be favourable conditions for RES especially at a local level. The decentralised nature of RES has been a precondition of success, bringing RES closer to the private sector and to the citizens. Experience has shown that RES can be instrumental in revitalising rural and industrial areas by creating new local markets, expertise and employment. Local policy can have a considerable impact in reducing CO_2 emissions, if the objectives, the targets and the top down message are precisely formulated. The transfer of know-how between the regions, with specifically developed technology, will contribute to a balanced EU and Member States energy mix. The creation of Partnerships between the different actors and the European Commission has importantly contributed to stimulating the implementation of RES at local and regional levels. Outstanding examples of RES implementation in the regions needs now to become part of the "business as usual" activities across the EU, in an integrated concept aligned with measures towards a true intensification of energy efficiency.
The panels acknowledged the continued necessity to tackle sustainable energy concepts directly in reach of the local communities and to foster exchange and knowledge transfer throughout Europe in a pro-active way.

Paving the way towards 100% Renewable energy based communities

An increasing number of communities in Europe head for a 100% renewable energy basis. Islands and remote rural communities have demonstrated throughout the campaign that they can be considered as high interest laboratories for all types of renewables. In these communities the renewables option was favoured due to the difficulty to get at conventional resources and their high supply costs, compared to their RES potential. It is in these areas where 100% RES initiatives had stronger development and true repercussion, decisively contributing to guarantee security of supply and protection of the environment,



as well as economic welfare. One of the most relevant conclusions is that islands and isolated communities can and should turn themselves into exceptional showcases and demonstration centres of sustainable energy communities' viability. Main success factors reported were leadership and clear policy frameworks. In particular, for islands and remote rural communities, utilisation of renewable energy sources and investing in best available energy efficiency technology. Campaign's innovative features allowed the search of new market niches for RES development and contributed with an extensive ensemble of cases to the replication capacity of projects and initiatives, which has to be strengthened in the future. Today, the Campaign allows showing not only innovating solutions in the field of RES, but also their application to emerging sectors within industry, construction, transport, or other fields such as tourism, services, and water production. Likewise, its innovator spirit reached advanced and imaginative formulas of financing and management, which will help lifting still existing barriers to RES development. Future Community action is considered essential to fill gaps in level of awareness and to produce replication of best practices throughout Europe.

Committing key stakeholders to the European Renewable Energy Targets

One of the main vehicles of the CTO to attract the commitment of key mar-

ket stakeholders, planners, and decision makers at all levels in Europe, was the 'Renewable Energy Partnership' scheme. Member States, regions, cities, municipalities, industries and their associations were called upon to join the network by signing up to strong commitments and tangible targets. 130 renewable energy programmes and projects involving more than 700 partner organisations in the EU, in Accession Countries and beyond – have successfully joined the Campaign in 2000–2003. These lighthouse initiatives serve as credible pacemakers to other communities. They acknowledged the true benefit of forming part of a committed European network and the unique visibility of their initiatives to a large European public was facilitated by the Campaign Measures.

NOTE: Those key aspects have been summarised into the conclusions presented in a document available at EREC that came out at the end of the first day of the "European Conference for Renewable Energy – Intelligent Policy Options" (19-21 January 2004).

How to make sure awareness is raised through the next Campaign

Having taken into consideration the political recommendations above, some parameters closely linked to the "Awareness" approach are worth stressing in this part, as they will contribute largely to the effectiveness of the next Public Awareness European Campaign. Awareness will only lead to large-scale replication of local initiatives throughout Europe (and therefore bringing us closer to fulfilling the objectives set by Europe for 2010 and beyond) if it is accompanied by a strong communication and marketing approach that coordinates a large-scale network at European level, while taking into account the local specificities, and at the same time as strengthening an integrated approach of bringing together all actors essential to launch an initiative at local level.

The European level indeed plays a key role by acting as an umbrella, disseminator of the projects taking place at local level. By bundling them into a common program of visibility, it gives greater strength and cohesion to the local action and will bring benefits to the local community (for instance an increase in tourism to the region). Dissemination enables information to be more far reaching and, as it reaches other regions of Europe, to convince the local population and give useful advice when taking the first steps towards sustainable energy use and the implementation of sustainable use of energy programmes. Yet it is important to stress that cultural or political particularities at regional level can constrain the optimal propagation of the message. Therefore it is important to stress which factors of success in an initiative are universally applicable, and which ones are more specific to a certain social, political or economic context. Great skills and knowledge from the European social, political and economic environment, at its global level, but also at its more local level, are therefore an essential requirement to make sure that awareness dissemination is adapted to the local actors, the end-group targeted by this Awareness Campaign.

Another important aspect is to create and strengthen links with key local actors politicians or media personalities and work out a communication formula, which will successfully reach the local population and illustrate to them the importance of and the opportunity presented by their participatory role into this environmentally friendly process that encompasses an initiative at European level. The information should provide indications of both the time-framework of implementation and the approximate costs. In addition, as demonstrated by the cases evaluated in this impact assessment, it often plays a key role to encourage decisions to organize renewable energy and energy efficient actions if all local players (technicians, financiers, politicians, and the media) are sensitised to the energy issues and coordinate their action to spread a common message on possibilities to launch such projects.

Within this context, an important aspect of the forthcoming Campaign should be centred in making available at all levels those successful cases with more possibilities of replication. It should enable a large European showcase of energy sustainable initiatives and projects, making their viability and possibility of replication readily accessible. Likewise, the generation of this knowledge should reach not only the classic range of energy markets, but also the different sectors of activity, generating the appropriate interfaces, as we could learn from the CTO.

Elements of the New Campaign

Very ambitious targets having been set (12% renewables for 2010; 22% electricity generated from RE by 2010, a share of biofuels of 5,75% by the same year, and the rationalization and stabilization of the energy demand to achieve an indicative annual reduction in energy intensity by an additional 1% per year above the business as usual forecast) means that major supplementary promotional action is required at all levels – European, national, regional and local. The European Commission decided therefore to launch a wide promotional campaign on the theme 'Sustainable Energy'. This Public Awareness Campaign launched in the frame of the new multiannual Community programme "Intelligent Energy – Europe", 2003-2006 (EIE), shall cover the EU Member States, Accession countries, and Candidate countries and is intended to last for four years, building on experience gained with the EC Renewable Energy Campaign for Take-Off (1999-2003). The scope to be covered is the promotion of energy efficiency and its approach will be enlarged from that of the CTO to embrace new promotion methods and effective communication tools. This Public Awareness Campaign complements the activity developed in the frame of other EC promotion initiatives in the energy field, for instance "Managenergy", but does not intend to duplicate nor overlap them. The Public Awareness Campaign for an Energy Sustainable Europe makes a contribution across all the four fields of the "Intelligent Energy – Europe" Programme. For this reason it qualifies as a horizontal key action within the Programme. Its aims are the:

- Improvement of energy efficiency and the rational use of energy in particular in the buildings and industry sectors;
- Promotion of new and renewable energy sources for centralised and decentralised production of electricity and heat and their integration into the energy systems;
- Initiatives related to the energy aspects of transport, including the diversification of fuels, the promotion of renewable fuels and energy efficiency in transport;
- Initiatives related to the promotion of energy efficiency and renewable energy sources in the developing countries.

Aim

The Public Awareness Campaign for an Energy Sustainable Europe aims to bring about a change in the behaviour of the main players concerned, so that they commit themselves to move towards efficient, clean and sustainable energy production and consumption schemes based on solid foundations and thereby make an explicit contribution to:

- the Community efforts designed to raise the part of renewable energy in energy consumption in the EU towards reaching 12% by 2010 and, notably, 21% electricity from renewable energy sources and 5.75% of biofuels for transport;
- stabilise and rationalise energy consumption in order to achieve an additional 1% reduction of energy intensity above the business as usual scenario;
- promote clean and energy efficient transport.

Changing behaviour through awareness activities is a 6-step process, starting with raising "awareness of the problem", followed by the "acceptance of personal/corporate involvement", an "attitudes" phase, the "intention" to change behaviour, the "experimental behaviour" and, finally, the "habitual behaviour". Different promotion/communication methods and tools are required throughout this process.

Set for a period of four years, the Public Awareness Campaign for an Energy Sustainable Europe will provide indicative objectives to measure progress and serve as benchmarks for decision-makers and planners, disseminate the results of successful projects, spread best practices, promote exchanges of experience and know-how and support activity designed to encourage European citizens, companies and organisations to invest in technologies and practices that allow them save money whilst having a positive impact on the environment. It draws upon a defined set of tasks which are comprised of pro-

motional tools, such as sustainable energy partnerships, organisation of sustainable energy weeks, awards competitions, web-portal, annual event of the Campaign, etc. The various promotion initiatives shall cover a selected range of public awareness topics and shall be linked into a balanced programme co-ordinated with existing initiatives at local, regional, national and European levels.

The Public Awareness Campaign for an Energy Sustainable Europe sets out a framework for action to highlight investment opportunities and attract the necessary private funding, which is expected to make up the lion's share of the capital required. The Campaign also seeks to encourage public spending to focus on the key fields and, in the process, to complement private investment.
Given this market approach, which is the predominant feature of the Campaign, a strong commitment from industry and other potential investors is clearly crucial, and forms the primary objective of the promotion and communication plan and operations to be put forward. The close involvement of the Member Sates is of equal importance, both in communicating the ideas, aims and milestones of the Public Awareness Campaign for an Energy Sustainable Europe, and in focusing their relevant renewable energy and energy efficient programmes and schemes, including in the transport sector, on its objectives. Such a central renewable energy and energy efficiency public-private partnership will strengthen the existing co-operation between the public sector at Community level and in the Member States.
Addressing the whole spectrum of individual citizens, companies and organisations in their role as consumers and producers of energy will require the future tenderers of the new Campaign to work closely through and with intermediary actors like industrial associations, manufacturers' associations, networks of local/regional authorities, networks of agencies and other promotion networks, environmental groups, retailers' groupings, consumer associations, professional associations, etc.

Conclusions

Renewable energy development is increasingly recognized as a successful way to increase energy autonomy, improve the security of the energy supply in Europe, including economies of transition, and in developing countries, where it also helps to provide access to energy in support of poverty eradication and thus creates economic development. Renewables form part of the European Union strategy and the strategies other countries for sustainable development, climate prevention, economic growth and social cohesion. They contribute especially to reaching the objectives set under the Lisbon Strategy and the Barcelona Objective. This message needs to be transferred to the Member States and to the respective decision-takers and to the State's population.

A relation of trust has to be established throughout all levels of action (European, national and local) and the dialogue has to remain active between those actors to guarantee mutual consultation and integration of the expectations and barriers coming from the different levels.
However well established and maintained the Campaign will be, achieving good results remains dependent on how the major policies are implemented. For instance, Member States will have to find support from the Commission to implement the measures adopted at Community level to ensure that every State applies the measures jointly adopted. Additionally, the setting of targets for growth and accompanying them with a stable policy framework for security of investment is equally important, as it is the creation of a level playing field; the further tackling of administrative and grid barriers through strict enforcement of regulatory frameworks; the creation of a frameworks for accelerating the growth of market for green heat; and to expand financial support for research and development (R&D).

CTO Programmes, Initiatives and Projects Showcase

UPPER AUSTRIA
a model for a RE REGION

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A very proactive regional government put into place a regional energy strategy in 1994. It continued in 2000 with a second phase called «Energy 21» which sets complementary objectives, consisting of 25 concrete measures following a timetable. Thanks to this programme, the share of renewable energy sources (RES) increased in Upper Austria from 25 % in 1993 to more than 30% currently of the primary energy consumption.

Main aims and motivations

The main aim of the Upper Austrian energy strategy is that based on clear political commitment, an action plan which comprises a mix of measures targeting at different market actors, should be consequently implemented. The implementation of the action plan is done by the regional energy agency O.Ö. Energiesparverband, which is very close to the market actors. Besides the environmental benefits, the energy strategy also brings clear economic advantages for the region. Currently more than 10,000 jobs are secured by renewable energy sources. A network of companies working in the field of sustainable energy has been established in the region, where 133 partners are co-operating. These green energy businesses achieve a total turn-over of more than 235 million€ and employ around 2,000 people.

The initiative

In 1994 concrete goals to reduce fossil fuel consumption by increasing both energy efficiency and the use of RES by 2000 were set and a comprehensive energy action plan was developed and implemented, which led to a significant market development of renewable energy sources and the achievement of the policy goals set by the energy strategy.

In the year 2000, the Upper Austrian Government unanimously passed the second phase of the regional energy strategy, the «Energy 21», including again ambitious objectives to be met by the implementation of a clearly specified action plan consisting of 25 concrete measures.

O.Ö. Energiesparverband, the regional energy agency of Upper Austria is responsible for the implementation of most of the measures included in the action plan.

As a result of the implementation of the energy strategy, the share of RES increased from 25 % to more than 30 %, featuring a leading position in modern biomass installations but also a number of other RES installations, e.g. solar thermal, PV plants, small hydro power plants, wind power plants, etc…

Main innovative aspects

One main novel aspect of the Upper Austrian energy strategy is that it combines measures creating a demand for sustainable energy products and services while at the same time offers measures to meet the created demand appropriately.

Enabling factors

A number of well targeted support programmes were implemented in order to reach different target groups using different measures and targeting at the supply and the demand side, including for example:

- Creating «demand» for sustainable energy products and services: energy information and awareness raising, energy advice (15,000 energy advice sessions annually), seminars, conferences...
- Supply side: training & education, R&D programme, regional TPF-programme, quality control.

Challenges

One of the main challenges was to continue the successful development to reach the really ambitious objectives of the Energy 21 strategy and to bring the positive market development also to other sectors. As an example, the ambitious aim in the biomass sector is to double modern biomass heating installations till 2010.

In the year 2000, the Energy 21 strategy set the target of reaching 1,000,000 m² of solar thermal collectors by 2010 - equalling nearly 1 m² per inhabitant!

Replication potential

The approach taken in Upper Austria can serve as an example for other regions and countries in Europe that a strategic approach based on a strong political commitment and a clear action plan can lead to a significant change in energy production and consumption.

Achievement by the end of 2002 in biomass

A leading position in modern biomass installations:

- 15,100 modern wood heating installations (852 MW)
- 32 % of all Austrian wood chips installations
- 200 biomass district heating plants
- 4,500 wood pellets central heating installations
- 27 % of all Austrian wood pellets installations
- 12 large pellet producing companies
- 15 companies producing biomass boilers & stoves

Achievements in other sectors

650,000 m² solar thermal collectors (7/2003), 470 m²/1000 inhabitants
600 PV plants (2,600 kWp)
> 500 small hydro power plants (< 10 MW)
17 wind power plants (7/2003), 14.4 MW
> 30 biogas and > 30 sewage gas plants
geothermal energy (50 MW), one plant for electricity generation

FISCHER
the first factory worldwide supplied by a tri-generation biomass plant

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In February 2001 Fischer, the world market leader in ski and aeroplane components, opened a tri-generation biomass plant which supplies two production facilities with heating, cooling and electricity. Fischer became the first factory worldwide to have been able to cover its heat and cooling needs with such a system for the production process and regulation of the building temperature, as well as being provided with electricity by such a system.

Main motivations

For 30 years, Fischer had been using a steam boiler in conjunction with a back-up boiler, fired by heavy heating oil to supply the heat demands. This system was cheap but very environmentally unfriendly. When it came to replace the old system by a new system, the environmental concerns and the beliefs that renewable energy sources will become increasingly important in future convinced Fischer to invest in research and innovation and to become the first factory worldwide to be supplied by a tri-generation biomass plant.

Project details

Using the waste of the wood industry (in particular bark, woodchips and sawmill wastes) and the agricultural sector, the biomass source of energy is used to supply the total of heat and cooling needs, while covering an important part of the electricity needs too.

20,000 m^3 of biomass are transported yearly by train to be brought to the Fischer production site. This is one third of the total amount of biomass needed for this plant.

Overall Evaluation

This project has been awarded the Energy Globe Award 2001 as an excellent example how a high-tech factory can fulfill its high quality energy needs with a biomass plant.

The 15-year contract signed between Scharoplan and Fischer shows long-term environmental and social commitments. Signed in 1999 it targets at using RE whenever possible, ensuring high security of supply and safety levels, reducing regional emissions and contributing to the Kyoto commitments, as well as creating socio-economic benefits for the region.

The consultancy Scharoplan strongly believes that the expected development of a railway after the privatization of the train sector, should facilitate a larger proportion of biomass transportation by train.

Main innovative aspects

The “energy contracting” arrangement concluded between the Scharoplan consultancy and Fischer enabled "the combination of an innovative biomass installation with a modern financing scheme for the plant. The firm's own capital and external finance amounted 65%of the total investment amount that was 5 million euros. The rest was covered by subsidies from the European Commission, the national government and the federal state of Upper Austria.

With this arrangement, Scharoplan owning and operating the plant, it sells the heat and electricity to Fischer to market price. Any electricity produced in excess of needs will be fed into the national network. If Fischer needs more electricity, it can buy it from the national grid.

Enabling factors

Biomass by-products were available from the nearby forestry and agricultural sectors, usually within a distance of 50 km, maximum 100 km.

Challenges

The main problems was to install the tri-generation plant without having to interrupt the production process of the Fischer factory. Hence, the main work had to be done during weekends or during periods when the production process was shut down anyway.

Replication Potential

Replication is dependent on the availability of biomass supply, as well as affected by the possibility to receive a subsidy.

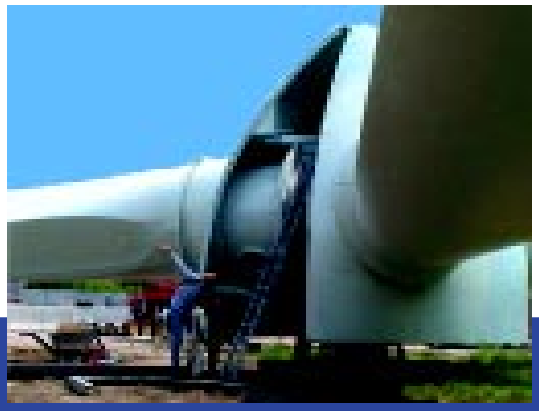
Number of jobs created

The project created and preserved job, totalling around 100,000 person-hours during the planning and construction phases, and three person-years for the operation of the plant. Furthermore, the project generates additional income in the agricultural and forestry sectors, thus indirectly contributing to increase and preserve jobs thanks to the purchase of their waste by-products by a new customer.

Environmental target

Fischer substitutes 3,000 tonnes of heavy heating oil per year and reduces CO_2 emissions by 9,456 tonnes per year, among other emissions reduction.

Amount of biomass used	50,000 m^3 of bark, woodchips and sawmill wastes yearly replace the heavy heating oil used before.
Annual output	26,000 MWh of heat; 1,000 MWh of cooling, 2,000 MWh of power, and 1,500 MWh of thermal oil.
Transport	a train connection for the environmentally friendly transport of fuel is needed. 135 wagons and about 270LKWs are needed per year; 1/3 is by railway; 2/3 by road traffic.



EEKLO Sustainable Energy Project

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The Eeklo project was an outstanding success in that it gained huge support and attention for Wind Power and RES throughout Eeklo, regionally and also at an EU level mainly through the high level of community involvement. Although there were some obstacles the project was greatly facilitated by the fact that transportation of Green Electricity over the distribution net is free in Flanders. This cut approximately a third of conventional supply costs enabling Ecopower to sell electricity to its customers at a lower rate whilst losing no money themselves.

Main aims and motivations To rapidly exploit the RES potential in the Flemish region of Belgium. To achieve close involvement and awareness at a community level.

The project

Ecopower (a financing co-operative for renewable energy) implemented a sustainable energy project in the small Flemish city of Eeklo. In 2001 the first two of three planned wind turbines started production. These are the largest wind turbines in Belgium, increasing the total installed capacity by over 20%. Also as part of the project there is a small hydro station.

Overall Evaluation

- High acceptance for Wind Energy within the community of Eeklo.
- Increased awareness of sustainable energy issues.
- Generated tourism and interest from other localities and also at EU level.

Innovative community involvement

One of the aims of the Eeklo project was close community involvement and support for the project. This was mainly achieved by delivering direct benefits to the residents of Eeklo through selling them shares at 250 Euro each and with 6% dividends. All shareholders have equal influence regardless of amount of shares they possess.

Enabling factors

The project received financial support from the Flemish regional authorities. A further enabling factor to the realization of the project was Market liberalization which facilitates the direct sale of electricity to private consumers. There was also legal support in that transportation of green electricity over the distribution net in Flanders is free, a major facilitating factor for Ecopower when deciding to become a supplier.

Challenges

The administrative processes for setting up a project like this are long and slow. One complaint can halt a wind turbine being installed even if the majority of the residents are in favour of it. This happened in Eeklo at one of the three planned sites and is the reason why the overall wind energy target has not been reached.

It was also necessary to combat the preconceptions of the local governments who were skeptical about the installation of wind turbines. This was achieved by providing them with all the facts and the predicted benefits. The overwhelming community support and financial success of this project may help to strengthen political enthusiasm for future projects of this kind.

Replication Potential:

EEKLO project is a replication of many others of its kind in Germany and Denmark.

Involving the community was what made the project so widely accepted and supported both financially and through community participation. This is something that can be done in any local area provided that the local council is interested.

The success due to the law in Flanders, that specifies that transportation of Green Electricity over the low-voltage distribution net is free of charge, should serve as an example to other regional governments. RES development would be given the boost it needs.

Two other co-operatives want to do similar things in Flanders and there is also some activity in Wallonia.

Implementation of the RES projects (1999 – 2003)

The public are willing to make more efforts to support RES developments but the problem is in raising their awareness of the issues. A concerted campaign operating on all levels; EU, national, regional and local is needed in order to achieve this.

The results of the Eeklo project constitute a 30% rise in RES share on a local level.

	Objective	Result	Comment
Wind Energy	15 MW	4.3 MW (av 8,500,000 kWH/year)	Delays in building permission
PV Systems	not defined	10 kWp	Co-ordinated private investors
Micro-hydro	125 kW	100 kW	Production levels doubled and cost halved due to local involvment
Gain Shareholders	1000	>2000	Due to market liberalization Ecopower is able to sell electricity directly to private consumers
Community			4 long term jobs created

SOLTHERM WALLOON
Solar Thermal Action Plan

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The Walloon Region set an action plan with the clearly ambitious objective to have 200,000 m² of solar thermal collectors installed by 2010. This objective would translate into about 60 m² per 1,000 inhabitants. Since January 2001, more than 1,000 households have opted for a solar thermal system and 5-10 large installations in public buildings are under construction. Although the objectives are still far from being reached, the growing trend has soared for the last year.

Main motivations

This Action plan was launched to create the conditions for emergence of the solar thermal market in Wallonia, to help it to become self-supporting and to initiate a wide "cultural" evolution.

Main motivations were the mature technology, the economically viable investment, the fact that local Small and Medium Enterprises (SMEs) which are active in solar already exist in Wallonia and that the technology can be used by any household.

The Plan

In order to reach the objectives, supply and demand needs to match, which requires both sides to be prepared to choose solar thermal for the water systems. A voluntary "Soltherm" agreement was developed for producers and installers to insure quality, as well as an awareness raising campaign to overcome the population's various prejudices on solar thermal and a support system to overcome the barrier of price.

Overall Evaluation

Expected economical impact could reach 200 million Euros. The population has shown increasing interest in solar thermal and SMEs in the water-heating industry have been able to develop their know-how, thanks to the "Soltherm" qualification system.

Enabling factors

This program has been mainly catalysed by a Green Minister for Energy in place in Wallonia since 1999.

Instead of facing the difficult economic comparison between the investment cost of installing a traditional water system and the investment cost of installing a solar thermal system, the information campaign emphasized the long-term interest of a solar investment: the calculation of the estimated cost per kWh solar thermal produced over a period of 25 years became a key argument for large systems.

To overcome the barrier of the investment cost, a generous financial scheme has been set up including the possibility to combine several subsidies (Region, Provinces, some municipalities), so as to cover up to 75% of the total investment. In practice, about 50% of the cost is covered.

A leasing system is also tested in 8 municipalities, which could dramatically boost the market by getting rid of the barrier of initial investment.

Challenges

Few administrative barriers had to be faced, as several regional energy information offices offer free advice to private individuals. For large systems, audits are subsidized up to 50%.

A very supportive legislative framework was also developed, offering a framework of financial support.

Environmental targets

Emissions reduction, thanks to the installation of solar thermal collectors, is relatively low as hot water represents only a small share (only about 10%) of the total energy consumption in Wallonia. Nevertheless, energy awareness has globally increased, which has an indirect impact on the environment. Indeed, it appears that people owning a SDHW system are more cautious about consuming energy.

Solar thermal Action plan of the Wallon Region

An ambitious objective of 200,000 m²solar thermal collectors installed by 2010. An integrated approach: voluntary "Soltherm" agreement on system quality, installers training, architects training, competition for architects, awareness raising campaign, subsidies, facilities regarding planning permission, demonstration through public example, movable installation on a trailer, evaluation of the feasibility of a mechanism of leasing,

A major success

- change of general misperception that there was not enough sun in Belgium for solar thermal
- more than 150 small and medium enterprises (SMEs) active in heating systems trained to solar technology
- more than 120 architects trained in solar technology
- 50 municipalities (out of 262) offer a local promotion

Domestic hot water production: more than 1,000 SDHW systems installed or 5,200 m² (achieved by mid 2003). NB: those figures don't include equipment installed before January 2001.
Large collector: 1,000 m² by 2003.

LÜCHOW–DANNENBERG
Energy and climate protection

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Lüchow-Dannenberg is a district of 51,000 inhabitants, situated in the eastern fringe of Lower Saxony, North Germany. It is spread over 1,200 km^2 and has a very low population density (42 persons per km^2). It is located on the Elbe river which formed the boundary between West and East Germany before reunification. Agriculture and forestry are still important sectors but employment potential is in decline.

The project which implements the goals of Agenda 21 locally, and in particular sets the target of 100% of energy supplied by RES within 10-15 years from 1999 onwards, using mainly wind power and biomass.

Main motivations

The growing debate concerning the possible building of a final nuclear waste disposal in a small village of the district, as well as the strong political will to act against the high percentage of unemployment and against losing its educated people, encouraged an alternative solution, such as RES implementation.

A group involved in Agenda 21 initiated a round table of reflection in 1997 on the topic "Energy and climate protection" and discussed this issue.

The project

Since 2001, the various energy potentials have been identified and conversion scenarios for 2015 have been prepared. The main objective was set to reach 100% RES. As a precondition to reach this goal the present energy consumption level must be reduced by 20%. An energy conservation competition gives prizes to the best actions taken each year.

90% of the electricity demand can be met by wind and biogas in the region. The main RES actions include the increase of wind turbines capacities installed: so far 8 wind turbines cover a total rated capacity of 4.8 MW, producing 7 million kilowatt-hours electricity annually. A further 85 wind turbines could be installed but at the moment there are a lot of difficulties within the planning procedure due to nature conservation concerns.

As well, several on-site biogas facilities have been installed at farms. A central biogas installation has just been built and is planned to provide 5000 households with electricity, using waste products coming from the starch factory (potato juice and pulp), as well as from maize, cattle and pig slurry delivered by the nearby farmers who hold shares. The heat produced within the installation is used to reduce by vaporization the fermentation substratum that is then returned to the farmers for use as fertilizer, but its volume is significantly reduced through this process, thereby decreasing truck traffic. Other actions include, for instance, the use of wood as fuel, the regions big forest timber potential suffices to produce 270,000 MWh heat and 30,000 MWh power annually.

Overall Evaluation

Lüchow-Danneberg contributed to reduce environmental impacts, as well as to increase the value added in the region.

The central biogas plant is a significant demonstration of successful economic biomass use. At the moment two more central biogas plants are planned. Because of the very poor budget situation of the district, which makes it impossible to invest in energy saving actions in public buildings, the district authority has concluded a contracting arrangement.

The idea of 100% has been implemented in the district of Lüchow-Dannenberg through educational and awareness raising activities. Building upon contacts to universities and supra-regional research institutes, sustainable jobs could be created in the energy planning and management spheres. Lastly, several schools and kindergardens have installed photovoltaic units, financed by teachers and citizens. The planning and construction was exercised together with pupils, integrating an important educational and awareness raising dimension.

Enabling factors

The ideas coming out of the round-table on "Energy and climate protection", set up in 1997, were welcomed by the district administration and the local politicians. The district assembly passed a resolution to support these plans. Soon, there was a network of committed people in the different public and private sectors of the district enabled success in several initiatives.

Challenges

A great difficulty is the bad economic situation in Germany as a whole and in this remote rural area in particular. The construction of wind farms proceeds much more slowly than expected because of complicated planning procedures.

Replication Potential

The clear success of this local community on its way to sustainability is contributing to spread the message beyond the district and will encourage replication especially in rural areas of the accession countries. Polish contacts from the partner district to Lüchow-Dannenberg showed high interest in the energy activities and participated in several workshops. An exchange on RES with a delegation from Latvia took place in 2003.

Key facts of the project

- PV Systems have achieved an output of 4,200 kWp
- Domestic hot water production ca. 1,900 m^2 in municipal plants and ca.15,300 m^2 in private plants
- District heating: 3,000 m^2
- Utility owned wind farm with a 1.5 MW capacity
- 2 Biogas installations at 130 kW and one at 140 kW
- Medium temperature Geothermal with a heat capacity of 6-8 MW

KRONSBERG
an innovative building area

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Kronsberg is a district area of the German city of Hannover where a demonstration project of 6000 dwellings has been in the process of establishment between the end of the 90's and 2003 Its aim is to show how far one can go in promoting environmental measures. This was part of ambitious projects within the framework of the World Expo in Hannover by 2000. The objectives were to reduce the energy consumption by 50% and CO_2 emissions by 60%. Once the project is finished, 15,000 inhabitants will live in a completely energy sustainable district. Thanks to a long-tradition of consultation when the City Council takes decisions on public projects, all main actors indirectly involved in the project came to an agreement to have the most environmentally-friendly measures possible in the sector of energy use and energy supply; water management; numerous waste management strategies; soil management and transport measures among others, taking into account the economic constraints.

The project

The city's 30 year-long experience of consultation with citizens to reach high levels of public acceptance for any major public project implemented that will influence the environment and public space led to an ecological showcase built for the World Exposition hosted by Hannover in the year 2000. As the Kronsberg site was close to the expo, one condition of the contract between the city and other EXPO organizers was the construction of the Kronsberg Sustainable Residential Area.

The concerted approach in the case of Kronsberg took place among the Council, the environmental and consumers groups, as well as with investors, architects and housing companies. As a result of the action plan, several measures were adopted to promote the development of this project: 1) the ground was sold to the real estate agents at the lowest possible market price; 2) long-term benefits of the investment were demonstrated to the real estate agent; 3) indirect subsidies were given to future house owners, in order not to make the price more expensive than if there had been no environmental measures.

Concerning energy measures, the city project installed two wind turbines of 1.5 and 1.8 MW, an optimised energy provision by a differentiated district heating system fed by two decentralised cogeneration plants, developed the "solarcity" solar power project with a superinsulated 2,750 m^3 seasonal storage tank and other innovative technology such as passive houses, photovoltaic plants at the primary school, etc...

Overall Evaluation

The project shows flexibility and adaptability to always find the best environmental option, taking into account the economic constraints: for instance, if so far the local district heating system is run by a Combined Heat and Power system with natural gas, being still the most economic option, the project developers keep an eye on replacing it with fuels cells, as soon as they become economic.

Challenges

To overcome the costs barriers of the project the Council offered indirect subsidies to future inhabitants on one side, while on the other side made the selling price of the ground for house promoters about the same than if there had been no environmental measures. This was possible because the city owned the ground. At the same time, the price of the construction area was still not below the minimum market price of the ground. However house promoter could be finally convinced when told that despite initial investment costs were high, the very low maintenance and running costs enable a pay-back period of 7 years already.

A certain lack of knowledge of and therefore lack of support for RES coming from the population and even from architects, necessitated to set up public information campaigns as well as training courses for architects and building companies to show not only how to build such low-energy buildings, but also the economic benefits, not to mention the innovative side of such as project.

Replication Potential

The Expo opened the minds of local investors and architects who wanted to be involved in innovative projects. After the World Expo, this movement continued, but was slightly less active. The project was a concrete example of how this can work. Now, the real estate sector of the nearby area is sensitive. If it offers lower quality construction, it may gain a bad image, as the population expects to have the same standards as the Kronsberg buildings.

From the point of view of the main project promoter this project that has been presented to several other European countries as a showcase is replicable. However, it is facilitated if some event out of the ordinary takes place at the local level: this will encourage local authorities to push for innovative projects.

Key facts of the project

- Kronsberg: A whole new environmentally friendly district: 6,000 dwellings for 15,000 inhabitants
- Reduce energy consumption by 50%
- Reduce CO_2 emissions by 60%
- Lesson lernt: One good example in your own city gives a new scale of reference and encourages replication.

PAUL LOEBE HAUS
Sustainable Energy Public Building

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One of the major buildings erected in the governmental quarter of Berlin during the last years was the Paul Löbe Haus that houses offices of the federal elected officials as well as the meeting halls of the Federal Lower House of Parliament Committee. The Paul Löbe Haus is a subtle mixture of PV integration and combined heat and power plants, accompanied by the target to reach the energy standard of at least 25% better than the actual building regulations. This PV system is the world's largest thin-layer system integrated into a building made of amorphous silicon, the world largest system made of semi-transparent PV modules, and one of the largest directed shadow photovoltaic systems in existence.

Main motivations

During the 1990's, Berlin has taken the opportunity of the move of the headquarters of the German capital from Bonn to Berlin to adopt a program of implementation of RE technologies into the various public buildings that needed to be erected in the new governmental quarter in Berlin. The environmental energy strategy «Solar supplied governmental quarter» targeted at the integration of circa 1 MWp of photovoltaic systems into the governmental buildings. As well, plans were to provide low energy buildings, to avoid air-conditioning systems and to use combined heat and power plants on the basis of biofuels (rape-oil) for energy supply.

The Project

The «Paul-Löbe Haus» is a building of about 950 offices for members of the Parliament, 21 conference halls for Parliamentary Committees and meeting rooms, a seminar area, two restaurants, the Europe conference hall and a visitors area. A 123 kWp solar plant is integrated in the lamella shading system for the central atrium.

A decentralised renewable energy system has been built up between the governmental buildings in the Spreebogen, the governmental quarter. The buildings are interconnected with a local electricity grid, as well as with two central seasonal aquifer-storages, one for cooling and one for heat situated below the Reichstag building. Combined heat and power plants (CHP –units) are also a major power supply of this local energy system. As a result 80% of the consumed thermal and electric energy of all governmental buildings in the area are provided with RE.

Overall Evaluation

The integration of a photovoltaic system however arrived in a later stage of the several years project implementation to replace the originally planned aluminium blinds as a heating system concept. The positioning of the PV panels was not optimal in terms of electricity production, but the PV-system offered other energy benefits, such as the possibility to use daylight from the north, without blurring effects, and reducing overheating in the building.

Hence, despite the fact that certain climatic/sun conditions cause a contradiction between optimising the lamella shading system for daylighting and maximal solar energy gain of the PV-system, the solution was to run the system energy optimised in terms of the overall energy consumption.

Main innovative aspects

The main innovative aspects are technical, and certainly demonstrated the importance of considering the multi-functionality of PV systems. For instance, in the wintertime, especially in the afternoon, it is more energy efficient to use all sunlight for daylighting, than using it for producing solar electricity, in which case lamellas can be moved to minimise shading of the hall.

Challenges

Berlin took the opportunity to become the demonstration ground for ambitious architectural projects over the last decade: the Spreebogen is a symbolic historical area, containing the Reichstag, and close to the path of the Berlin wall, thus making it a powerful centre for innovative architectural projects. On the other hand, the very large ground available imposed very little restriction on architectural design. The only challenges were therefore how to organise the most optimal energy system among the different new buildings.

Replication Potential

It is certainly an impressive achievement in the field of architecture. The Paul Löbe House demonstrated how a building based on renewable energy can be combined with aesthetic criteria and passive solar techniques.

Solar governmental programme	Environmental strategy «Solar supplied governmental quarter» with the objective to have circa 1 MWp of photovoltaic systems into the governmental buildings
PV in the Paul Löbe Haus	123 kWp solar plant, 6,048 semitransparent PV lamellas were installed on the 5,500 m^2 roof made of saw-tooth glass World's largest thin-layer system integrated into a building made of amorphous silicon Multi-functionality of PV systems: electricity, but also for passive solar house purposes
Combined heat and power plants	Biofuels (rape-oil) energy supply; 80% of the consumed thermal and electric energy of all govermental buildings in the area are provided with RE
Energy standard in the Paul Löbe Haus	At least 25% better than the actual building regulations 80% of the consumed thermal and electric energy of all govermental buildings in the area are provided by RE

LÜBOW-KRASSOW
100% RES supplied Region

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The district of Lübow-Krassow, situated in Northern Germany, has set itself the target of sourcing 100% of its energy supply from Renewable Energy by the year 2030. In order to achieve this a variety of initiatives have been and are being implemented. The main two efforts were the establishment of a Solarcentre in Mecklenburg – Vorpommern and The Energy Park in Krassow. Furthermore two complimentary actions have been initiated under the management of the Solarinitiative MV, the "Solar East-Sea Coast" demonstrating solar alternatives in transport and tourism and "Network, Climate Security Permanency – Solar Energy for MV" opening a solar consultancy in Schwerin. Also accesses to the East-Sea highway were constructed, powered solely by renewable energy. They also purify water by aid of plant sewage.

Main aims and motivations

The region of Lübow-Krassow intends to fulfil the 100% RES target and to help preserving the environment by reducing the use of conventional fuel consumption. Another important motivation is the positive impact on employment and rural diversification.

Project details

The Solar center in Mecklenburg – Vorpommern was constructed to demonstrate the feasibility of RES technologies. It is fed by solar thermal and solar photovoltaic modules and will be used as a communication center and meeting point for young scientists, trainees and craftsmen and offer vocational and advanced training in the field of RES. It will also serve as the headquarters for solar research in the district. A wind park at Lübow will be integrated as an extension of the training and demonstration activities.

Overall Evaluation

The project had an impact on public opinion in that it increased the interest in and knowledge and application of RES among the population, people expressed an interest in finding a job with help from the center. Apart from Solarinitiative MV, regional politicians and householders became involved with the projects. The predicted rise in employment is 256 jobs in the next five years. There are plans to build 15 wind turbines, 1,500 m^2 of solar PV panels, 2 biogas plants, 1 oil-pressing mill, 1 bio-coke plant and 1 bio-methanol plant in the next 30 years.

RES Increase

The result of the Solarcentre alone was a 5% increase in RES supply at local level.

Innovative financing scheme

The wind farm in Lübow-Krassow was financed through a private-public pooling scheme.

Enabling factors

The project received financial support from the Parliament of Mecklenburg – Vorpommerns 'Future' fund and from the Ministry of Environment which also provided political support to the project.

Administrative barriers

The administrative challenges were seen to be decreasing throughout the course of the project, which is optimistic for future projects of this nature.

Although the center took more time than anticipated to set up another similar project would be easier to implement after the lessons learned through the establishment of this one.

Replication Potential

This Solarcentre is not a replica in itself but it has a high replication potential due to the jobs it can provide, both directly through staffing and indirectly through training and dissemination of information. Solarinitiative MV knows no similar initiatives but they would be willing to participate in other such projects.

Solarinitiative MV is a partner in the EU project 100% RENET together with partners from Austria, Spain and France. The Solar center is also integrated in the German Project "ESEAN"

Change in perception of implementing RES projects (1999 – 2003)

It is easier to implement RES projects today than it was a few years ago. The public is also ready to make efforts to support RES developments in general. This is important and linked to the fact that there is a growing concern for the issues of sustainable energy than there was in 1999.

Solar center		Energy Park Krassow	
Objective:	*Result:*	*Objective:*	*Result:*
Wind Energy: 2MW	4.2 MW	Biogas plant	1.4 GWh electricity 2.15 GWh heat
PV Systems	2x25 kWp	Biogas plant Krassow	2.4 GWh electricity 3.6 GWh heat
Thermal	60m^2	Oil-pressing mill/rape	9,000t/a
CHP plant	750 kW	Decentralised fired	600MWh
CO2 reduction	4,600 t/y	Bio-coke plant	11,500 t Bio-coke
SOx reduction	6.4 t/y	Bio-methanol plant	20,000 l biofuel
Nox reduction	4.7 t/y	Wind generators	270GWh

FREIBURG
Hotel Victoria

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The Hotel Victoria in Freiburg, Germany is a shining example of a successful private renewable energy project. As a hotel, it is a large energy user, consuming 210,000 kWh of electricity and 450,000 kWh of heat each year. This is enough energy for 60 households and would supply heat to 15 family homes.
The Hotel proprietors decided to combat this by ever increasing the energy efficiency of the hotel and to source 100% of it's energy from a wide range of renewable sources.

Main aims and motivations

The objectives are to reduce energy dependency and usage, to raise public awareness and therefore propagate an ecological attitude amongst the guests and to push for prioritization of RES issues.

Project details

Hotel Victoria uses the most ecological technology possible to minimize water, heat and electricity consumption. For example, all showers are water-saving and use 30% less water than the average conventional shower, toilets have a 6 litre capacity instead of the previous 9 litres. The minibars in the rooms are also 30% more efficient. No foods with polluting packaging are served in the hotel and food is sourced locally where possible which avoids transportation emissions and supports local business. All waste is recycled and all cleaning products are eco-friendly.
To source energy from renewables the hotel has solar panels on the roof which provide 25% of the rooms with electricity. The old heating system was replaced with a wood-pellet system in 2002. The wood comes from a guaranteed sustainable source. The hotel has a share in the Etterheim wind farm which provides 100,000 kWh per year.

Main Innovative Aspect

This project was implemented solely under the impetus of the hotel owners due to their concern for the environment and desire to spread this concern to the public by running their business in as ecological a way as possible.
They are continually developing new methods to extend their efforts, for example the hotel provides a free public transport pass to all guests for the duration of their stay. The hotel also hires out bicycles.

Technology	Achieved
PV systems	7.6 kWp
Thermal collectors Domestic hot water	30 m^2
Thermal collectors Domestic hot water	30 m^2
Small commercial Wind farms (<5 MW)	1.3 MW
Dwelling heated By Biomass	300 kW
Dwelling heated By Biomass	300 kW
Enviromental statement In all guest rooms	20,000 guests a year
Guided environmental Tours	1,000 persons a year

Overall evaluation

Hotel Victoria has reached its target of 100% RES. The staff are careful to ensure that the guests are aware of their ecological practices through brochures and demonstrations of the policies and technologies used. The Hotel Victoria has received many acknowledgements and awards. It won the Environmental Award 2000 as the most environmentally friendly hotel in Germany, the Green Hotelier, The Energy Globe 2001, the Environmental Prize for Business and recently in the 2002 edition of the magazine "Der Feinschmecker" Hotel Victoria was voted the best hotel in Germany.

Enabling factors

Technical support was provided by the Freiburg Energy Agency, the engineering office 'Solares Bauen', University of Stuttgart. There were financial subsidies from the state of Germany and the municipality for Solar PV.

Replication Potential

The hotel is a working example that others can use as a model for both environmental and economic reasons due to its success in both areas. It is an original project that has not yet been replicated.

Change in perception of implementing RES projects (1999 – 2003)

The hotel management feels that the issue of sustainable energy is of a greater concern today than in 1999 and obstacles to RES development have decreased today compared to then.

RES Increase

Hotel Victoria has reached its target of 100% RES and makes an annual saving of 230,000 kg of CO_2 and 30 0kg of SO_x.

MUNICH
RES & RUE Alliance

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The city of Munich created the policy framework for promoting renewable sources of energy in the late Eighties and it has expanded and deepened since then. Initially, the emphasis was on solar-thermal systems and then, more recently, on solar-photovoltaic systems.

The projects main objectives are to create a well managed forum, which brings together market players in a climate of confidence in order to tackle projects, measures, actions and campaigns and to double the share of energy from renewable sources in Munich by 2010.

The partnership between the City Council of Munich and the European Commission, which includes many programmes and activities in a number of RE fields, reflects the enormous effort that has been made by the local authority to reduce energy dependence and improve the quality of the city's environment. The RE Partnership created involves the members of the already existing "Munich Ecology Alliance" (which includes craftsmen' organisations, industry, NGOs, banks, administrative authorities), as well as the municipal utility company and the Munich Energy Agency.

The Project

In order to reach this goal many projects have either already been completed or are currently underway. Projects include: a special forum "Solar City of Munich" to facilitate the exchange of knowledge, dissemination of information and project results targeted at Solar Thermal and PV. There is also a special forum "energy efficiency in office buildings", Munich Solar days – a publicity event organized since 1987 - with a non-commercial Solar market outdoors and a commercial Solar Fair indoors. The project further supports Citizens partnership solar plants, solar roofs on municipal buildings, mobile solar information booths, solar ice-cream bicycle – selling solar-power cooled ice-cream in combination with information distribution.

Citizens´ partnership PV plants

The project used the financing concept of Citizens' partnership solar plants. Private and public interested parties; investment grants and/or grants for public relations to the operators of citizens´ partnership PV plants were used towards the realization of five large PV plants. This involved the citizens, who are not builders themselves, with the utilization of solar energy.

Enabling factors

Political support was received through the foundation of a climate and energy task force during the International Energy Conference "Rio 10" in Munich 8/02. Financial support came from the European Commissions ALTENER 2002; legal backing came from the Renewable Energies Act from the German Government.

Challenges

The figures of about 6 % of electric energy generated from renewable energy and about 8,000 customers using natural power (eco-electricity) demonstrate, that there remains a lot to do. Due to economic (prices for fossil fuels still are too low) and political (support still is too weak) reasons, people were not sufficiently motivated to deal with the matter of renewable energies. Furthermore, the necessity for the promotion of renewable energies was not recognized by the politicians, so that the financial means were not made available. This was combated as far as possible by means of public relations consisting of conferences, the special forums, the solar days, the citizens' partnership plants, the solar information booth, the solar ice-cream bicycle

Replication Potential

The climate protection activities carried out by city of Munich may be, in principle, conducted by every town or city. The main prerequisites are political willingness and sufficient financial capacities, which certainly influence each other. There is a tight cooperation between the city of Munich and further European cities in the framework of the climate and energy task force.

Change in perception of implementing RES projects (1999 – 2003)

The issue of sustainable energy is of greater concern today than 1999. It is not easier to finance a project today due to difficulties caused by the actual economic problems and the resulting tax policy. Achieved success and future success is threatened by economic and employment problems.

RES Increase:

By 2000 the PV share increased by 56% and then by 2003 by another 98.6% The share of Solar Thermal increased by 45% and then 42% at the same dates.

Key facts of the project

- PV Systems have achieved an output of 4,200 kWp
- Domestic hot water production ca. 1,900 m² in municipal plants and ca.15,300 m² in private plants
- District heating: 3,000 m²
- Utility owned wind farm with a 1.5 MW capacity
- 2 Biogas installations at 130 kW and one at 140 kW
- Medium temperature Geothermal with a heat capacity of 6-8 MW

PELLWORM
100% RES

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In 1997 the German island Pellworm drew up a renewable energy plan in order to present model concepts for energy supply sourced from renewables and to access a wide range of applications. The strategy for the future is to fully exploit the island's main sources of renewables: wind, sun and biomass. Pellworm is connected to the mainland electricity grid in Germany via submarine cables. The idea is to sever this connection in the near future and create a self-sufficient, 100% RES system.

The initiative

The strategy set up by the island is to work towards the goal of increasing the share of renewables to 100%. Increasing public awareness of issues related to renewable energy and spreading best practices to other locations where similar potentials exist are also important motivational factors.

So far 13 wind turbines have been erected to achieve the goal of exploiting the renewable energy capabilities of the island. Wind energy has by far the greatest potential of the renewable energy and there is still much room for expansion.

Photovoltaic and Biomass are also being further developed. A biogas plant is in the process of being established at the current time.

Innovative aspect

Once the feasibility study for the Biogas plant was completed three farmers who wished to participate formed a society and adapted the project outline into a plant they could set up. Since then more people have joined the society and in this way the plant has enough financial backing and is now in the establishment process.

Enabling factors

The cost of the feasibility study for the biogas plant was taken over by the federal state of Schleswig-Holstein and the Pellworm local government. After this was completed three farmers took up the project and formed a society in order to implement the project. The plant is now in the development stages. Financial aid has also been received from the EU from the ALTENER Programme and from EON, then Schlewag. The current task is to acquire funding for the heat storage plant that would enable the heat from the new biogas plant to be used in Pellworm also. To combat the lack of funding, Pellworm, in conjunction with the Georesearch institute in Potsdam, held an Information Day in autumn 2001. As a result of this the University of Lüneburg and Stuttgart became interested and agreed to take over the research, that has been outlined in the Pellworm feasibility study, of the new heat storer which will be shallower (20-40 meters deep), so more cost effective to boar down to and with a higher temperature output (70 degrees) than any yet in existence.

Challenges

There have been some challenges posed from a lack of proactive political support in the past. These were eased when Pellworm was selected as a model village for the Expo 2000 in Germany. This meant there was great publicity and support generated. Pellworm received a greater influx of tourists as a result and the project attained high visibility.

The heat production capabilities for the biogas plant will not be used under the current terms. This is due to the fact that there is not the financial capacity to set up an underground storage for the heat. The necessary funding aid is 60%, of which the EU could supply 50% and Schleswig-Holstein federal state 30%.

Replication Potential

For many areas heat storage would be the perfect solution. In Pellworm there is no major industry mainly residential areas but for localities that have a high demand for heat this is a really cost effective method. Pellworm has already started to contact the neighbouring Islands to disseminate information and generate support for replication elsewhere.

RES Increase

As a result of the initiatives on Pellworm the RES share of the island has gone up 78% and once the biomass plant has been established this will further increase to 92%. CO_2 emissions have been reduced by 80%.

Key facts of the project:

- The objective was to install PV systems with a capacity of 600 kWp and 300 kWp of this is currently active
- There are 28 large solar thermal collectors installed with a surface area of 318 m^3
- 5 privately owned wind turbines have been installed with an output of 680 kW
- There is one windpark with 8 turbines
- A combined heat and biomass plant is currently in the planning stages

ÆRØ
a renewable energy island

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The Island of ÆRØ aims to meet its energy demand 100% from renewable energy sources. The island utilises solar energy for district heating and so far there is on average 3.7m^2 of solar panels per inhabitant; 26,800 m^2 in total. To reach the goals many other projects are to being set up.

Main aims and motivations

ÆRØ wishes to reduce CO_2 emissions and become self sufficient. This would serve to improve Island's economy as the income would stay on the Island. It is hoped that the jobs created would help to counter the current trend of people leaving the island for work.

Other main aims are to maintain and increase the energy efficiency of the local business community and to ´green´ the existing jobs within the energy supply sector.

There is also the aspiration to increase the level of energy related tourism and to involve the local population in the projects and the overall campaign.

Project details

The solar energy is sourced from three district heating plants.

Future projects include solar thermal and woodfuelled domestic heating. A combined ethanol and biogas plant is expected to produce 20GWh netto annually of energy and treat more than 50,000 tonnes of waste. In addition to the normal farm slurry, it is capable of treating manure and green crop waste and household waste as well. The produced ethanol will replace 20% of petrol consumed on the Island.

The Island aims to set up an isolated electricity grid based only on renewables.

There will be 10 individual hydrogen household units producing CHP using Hydrogen sourced from RES.

ÆRØ has set the goal of reducing its electricity demand by 20% up to 2006.

Overall evaluation

The current initiatives implemented are successfully supplying RES to the residents, which provides encouragement for the new projects that are being developed. There is planning underway to set up a large biogas plant, which the farmers are keen to get involved with.

Innovative Aspect

The wind turbines and some of the district heating projects are funded by the sale of shares directly to the island residents. This serves to benefit the local economy and ensure a high level of support for and interest in the project as people are directly involved.

Enabling factors

The projects have been co-financed by many means, including public and ordinary loans, registration fees from consumers, private investments and the sale of shares. Community's involvement is important in ensuring the success of the projects. There are 500 community owners of the 3 major windmills in Aerø.

Challenges

There is some local opposition to large wind turbines due to the noise and periodical shade they bring. In the past farmers had a turbine on their own land and so they alone received the impacts from them but now they are built far away from the owner and this gives the illusion to the community that they were erected without prior consent, which is not true. There were no problems with the solar heating projects.

Replication Potential

The projects should be relatively easy to replicate as they were carried out under normal market conditions. Most of the Aerø projects were original.

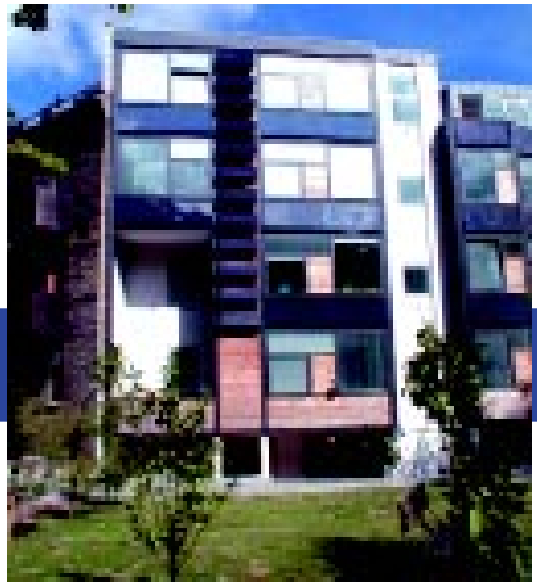
Perception of RES situation today compared to 1999

There was overwhelming public support for the islands strategy to become 100% RES supplied. The participants in Denmark perceived the EU support very positively.

A science center is currently in the planning stages. This is hoped to increase and consolidate awareness and the spread of information.

Marstal plant	18,300 m^2	18.3 MW waste oil boiler to be replaced with a wood pellet boiler	15,600 m^2
AerØkoebing	4,900 m^2 solar thermal	Wood pellet boiler 1 MW Straw boiler 1.6 MW	1,400 m^3
Rise district heating plant	3,600 m^2	800 kW	

- Three large wind energy turbines were erected each with a capacity of 2 MW which constitutes a combined production of 20.5 GWh annually. This equates to 57% of the total energy consumption of ÆRØ
- Five small wind turbines were erected each with a capacity of 1,135 MW



ÅLBORG
Clean City - Green City

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The city of Ålborg has been promoting environmental awareness since the "Clean City –Green City" campaign. With regards to town planning, the city council has authorised a programme of actions tackling various areas of sustainable and ecological development. The renovation of Danmarksgade, a district located in the centre of Ålborg, was completed during 2000. The project consisted in the renovation of four blocks, built at the turn of the century and the Public Louise Square. The square is central and gives exceptional visibility to the ecological measures taken. Qualified research firms, SBS Byfornyelse, a private company co-coordinating the technical and organizational aspects of urban renovation projects throughout Denmark, collaborated with the municipality of Denmark and the Danish Housing Minister.

The Project

The main objective of the project was to increase awareness of RES and ecological issues. The project also aimed at showcasing the renovation of buildings in a sustainable way, presenting new technologies and solutions.

The concept of themed houses and workshops each focusing on different aspects of sustainability and RES implementation was the main innovative aspect.

The project was divided into six concepts:

- The Green Space: To improve the green areas of Danmarksgade starting with the new layout of Louise Square.
- The Yellow House: Installed exemplary energy saving and RES technologies into an old town house, including PV panels, solar collectors, triple glazing, low consumption and high performance appliances. The objective was to reduce energy consumption by 30%.
- The Blue House: Installed innovative techniques of water storage, the goal is to reduce water consumption by 30%. The technologies used are a water wall that purifies the used shower water, used water toilets and rainwater for laundry.
- The New Ecology Construction frame concept: A twenty-six unit social housing was built and used 30% less resources in construction than a conventional building of the same proportions. A series of workshops were created to showcase these measures.
- The Public Spaces frame concept: proposals, which examine how to best utilize common open space. Four ecological open spaces have been completed during the project.
- The Retrofitting frame concept: to introduce as many ecological and environmentally friendly, technically tested and financially viable measures in urban renewal.

Overall evaluation

All of the projects were successfully implemented except the water wall, which is still not in use. The square is now well used by local residents and hosts major public events, like an ecological market. Experience shows so far that the residents of the pilot projects participate actively in getting new technologies to work. However, despite the interest shown and even though subsidies are available it is still hard to reach a final agreement concerning the application of the Rehabilitation frame concept to housing stock improvements or private urban renewal.

The methods used in the two houses put the project five to ten years ahead of its time. The first partial results of the evaluation programme show room for improvement. The Yellow House heating consumption has dropped by 30% but the energy consumption has risen to 29 kWh/ (m^2a).

Challenges

The biggest difficulties occurred with the use of water saving technologies, which had been altered many times. The water wall is still not in operation. In case of any public complaints or inquires and to keep the local population involved, citizens had the possibility to voice their opinions two afternoons per week at the info center Lousiegard.

Replication Potential

Innovative technologies used can provide working examples for interested parties. The Retrofitting and Public Spaces frame concepts provide results, which can contribute to new directions and new standards in urban renewal. Many municipalities, including Copenhagen, have taken up the Ålborg model.

Key facts of the project

- Improved layout and content of the Louise Square
- 30% less heating consumption in Yellow House
- 30% water saving in Blue House
- 30% less resources used in construction of social housing unit
- Four ecological open spaces completed
- Generated local interest

SAMSØ
Danish Renewable Energy Island

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Samsø is an island geographically located almost exactly in the heart of Denmark with an area of 114 km^2. The population of the island is about 4,400 inhabitants and main industries on the island are agriculture, tourism, and services. Total gross energy consumption is about 900 TJ/year, from which the energy consumption in the transport sector is excluded, a renewable energy (RE) accounts for 12-15%.

People on the island have been trying to introduce RE since 1980's, and then they made a energy plan together with the local utility company (NRGi) and consulting companies in order to respond to the national energy policy "Energi 21" which was approved in the parliament in 1996. In the plan it was aimed that the intensive saving of energy in the sector of power generation, heat supply, and transport would be implemented and the current energy supply system would be transformed into the renewable energy system within the next 10 years (1998-2007).

The project was chosen as "Danish Renewable Energy Island" by the Danish Energy Agency in 1997, because the Danish government expected at that time that the project in Samsø would be a model of solution for the international society, authorities, planners, and not least the inhabitants of local community who were facing the many challenges.

The projects

Electricity supply projects: Total electricity consumption in Samsø is about 28,000 MWh (101 TJ)/year.

In the wind turbine project, 11 of 1MW wind turbines were built at the south of island in 2000. They are producing about 27,000 MWh/year, which is nearly same as the annual electricity consumption in the island and reduce CO_2 by about 22,000 t/year.

Heat supply projects: Total heat consumption in Samsø is about 232 TJ/year, about 30% of which is made of biomass. It is considered in the plan that additional insulation and renovation of buildings, introduction of energy control and improvement in the effectiveness of heat supply plant will make it possible to cut this consumption by 21%. 60% of households will be connected to the network of district heating and remaining 40% in the rural area will be supplied with heat by individual systems such as heat pumps, solar heating, wood chips, farm-based biogas plant and household wind turbines.

Projects in the transport sector

Roughly 310 TJ/year is consumed in the transport sector for ferries, cars, buses, and trucks etc. Information campaigns, introduction of energy control, improvement of driving technique, changed services, and new forms of cooperation in delivering should make it possible to reduce the consumption by at least 5%. Consumption can be reduced by further 15% if electrically powered vehicles replace service vehicles and half of the private cars on the island.

Despite the reduction and conversion to electrical cars, the transport sector will still consume 250 TJ of fossil fuels per year, and therefore to supply the same amount of energy consumed in the transport sector the installation of offshore wind farm is planned. The first planning phase for a 23 MW offshore wind farm at south or west of Samsø started in the autumn of 1998. The second planning phase started in the spring of 2000. In 2002 10 wind turbines were finally built 3.5 km south from Samsø. The Offshore wind farm will produce about 250 TJ of electricity which substitute the same amount of energy consumed in the transport sector. In the long term, a hydrogen plant will be established in 2005. The plant will be powered by electricity from offshore wind turbines and supply hydrogen to cars, which can be driven by hydrogen.

Overall evaluation

The total cost for implementation of the energy plan is about DKK 590 million, and a total subsidy of about DKK 70 million is needed in order to ensure competitive economy for consumers.

However, at the same time, the island can save about DKK 54 million/year, which is used for purchasing fossil fuels and electricity, and then that money will be used for purchasing bio fuels, employing construction labour, operating new plant, financing, etc. and will circulate in the island.

In terms of environment, a complete conversion of the energy supply system will mean that emissions of SO_X, CO_2, and particles will be removed completely, while emissions of NO_X will be reduced by about half. Moreover, to use manure in biogas plant makes it possible to reduce odours and pathogenic bacteria in manure.

People's commitment

In the Samsø projects the importance is placed on people's commitment at all levels, especially politically, technically, and financially.

Foreningen Samsø Energi- og Miljøkontor and Samsø Energiselskabet which were established to promote participation of residents play an important role in this process. For example, Samsø Energiselskabet consists of representatives of Samsø municipality, the Commercial Council, the Farmer's Association and Foreningen Samsø Energi- og Miljøkontor, and its secretariat widely provides general information.

Residents take both benefit from and responsibility for projects by participating them. It is very important, because it raises a resident's interest in the projects and thereby they proceed smoothly. Therefore, it is very important for a region that wants to convert the current energy system into the RE system to make residents as involved in project as possible.

NAVARRE
Renewable Energy Plan

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Main aims and motivations

Navarre, with a population of just over 578,200 covering 10,391 Km^2, is a world benchmark for renewable energies. Thanks to the 1995-2000 Energy Plan promoted by the Government Navarre to foster energy conservation and efficiency, favour the best use of RES and extend the energy transport and distribution network, by 2001 Navarre was already the second Spanish region in the generation of electricity from the wind. In 2002, 60% of the electricity consumed in Navarre came from renewables.

The Navarra Energy Plan Targets for 2005 foresees yet again a doubling of RES electricity capacity, including the doubling of wind installed capacity and expansion in solar photovoltaic and solar thermal generation – aiming towards a 97% green electricity coverage by 2005.

The initiative

The development of renewable energies in Navarre has meant that major initiatives could be carried out.

- In 2004 the biodiesel manufacture plant located in Carraposo will enter service, with a production capacity of 35,000 tonnes/year.
- An electricity generation plant from the combustion of waste cereal (straw) with a capacity of 160,000 tonnes/year. Located at Sangüesa, it has an installed capacity of 25MW and produces 200 GWh/year.
- Wind energy has also generated an active industrial and productive sector in the region, one with a bright future and a clear export-led orientation. The need to encourage the creation of a wind-power-led industrial sector in Navarre was envisaged from the outset. Industrial plants to produce this type of equipment cover turbine assembly, the manufacture of blades, turbines, towers and control equipment and a wide range of wind turbine components.
- At the end of 2001 the largest photovoltaic solar energy plant in Spain, located in Tudela, entered in service with 1.2 MW capacity.

Overall Evaluation

- Against a forecast capacity for 2002 of 341 MW from a range of renewable energy sources, 590 MW have already been installed, of which 550 MW correspond to the wind power sector.
- There are 107 hydropower plants in operation, representing 15% of the region's energy consumption in 2000.
- Wind power-based installed capacity in 2000 produced the equivalent of 40% of the total electricity consumption of Navarre over a full year.
- Installed capacity in renewables in 2000 was 773 MW, generating 55% of the electricity consumed in Navarre.
- In 2000 alone the emission of 1,798,000 tonnes of CO_2 to the atmosphere was avoided, double the figure forecast in the Energy Plan.
- Investments of over 382 million euros have been made in renewable energy production facilities.
- More than 30,000 schoolchildren have visited the travelling exhibition on energy saving and renewable energy in the main towns and cities of Navarre.

Enabling factors

- Wide-ranging acceptance of wind farms by the community.
- The existence of private developers that have made a strong commitment and large investments particularly in the launch stage, when the situation and technological costs represent considerable risks.

Care for the Environment

Care for the environment is something that is given special attention in the development of wind power in Navarre. Wind farms are subject to environmental studies and the Government of Navarre applies changes to their design before they are authorised. Certain sites have been ruled out as a result of their impact on the environment, and the location of some turbines has been modified in projects that have received approval. Navarre has some of the most advanced legislation in Spain on the environmental monitoring of wind farms. The minimum distance between turbines in the most recently authorised facilities is 200 metres, to ensure that there is space for birds to pass. Each wind farm has its own environmental monitoring programme to assess the impact of the turbines on bird life. Experiments have also been carried out in the form of turbine shutdowns at times when there are a large number of birds, to facilitate their flight paths.

Replication and Partnership

In 2003 alone the region received visits from representatives of the Environment Ministries of the Czech Republic, Hungary and Slovenia and different regions in Ireland, Rumania, Slovakia, Italy and Belgium, as well as the Energy Ministry of Tasmania (Australia).

Navarre participates in a renewable energy project in Tunisia, in collaboration with the Spanish Agency for International Cooperation under the *Azahar* programme. The Community provides technical and legal assistance for the installation of wind turbines. The partnership programme contributes to the design of an energy model in which guaranteed supplies, at competitive prices, is compatible with care for the environment. This model involves technology transfer in clean energy sources from developed to developing countries, to increase their economic development and the application of measures to reduce polluting emissions.

ADEME
Sustainable Energy Project

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ADEME, the French Agency for the Environment and Energy Management, is involved in a long-term framework agreement (2000-2006) with the 26 regions of France annexed to the State-Region contracts (CPER) to promote RE and EE measures. This project improves the economic position for RE industry sectors that are close to competitiveness (e.g. reduction of costs of electricity from RES), reduces the non-commercial barriers for other sectors (e.g. the very unfavourable tax system for geothermal), facilitates research and development for sectors such as PV that are still facing very high production costs.

Main aims and motivations

The national objectives are fixed by the government. However, ADEME facilitates the implementation of these objectives within the regions being an intermediary between the two parties. ADEME takes the opportunity of the CPER contracts to fulfil the agency's commitment to promote RE and EE measures. ADEME experiments local projects, and generalizes them in the rest of the regions of France if proven to be successful.

Ways of action

ADEME focuses on 7 main ways of action: Research priorities; supporting the definition of standards and regulations; Readily accessible procedures to support decision-making (from pre-diagnosis to guidance, from diagnosis to preliminary study); Demonstration of good examples to promote market access, remedy a failure of diffusion and develop organizational or territorial practice; Financial support to investments; Strengthened international action; Crosscutting communication to inform the public and maintain a link between all the parties concerned.

Overall Evaluation

The intervention of ADEME as a third party between the government and the regional entities facilitated a contract-process on energy policies, therefore it was easier:

- to identify objectives and ways to implement projects ;
- to evaluate the financial needs ;
- to involve all the regions.

Innovative financing scheme

During the 7 years period (2000-2006), ADEME will provide 557 million Euros for energy and environmental projects, of which 127 million Euros are for RES. The 26 French regions will bring 536 million Euros, and European Regional Development Fund another 270 million Euros. Thus, a total of 1,363 million Euros will be dedicated to the project during the overall period.

Enabling factors

The contractual framework is optimal for ADEME, who can plan its actions at local levels, while at the same time it enables the spread of successful experiences to other regions of France more efficiently, and at a lower cost. A contract is negotiated with each of the 26 regions.

Challenges

In order to create a long-term sustainable market development, it was important to demonstrate that the programme offered guarantees thorough quality standards and certification. Partnerships formed through the CPER contracts enabled the different RE sectors to be structured, organised and certified.

Replication potential

The fact that ADEME is involved in the large-scale programme of the CPER and is therefore linked to the State-Regions dynamic makes the agency able to replicate a project that was successful in one region in all 26 French regions.

Sectoral objectives (2000-2006)

- 333,000 m² of solar thermal collectors newly installed in Metropolitan France
- 280,000 m² of solar thermal collectors newly installed in overseas departments and territories
- 1,000 additional collective wood heat installation
- 500 supplementary isolated electrified sites/year
- 55 GWh/year of electricity on the grid from RES (small hydro-power and PV) in the overseas dep. and territories and in Corsica.
- a capacity of 30 MW by 2006 (additional) on the grid from small hydro-power plants
- a capacity of 1,200 MW by 2006 (additional) on the grid from wind farms
- 20 electricity biogas exploitations from dump
- 20 biogas exploitations from agro-industrial effluents
- 3-4 large geothermal operations

Plan soleil

One of ADEME's major successes in the field of solar thermal development. It aims at creating quality chart for solar thermal installers, launching large-scale communication campaign, giving financial support to solar thermal systems buyers, etc… This programme first started in some regions with which ADEME negotiated under the CPER (State-Region Contract) systems. Thanks to a system where all regions are covered by the same type of contracts, ADEME could easily replicate this success to all regions. It is now a national programme.

PIETERSAARI
Alholmens Kraft Biofuel CHP plant

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Alholmens Kraft Ltd. built the worlds largest biofuelled CHP power plant and one of the biggest CFB boilers in Pietarsaari on the Swedish speaking west coast of Finland. The plant produces steam for the forest industry and also operates as a utility producing district heat for the municipality. The pulp and paper mill is the largest employer in Pietarsaari and the new CHP plant sought to use its by-products as fuel sources.

Main aims and motivations

The most important aims were to produce electricity at a competitive price, to exploit the use of process steam in the paper mill and the town's district heating, and to utilize pulp and paper mill and saw mill by-products as fuel. The desire to obtain sufficient fuel resources within economical transportation distances was also a factor considered.

Project details

The plant demonstrates a new multifuel power plant concept. The latest technology for solid multifuel and low emission cogeneration was used but in new commercial size.

Overall Evaluation

The plant employed 1,300 people in the year of its construction and continues to employ 50 people for its operation and maintenance. Added to this figure are 400 people employed within fuel production and transportation for the plant.
There is high public support for the project due to this increase in jobs and the large contribution to domestic energy supply that the plant provides. There is cheaper district heat, which has increased the use of it in the locality, and the new plant has also provided cheaper electricity.

Main innovative aspects

Innovative procurement scheme:
A wood fuel procurement system is in place, based on the bundling of forest residues. The annual aim is to use 300,000 bundles of forest residues per annum.
The fuels for the pant are all sourced from the local area. Wood based fuels come from the paper mill, sawing and forest residues from the saw mills nearby and the forestry sector, peat is obtained from the production sites close to the plant. Only the coal and oil used mostly as a start-up or support fuel is imported.

Enabling factors

The project received financial support from the Finnish Department of Trade and Industry and the EU's THERMIE programme.

Difficulties

There were no major obstacles to the project. The target was fulfilled in the timeframe anticipated.

Replication Potential

Alholmens Kraft power plant uses a 'best practice' biomass/fossil fuel-cofiring concept with an extremely diverse fuel selection, which is suitable for replication almost anywhere in Europe. The boiler in Pietarsaari is twice the size of solid biofuelled boilers on average but there have been other projects to follow suit on a smaller scale.

Change in perception of implementing RES projects (1999 – 2003)

It was felt that it remains as difficult to undertake a Renewable Energy project now as in the past. Despite this, it would be worth doing if the economic conditions were favourable.

RES Increase

As a result of the new CHP plant there is a 45% rise in RES share on a local level.
There is a CO2 emissions saving of approximately 390,000 tons

Key facts of the project:

	Objective	Result	The percentage of fuels used	
Biomass	1 new CHP 550 MWth.	1 new CHP 550 MWth.	Bark and Wood Residues	45%
Heat production	700GWh	700GWh	Peat	45%
Electricity	1,300GWh	1,300 GWh	Coal or oil	10%

VARESE LIGURE
Agricultural conversion and 100% RES

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The Comune di Varese Ligure is a community on its way for 100% RES and 100% organic farming. Specifically in the RES sector, wind turbines were installed, 80% of the farms have become organic, PV systems were installed in 2 public buildings. Beside this, a program to promote pellets stoves will be launched.
The peculiarity of this municipality of over 2,400 inhabitants, is that it is huge compared with its density. There are many little centres, but no strong link among them. The renovation facilitated the reactivation of the two main centres and to preserve the cultural heritage.

Main aims and motivations

10 years ago, Varese Ligure was in a difficult economic situation, as the population tended to move to other places where there were more job opportunities, and the city was disconnected in-between the different areas. The mayor decided then to revitalize the municipality while integrating some sustainable development priorities.

The Project

The activities are manifold, main emphasis being put on clean energy and organic agriculture.

- The renovation of old buildings started in 1991.
- A marketing campaign was launched to present the 100% organic farming in 1997.
- Varese Ligure also was the first Italian municipality to receive the ISO 14001 certification (Oct. 1999) and was the first European EMAS registered municipality (Nov. 1999).
- A wind farm was installed (2000) and PV collectors (2003).
- Promotion of pellets boilers (pre-feasibility study, the plan being to create a local industry).
- The municipality participated in a LIFE project for environmental accounting and reporting (started in around 2001).

Overall Evaluation

The village overall development strategy including the urban restoration of public buildings and the agricultural conversion towards organic farming attracts tourism up to 3 times more than before. Organic farming is a key aspect economically (production and tourism), environmentally (resources and energy saving, nature conservation) and energetically (farms are self-sufficient – less fuel consuming).
The integration of RES includes the installation of 2 wind generators (4 million kW/h), 2 other are planned (2 million kW/h), PV collectors have been installed on the top of the municipal and school buildings.
The ISO 14001 and EMAS certifications have been fundamental to demonstrate the village's environmental awareness and active participation in reducing emissions.

Enabling factors

The government started to financially support the programme. Hence, there were local, regional, national and EU funds available to cover a total of more than 8 million Euros of funding for the different activities.

Replication Potential

The community having reached its 100% green electricity target, feeds the excess of electricity into the national network. There has also been a regional energy plan developed, supported by the regional energy agency, to promote RES to the whole mountainous area (7 municipalities), to which belongs the Comune di Varese Ligure, to develop heating by biomass.

Change in perception of implementing RES projects

The population was included in the municipality's actions and participated in the EU project for schools called FEE (Force Energétique par les Enfants). The public opinion is generally quite enthusiastic.

Key facts of the project	
Wind	2 wind generators (4 million kW/h) have been installed and a further 2 generators (2 million kW/h) are planned.
Photovoltaics	One installation on the municipal building made up of 102 panels (120 Wp each) which occupy 94.76 square metres and has a power of 12.24 kWp. This installation produced 12,701 kWh/year and covers 98% of the needs of the building. Another PV installation in a school is made up of 39 panels (120 Wp each) which occupy 36.23 square metres and has a power of 4.68 kWp. This installation produces 4,600 kWh/ year and covers 62% of the needs of the building.
CO_2 emission:	
The wind turbines	Saves 8,000 tons of CO_2. It also saves 3,000 tons of coal, 1,800 tons of oil and 1,100 tons of natural gas.
Photovoltaic	Savings in CO_2 emissions equal to 9,600 Kg/year.
The total amount of CO_2 saved through the Varese Ligure initiatives is: 0.05% of total CO_2 regional annual emissions.	
130 jobs permanently created	Cheese and breeder cooperative, maintenance of the wind turbines, staff employed in the environmental management system (ISO and EMAS).
Tourism	Three times more tourist visits than earlier (rural, cultural and food tourism).

PROVINCE OF CHIETI
RES and Agenda 21

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Chieti is the most southerly province of the Abruzzo, Italy. As this region had not developed an energy plan, Chieti decided to design its own energy strategy. The guidelines closely follow those of the CTO and the more general framework of the White Paper. There are two reference periods: one up to 2003, the other up to 2010, the latter being more ambitious and with longer-term effects.

Main motivations

The Province of Chieti intended to promote the development of its territory in a really sustainable sense. The concrete application of the Local Agenda 21's principles had as its first important steps the promotion of renewable energy sources with the approval of all stakeholders.

Project details

The specific goals of the plan include:

- Installation by 2003 of 2,000 m^2 of solar thermal panels
- Development of wind energy through the installation of wind turbines in various areas, amounting to 205 MW by 2003.
- Fostering the use of biomass in private homes (3,000 houses) and large buildings, through the use of olive pressing sand forestry waste
- Exploiting the potential of photovoltaic panels in industrial and commercial centres
- Use of waste for electricity production (2010)
- Encouraging the generalisation of the use of liquid biofuels for public transport (consumption of 6,000 tonnes a year for public transport in 2003, and 10,000 by 2010)
- Bolstering measures related to the rational use of energy, such as introduction of co-generation systems
- Improving the monitoring of environmental status, through the design and preparation of a battery of indicators to be collected periodically.

Innovative financing scheme

The programme tackles the energy problems facing sustainability, according to the criteria dictated by LA21. In this it has adopted the community principle of promoting strategical geographical partnerships and sectoral ones often integrating one with the other in the various actions.

Enabling factors

The establishment of the Provincial Agency helps the diversification of energy sources and channels the efforts of the different social-economic actors, as well as it helps them to look for appropriate funding.

Challenges

The legal barriers concern the big plants, in particular, especially in terms of environmental impact assessment (wind farm) and emissions in the atmosphere. The agency is also in charge of the design, the implementation and the monitoring of the provincial energy plan.
The administrative barriers are linked above all to the realization of the household plants in the residential area. They are often not permitted in the municipality plans because of their visual impact. Another notable barrier is getting the community to accept the big plants, in particular due to the visual effects they have on the landscape.

Replication Potential

The project has a high degree of replicability, above all for the adopted methodological approach. The method demonstrates that a local government can and must work to promote and coordinate local partnership.

Environmental and social targets

The reduction of CO_2 emissions is about 180 Ktons/year.
The activity has stimulated the market to create approximately 250 new job opportunities.

SHP	205 MW. At least 6 abandoned micro-hydro stations will be put back into use.
Biomass	District-heating systems with a production of 7 MW coming form the combustion of olive pressings and forestry wastes. Other projects included gas cogeneration (CHP) and small-size wood-fuelled electricity generating systems for mountain and rural areas. Biofuels mixed with diesel for public transport.
Wind	Objective: to install new privately-owned wind farms with an estimated capacity of 205 MW.
Solar thermal	Tthe province of Chieti is actively involved in the National Programme “Solare termico” project, sponsored by the Italian Ministry of Environment. The objective is to install 20.00 m2 of solar panels by 2003.
Solar photo-voltaic	Installation of solar panels in commercial centres and factories.
Planning	Realization of the provincial coordination plan, with particular restraints for the common planning to diffuse RES through the administrative implementation, promotion and simplification
Sustainable village	In this exemplification on medium scale the technical and management expedients for the sustainable development, in terms of residential use of the territory, have to be applied to reduce consumptions and impacts.

The Italian Sustainable Islands Programme

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Main aims and motivations

In the last 20 years there have been several attempts to introduce renewable energies in Italian small islands, with limited results. Rather then a problem of funding, the reasons has been the combination of two important obstacles: the regulatory framework for the production and distribution of electricity and the obstacles posed by authorities (Soprintendenze) that defend the landscape.

The Ministry of Environment has decided to launch a sustainable energy program for the small islands to try to overcome these obstacles and foster the large scale diffusion of renewable sources of energy. The expected results are a greater sensitisation towards these less polluting forms of energy , more rapid concentration of different funds in this area , accelerated establishment of new rules for local electric producers and finally reduction of the gap between the culture of the Authorities in defence of landscape and the approach of the installers of renewable energy technologies.

The project

The programme foresees the realisation of environmental valorisation actions to be realised in Italian Small Islands that are natural parks.

For the realisation of the programme a Protocol has been signed by the former Minister of Environment and the Association of small islands, ANCIM.

The first operational step toward the application of the Protocol has been the launching of a public tender for the local administration of Small Island to submit energy and mobility plans (deadline 15 October 2001).

Projects will be judged by a jury that will select the best projects and finance them to a maximum of 1.7 million Euro per project for the energy projects and to a maximum of 1.25 million Euro per project for mobility.

A fund of 2.4 M euro will be given to a couple of islands that will be chosen among all the municipalities that will prepare feasibility studies to improve sustainable mobility in their areas.

The answer to the call has been wide. Most islands are interested both in renewable energies and mobility.

As regards the energy plans the islands are requested to follow a scenario procedure focusing firstly on energy saving measures and solar thermal systems and secondly in renewable energies application for electricity production.

Enabling factors

The tourist nature of the island gives a unique opportunity of applying direct solar technologies: the seasonal nature of the load curve meets the solar insulation curve availability much better than any other seasonal load curve in the continent. The first result of this is that the ratio between the energy actually used and the total energy produced is much higher than usual.

The Programme will offer to a large number of islands a unique possibility to develop specific feasibility studies on the large-scale introduction of renewable energies and will enable a couple of them to begin the transition toward self-sufficiency.

Challenges

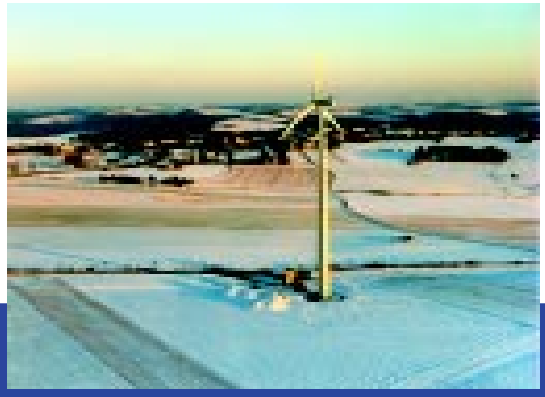
Most of the island generation systems are managed by small electricity distribution companies. Only 8 out of 45 are ENEL-owned (Panarea, Salina, Capraia, Stromboli, Vulcano, Alicudi, Filicudi, Ventotene). Island utilities are quite reluctant to change the existing situation for several reasons:

- They work in a monopoly condition.
- The extra cost of local energy production is totally covered by the government.

This mechanism produces high energy consumption and inefficiency and it is the reason why distributors are definitely against a change of scenario particularly if energy saving measures and renewable energies are being proposed.

Summary of characteristics of the CTO´S projects:

Island	Proposed technologies				Financial data		
	Wind(kW)	SPV(kW)	STH(m3)	Energy Saving	Total investment(Euro)	Funding(Euro)	Co-funding(%)
Pantelleria	660	100	758	URE	2,848,715	1,137,339	40
Pantelleria	660	100	758	URE	2,848,715	1,137,339	40
Ventotene	-	126	494	Lamps, pumps	1,766,799	1,062,842	60
Gorgona	50	-	455	Boilers, lamps	1,152,758	406,749	35
Giglio	535	14	346	Pumps	1,726,960	465,552	27
Panarea	study	33	60	-	363,415	205,252	56
TOTAL	**1,245**	**273**	**2,113**		**7,858,646**	**3,277,734**	



HEINERSCHEID
Wind Farm

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On the basis of the Energy Law which came into force on the 5th August 1993, the Luxembourg government concentrated on promoting the use of renewable energies. Wind power has come to have an important role as it has the greatest economic development potential of all the renewable energy possibilities in Luxembourg. The project was the establishment of a large wind farm in the commune of Heinerscheid, located on the northern tip of Luxembourg.

Main aims and motivations

The project set out to fully exploit the potential of wind power, to raise the share of RES in the area and to fulfil the regulatory guidelines as to the promotion and utilization of Renewable Energy Sources in Luxembourg.

The project

Heinerscheid was selected as it experiences favourable wind measures and is at an acceptable distance from residential areas, protected areas such as nature reserves and the national grid.

In 1996 the local council assigned the Energy Agency the task of developing a concept for making use of wind energy. Many interested parties had addressed the council to obtain permission to set up a wind farm in Heinerscheid. The council proposed that all parties join together with the united aim of planning, building and managing a wind farm. The wind farm was established in three Building Phases. The first was of 3 turbines with an output of 600 kW per machine and was completed by autumn 1998, the second was of 5 wind turbines at 1,000 kW per turbine and they were running by the end of 1999. The final phase set up 3 turbines with an output of 1,800 kW each.

The total installed capacity of the Heinscheid wind farm is 12,200kW.

An innovative partnership scheme

The partnership scheme between the interested parties, who after much organizing, founded the Wandpark Gemeng Hengsicht S.A. The capital 3,200,000 Euro, divided into 12,800 shares at 250 Euro each. The local council is the legal holder of 22.5% of the shares and aims to sell 20% to the local community. This keeps the community involved with and concerned for the success of the wind farm.

Overall Evaluation

The project has been successfully implemented and is in good working order. The electricity generated by the wind farm substitutes fossil fuel use and about 14,375 tonnes of CO_2 emissions are being saved annually. The project meets requirements of noise limitation, shading and minimum distance from protected areas.

Enabling factors

The financial outlay for the wind farm was divided by the different companies participating, each of them having a certain amount of shares in the farm. Approx 1.1 m of the total investment was financed through national government subsidies.

In Heinerscheid feed-in tariffs for electricity produced from wind power, which were established by the Grand-Ducal regulation of May 30th, 1994, are set at levels that render wind farm operation a profitable endeavour.

Challenges

There were no real obstacles to the project apart from a few technical setbacks. Problems occurred with the gearboxes of the wind turbines, which needed to be replaced. Two propellers were also replaced during the warranty period.

Replication Potential

Such a co-operation is possible anywhere. The wind farm makes a useful working model for other interested companies or organizations. Many municipalities have already contacted Heinerscheid for information with a view to implementing similar projects in their area.

Heinerscheid proves that municipal authorities can act very successfully as co-coordinators for wind farm construction. A wind farm situated between Heinerscheid and Kehmen is currently in the process of being established.

RES Increase

The energy produced each year is enough to supply 6,000 households (at 4,000 kWh per household) this equates to 0.6% of the total energy demand on the public Electricity grid.

Business year	Energy production	Contribution of phase 1	Contribution of phase 2
1999	3.9 GWh	3.9 GWh	0.0 GWh
2000	11.9 GWh	3.7 GWh	8.2 GWh
2001	11.1 GWh	3.6 GWh	7.5 GWh
2002	11.6 GWh	3.6 GWh	8.0 GWh

DELFT
100 Blue Roofs Project

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The desire of Delft to become a leading "Knowledge City" is centred in the fields of environment and energy, soil and water, communication technology and architecture and design. Delft aims to demonstrate and promote best practise in the above fields.
The most famous and successful of the Delft Energy Agency's projects is the 100 Blue Roofs project. The two projects within this that have the highest level of European replication potential are the PV for homeowners (2001) and the PV for tenants (2003).

Main aims and motivations

The initial aim was to install PV systems in as many private homes as possible, and then the project was expanded to promote PV to tenants in one particular area of Delft.

Project details

The city of Delft sent a letter to 14,500 house owners with a view to providing them with detailed information on the installation of PV and explanations of the subsidies. At the exhibition stand two weeks later, there was so much interest that Eneco and City of Delft decided to subsidize 400 instead of 100 houses.
Following the success of this project, the energy agency put forward an extension of this project to include PV panels installed in rented housing, partially paid for by the tenants and partially by the housing associations Delftwonon, Vestia and Vidomes.
The planning of the project followed these stages: a mailing and information evening for the tenants, energy scans for interested tenants, contracts supplied by the housing association, the ordering of PV systems, installation and a subsidy call.
A PV offer was made by three housing associations to tenants in a particular area of Delft. The City of Delft and Eneco financed both parts of the project.

Main Innovative Aspect

The option offered to the tenants to make an immediate yield of 6.73 euros of sustainable energy (40 kWh) for a rent increase of 3 euros per month.

Overall evaluation

The PV for homeowners action led to 400 households ordering a self install PV system which equates to an installation of 160 kWp 2.2% of all the individually owned houses in Delft now have a PV system.
Over 249 people signed up to the tenants' scheme, which amounts to a 144 kWp installed.

Challenges

The design and finance of the tenants project was ready by mid-2002 but did not start before May 2003 due to fear that the national government subsidies would be withdrawn before the end of the project, thus leaving the housing associations with overwhelming costs. This was overcome by the government promising not to end the programme without a two month "ending period", which would have been enough time to finish the project anyway.
The tenants who neglected to respond to one of the housing associations were contacted and 50% of them expressed the opinion that they thought green electricity was none of their concern.

Replication potential

The PV for households has already been replicated a number of times the first of which occurred in 2001. Rotterdam and The Hague are prominent areas where PV for households has been implemented.
PV for tenants has not yet been established in any other municipality.
The replication potential of PV on existing roofs is growing and growing and all we have to do now is move it from the group early adopters and into mainstream private households. This may eventually create greater opportunities for tenants because housing associations can deal with long payback times and handle techniques and subsidies professionally.

Perception of the RES situation today compared to 1999

PV system is no longer a novelty in the city of Delft. This should also bring on other financers, i.e. the ones that take fewer risks. There is great public approval of solar energy. Delft has a large technical university that deals with these types of issues.

PV in homes	400 homes equipped with PV panels 160 kWp of electricity 2.2% of all individual homes in Deflt have PV systems
PV for tenants	249 people signed up 144 kWp installed

SOLTHERM – EUROPE
Initiative

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The EU has set a target of 100 million m^2 of solar collectors to be installed in Europe by 2010. Currently there are approx 11 million m^2 installed with an annual growth rate of 1 million m^2. The concrete goal is that in 2004 15 million m^2 of solar collectors are installed across Europe, which is equivalent to solar thermal water heating systems for about 3 million households. The Initiative involves collaboration between more than 40 organisations, the majority from EU Member states but some also from Accession countries. It is internationally co-ordinated by Ecofys, an international renewable energy consultancy and research company but involves people at four different levels: Stakeholders at EU level, organising partners, co-ordinating projects in a specific country, industry partners and installers and facilitating partners i.e. NGO´s and energy agencies

Main aims and motivations

The Soltherm initiative was set up at the beginning of 2002 to catalyse a strong increase in market volume and to help unify the market for solar thermal products, to support the Campaign for Take-Off's goals in the field of solar thermal energy and to significantly contribute to meeting the EU´s Kyoto targets for CO_2 emission reduction. Also of concern was the creation of employment, raising public awareness and to increase co-operation and experience exchange between market actors.

Project details

National campaigns have been started to boost sales and publicity of the solar thermal industry. A central website has been set up which monitors and showcases all activities across Europe. Installers are involved in the campaigns as they play an important role in promoting the product. A market analysis has been carried out to give inside information and analysis of the EU market structures. A Tools Database has been constructed to provide a library of resources to potential campaign organizers. A quality standards inventory has been set up to give an overview of relevant quality structures. Conference presentations and workshops are taking place to inform professionals on the Soltherm campaign and its issues. All the above have been successfully implemented and have reached the target groups of companies, municipalities, potential and current campaign organizers and consultants.

Main Innovative Aspect

The initiative has made use of private-public pooling, solar contracting, Guaranteed Solar Results (GSR), and Third Party Financing.

Overall evaluation

The Initiative has undertaken and achieved all the projects it set out to although as the project is viewed to end at the end of 2004 it is too soon to attribute any concrete figures to the increase in the amount of solar thermal collectors in Europe. Partial goals have been fulfilled, especially the fulfilment of local targets and increasing the prioritization of Solar Thermal and the increase in cooperation and exchange of results and the unification of solar markets. The main target groups of the project are professionals (potential campaign organizers, authorities, and market actors). These parties have positively received the Soltherm Europe Initiative as an important platform for further market development. The campaigns executed in Soltherm are influencing the public opinion in their respective countries and regions.

Enabling factors

The initiative received public awareness support form the Climate Alliance and several other parties. ESTIF also aided Soltherm. The EU Commission ALTENER Programme and several national and regional organizations gave financial aid.

Replication Potential

The Soltherm Initiative was not a replica in itself but it has replication potential in that it has successfully brought together the key market actors (the parties that have made a difference in their countries or regions in actual market development) and has successfully led to exchange of experience. This exchange has led to visible common elements in new campaigns and initiatives. There are similar initiatives in the planning stages, and Ecofys and the other Soltherm partners would be prepared to participate in such new initiatives.

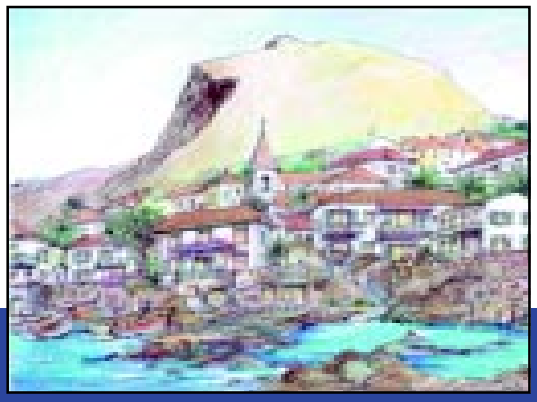
Key facts of the project

The Soltherm Europe Initiative aims to establish:

- Domestic hot water production
- District heating
- Large collective solar systems
- Space heating
- Air conditioning and Industrial process heating

In order to contribute significantly to the CTO goal of 15 million m^2 Solar Thermal collectors by 2010. The project is on-going and reliable figures on achievements will become available in 2004.

MADEIRA GREEN HOTEL
100% RES SUPPLY



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Madeira is a well known tourist destination from the middle of the XIX century, due to the influence of the development of steam navigation and of the British economy, which, during that bygone era, created the conditions to profit the excellent climatic and natural landscape characteristics as one of the first tourist destinations worldwide.

The increase of tourism in recent years has obliged Madeiran authorities to adopt a Tourism Policy Plan, with the aim of reaching a sustainable development for tourism, based on quality, where rules are defined for the growth of the hotel capacity in the next years, is defined.

The increased rate of social and economic development in the Autonomous Region of Madeira is reflected in a rapidly growing demand for energy. The Madeira Energy Policy Plan of 2000 provides the Regional Government with the means to adapt the policy to new opportunities for economic growth – meeting increasing demand while, at the same time, taking environmental concerns into account.

The strategic objectives of the Regional Energy Policy are:

- Easing of constraints caused by insularity
- Rational use of energy
- Greater emphasis on regional energy resources
- Management of electricity demand and provision of adequate supply
- Innovation and inter-regional co-operation.

Main Aims

With the spirit of promoting a new concept of tourism and integrating environmental and energy issues in the economic development of Madeira, as well as promoting quality, innovation and inter-regional co-operation, the Madeira Green Hotel project consists of the creation of a tourist complex that is 100% supplied by renewable energy sources, through the application of the most advanced and feasible energy and environmental solutions.

Project details

The complex will have a 165 room hotel and a marina with a capacity for 250 vessels, also incorporating the reception marine services, a nautical sports centre, restaurants and stores. Its construction is scheduled to start in the beginning of 2004. The project will integrate most RE technologies – wind generator, photovoltaics, solar thermal and a fuel cell – coupled with low energy building design and low energy techniques for water desalination and wastewater treatment, waste management procedures, rainwater and runoff collection, landscape treatment, integrated and clean transport system.

To guarantee the electricity supply, the hotel will be connected to the public electric grid for the cases where the hotel's demand is higher than the instantaneous RES production. The main target for the hotel's electricity system is to have an annual equilibrium between demand and production. This means that the system will be dimensioned and managed in order to have the minimum energy exchange with the electric grid, which will act mainly as backup.

Replication Potential

The project will have a demonstrative effect of the RE technologies application, and the resulting know-how will contribute to the improvement in these technologies performance, which will raise the liability of these technologies and, consequently, will contribute to the replication of other similar projects.

Dissemination Activities

The demonstration component is the key to the success of this initiative and focuses both on other hotels of the islands, on local and European RES professionals and on the citizens and tourists in general. With the aim of increasing public awareness, there will be a live museum, in the hotel grounds, open to the public, which will show the RE technologies used in the hotel resort. Several promoting actions like conferences, workshops, papers, CDs, and a website, where the results of the project will be disseminated, are also foreseen.

Key Facts of the project	
Energy System	1 photovoltaic system of about 26 kWp – 26,000 kWh/year 1 fuel cell – 20,000 kWh/year 1 solar thermal system of about 432m^2 of concentrators – 232,200 kWh/year 1 wind turbine with a capacity of about 750 kW - 2,267,128 kWh/year
Mobility System	An integrated mobility system with: GPL taxis, electric or fuel cell buses and scooters, electric bikes and a taxi boat.
Water System	1 seawater desalination system 1 wastewater treatment system
Saved Emissions	2,500 tonnes/year of CO_2 5.4 tonnes/year of SO_x 4.4 tonnes/year of NO_x
Reduction on imported fuel	400 toe/year

GOTLAND
A Renewable Energy Island in the Baltic Sea

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Gotland is located in the middle of the Baltic Sea; it is the largest Swedish island. High costs for transports of energy, goods and people have contributed to a non-dynamic growth of the local economy.
The island has a large RES potential in wind, biomass and, to some extent, solar energy. Island's energy strategy has to be considered within a broader sustainable development framework: on 14th October, 1996 the Municipal Council of Gotland published the Eco-Programme, which identifies the Municipalities' goal that "Gotland is to become an ecologically sustainable society within the course of one generation".

Main aims and motivations

The target of achieving 100% renewable energy balance by 2025 has arisen from the Municipalities plans to achieve a sustainable society within the course of a generation. The advantage of having a long-term plan with a specific year is that other planning which involves the production of short-term plans can become a part of the overall objective.
To achieve an increase in the use of renewable energy on Gotland with the aim of reaching 100% requires an active involvement from all sectors of society.

What has been achieved?

- An energy plan has been produced outlining development to 2005. In this plan the target is 40% from sustainable energy sources by 2005. A plan for 100% for renewables by 2025 is now underway.
- 95% of the Island's district heating plant is supplied by renewable energy.
- 20% of the Island's electricity comes from renewables.
- Bio-climatic, sustainable buildings are being built.
- Widespread energy saving measures are being implemented.
- Heating systems are being converted to biomass and solar energy.
- Bio-diesel is replacing fossil fuels in municipal fleets.
- The use of fuel-cells as part of a solar-hydrogen transport system is being developed for Visby.

Main innovative aspects

The most outstanding aspect is the establishment of a long-term plan for energy sustainability, with a wide participation range (sme's, university, local authorities, regional energy agency and local utility). An important complementary measure is the introduction of green certificates in the beginning of 2003.

Enabling factors

The Municipality of Gotland has shown in a number of plans and decisions that its aim is to support sustainable development. Other relevant factors:

- National financial support for local energy management agencies.
- 10% capital grants for windpower developments and power purchase support.
- Support for municipal energy advisors.
- 25% capital grant to domestic solar heating/hw systems.
- Grants for solar heating on public buildings and grants to convert domestic heating from electrical based systems.

	Max. Objective (2025)	Achieved
Solar TH- PV	3MWp/15,000m²	52 m²
Wind		
Max. Plan	1,100 MW	
Private owned	50 MW	10MW
Small Com. WF	150 MW	30MW
Small Com. WF	500 MW	30MW
Utility Owned	400 MW	20MW
Biomass		
Combined HP	150GWh/30MW	0
Dwelling	10,000/400GWh	5,150/200 GWh
Biogas	25/400GWh	3/12 GWh
Biofuels	24,000 tons	0

Number of jobs created: 45
Res Increase 18 %
Reduction of CO^2:295 kton

Challenges

Grid infrastructure: Grid connection has been restructured to allow export.
Government policy: The establishment of bio-ethanol production depends on governmental taxation system for fuels.
Low energy prices: cheap nuclear and hydropower via sea cable from mainland.
Acceptance of wind power: public resistance from, e.g. summer-house owners provides a challenge for the democratic process to fulfil all the potential of wind power on and around Gotland.

Replication Potential

During five years a large number of other island representatives visited the island, because of their interest in Gotland's project. There have been approaches at an international level due to the publicity received by the CTO website and CTO-award, with visits from as far afield as Japan and even Australia.

Change in perception of implementing RES projects (1999 - 2003)

Interest in replacing fossil fuels is increasing among the general public.
Acceptance of wind power by the local population is to a great extent influenced by whether or not some form of local benefit occurs as a result of any developments.
Politicians and civil servants have been informed about the ambitious energy and environmental targets already set. Technicians in the municipalities property department have been trained.

VÄXJÖ
Fossil Fuel Free

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The city of Växjö has long been a centre for trade, culture and education in southern Sweden. It is located right in the middle of Southern Sweden, 250 km north of Copenhagen, in the province of Småland. The ambition of the Municipality of Växjö is to achieve a 100% RES supply for its city, by undertaking activities in the fields of biomass and solar energy and transport sector.

Main aims and motivations

In 1996, the executive committee of Växjö municipality unanimously decided to stop using fossil fuels in the activities of the municipality. Furthermore, the aims set by the Climate Alliance, of which Växjö is a member, have been unanimously accepted.

The initiative

The initiative, fitting the Agenda 21 development scheme, was basically focusing an integral exploitation of biomass resources, maximum penetration of RE technologies and a change of attitude with regard to transport. Among the undertaken actions, the following are worth to be emphasised:

- Since the beginning of 80's Växjö Energy Ltd., VEAB, has worked towards replacing oil by bio-fuel and developing a combined heat and power plant in Växjö. Major parts of the city are served by district heating and new areas are continually added.
- The municipal housing company, Värendshus, has had encouraging experience with solar panels. During 1998-2003, the municipality pressed for the use of solar heating by means of a general subsidy to households for the installation of solar panels.
- At Växjö Public Transport Company, buses run on 50% RME (rape-methyl-ester). Växjö and a number of companies are co-operating to start production of DME (di-methyl- ether) and methanol, which can be extracted from biomass.

Overall evaluation

The city's accomplishments did not go without recognition. In 2003 Växjö became the proud winner of the Local Initiatives Award for Excellence in Atmospheric Protection for setting aggressive greenhouse gas reduction targets and outstanding efforts to achieve them.

Main innovative aspects

Noteworthy aspects of the initiative management are: Free energy advice, Eco-labelled electricity production, concerting in DME production, together with projects of public visibility such as "Energy efficient street lighting".

Enabling factors

Växjö has received an investment grant from the Swedish Ministry of Environment of approximately 9M Euro that generates total investments of 34M Euro, in a number of private and public organisations in order to reduce the use of fossil fuels by 32 000 tonnes.

Another important factor to be considered is the political consensus concerning Fossil Fuel Free Växjö.

Challenges

Mostly, the work with Fossil Fuel Free Växjö has been quite free from obstacles. There is a lack of public awareness of Växjö's offensive targets. We are more known among other municipalities in Sweden and the world for our work, than we are at home. The main problem is to change peoples' attitudes towards transports.

Political decisions at national level can sometimes be problematic for our objectives, for example tax legislation.

Comparing present project's perception with 1993, the initiative turned to be of secondary importance due to municipality's priorities related with the budgetary crisis,

Replication Potential

Many Swedish and European cities have declared they should be Fossil Fuel Free, Växjö was the first city to declare that. Växjö's system for monitoring fossil CO_2 has become a model for Swedish municipalities. Experience replication capacity has actually reached Japan, where the Iwate Prefecture will introduce bio-energy after studying Växjö's experience.

RES increase and CO_2 reduction

In 2002, RES stands for 43% of the total energy supply to Växjö (this includes transport sector). If transport sector is excluded, the increase was 52%, and the RES stands for 67% 2002.

Reduction of CO_2: 795 kg or 17.2 %/capita (1993-2002). This can be split into a reduction of 59.3 %/capita for heating and an increase of 20.6 %/capita for transports.

	Project Objective	Achieved	Comments
Solar			
DHW roduction	Approx 1,600 m² (200 places)	323 m² (38 places)	Solar energy stand for 0.3 GWh 2003.
Large collective solar systems	850 m² (11 places)	-	
Biomass			
CH and Power Biomass Installations		About 500 district heating installations each year (2000-2003)	Slightly fewer installations the previous years.
Dwelling heated by biomass	300 installations (Municipal subsidies)	More than 200 conversions from oil heating to biomass	Giving more than 6.5 GWh.
Transport			
environment-friendlier cars	200 cars	Less than 20	

BARCELONA
Renewable 2004

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Since July 2000, the Barcelona City Council has implemented a law concerning the use of solar energy. According to this «solar by law», all new buildings as well as those subject to general refurbishment, are obliged to use solar energy for 60% of their sanitary hot water supplies.
Moreover, the Universal Forum «Barcelona 2004» is being planned, which will take place at the seafront of the Besos municipality. For this reason, a significant renovation and remodelling of the Besos seafront is foreseen in the master plan as well as in the infrastructure development plan. These changes will entail considerable building work over the next few years. The urban renovation and reconstruction of this community provide an excellent opportunity to apply the principles of sustainable development. The Renewable Energy Partnership «Barcelona Renovable 2004» is being founded with this in mind, and with special emphasis on the energy cycle. Its general objectives are the application of renewable energies as well as energy efficiency measures, and reducing the environmental impact of the use of energy.

Main aims

The urban renovation and reconstruction of this territory offer an excellent opportunity for application of the principles of sustainable development. The Renewable Energy Partnership "BARCELONA RENOVABLE 2004" is being founded with this idea, and with a special emphasis on the issue of energy cycle. Its general objectives are the following:

- Promote the application of Renewable Energies.
- Promote the measures for the efficient use of energy.
- Reduce the impact on the environment caused by the use of energy.

Objectives

The «Barcelona Renovable 2004» initiative puts forward several specific propositions that should be attained by the beginning of 2004, such as:

- 1.35 / 4.5 MWp of photovoltaic systems,
- 10,000 m^2 of solar thermal collectors, district heating (25 MWt) and district cooling (30 MW c) from thermal solar energy and waste energy,
- 50 apartments with biomass heating, bioclimatic architecture in urban planning and building design,
- a community which is moving towards 100% renewable energy supply.

Project details

Three energy measures foreseen initially:

- PV central
- District heating &cooling system
- Energy efficient buildings

Besides this three energy measures foreseen initially, the new one is added: biogas digestors are being constructed within the same site. Biogas is going to be used for CHP.

PV fields on the site: Under initial planning the station has been divided into two units: the main pergola of around 1 MW and an additional installation of 150 kWp. First phase (main pergola) is going to be finished in February 2004. Second phase building October 2004 – March 2005.

District heating cooling system. The proposed DHC operation is based on the utilization of the TERSA's plant steam. 30 ton/h at 8 barg, 5ºC reheating are put in order to reach wep steam in the DHC central. An energy transference plant composed by heat exchanger water/water, a system of energy measurement and a control regulation system will be in each building. Along the primary unit mentioned before the water will be driven from the DHC heat plant to the secondary unit transferring the enough energy to satisfy the demand. The control system of the heat plant will allow to optimise its functioning, so much from the energy point of view as of the point of view of operation and maintenance. The system will allow also the monitoring and energy bill control in each building.

Bio Climatic Criterions – Applications & Control: The main topics proposed to be regulated are:

- Energy efficiency
- Implantation of renewable sources

The measures related to the energy efficiency are the following ones:

- Limit of the energy demand for building climatization.
- Lighting of buildings.
- Efficiency of the building air conditioning systems
- The measure related to renewable sources:
- Power generations systems by means of the Photovoltaic facilities
- Thermal energy generations systems by means of the Thermal solar installations

Enabling factors

The network connected PV systems benefits from the Spanish feed-in law, so they generate incomes. The installations bigger than 5kWp the price for each kWh generated and sold to the public network is 0,22 Euro/kWh.

Challenges

Currently, the exigency degree of the PV installations is the main doubt in the normative due to the prices of this technology. Nevertheless, the PV costs tendency is to decrease gradually. The consulting service focused on advices on the PV market and the possibilities to obtain subsides could help the building developers to fulfil this criteria.

MOLINS DE CAMPOS
Mills of the past winds of the future

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The project of Campos is an excellent alliance between the heritage from the past and the new technologies of the future, a multidisciplinary project joining heritage restoration, landscape maintenance, wind-energy production, search of new tourist products integrated and adapted to the environment and the recovery of local traditional productions.

The characteristics of the Balearic Islands' agricultural development have partly been determined by the archipelago's climatic conditions. Windmills were built to overcome irrigation problems due to a lack of surface rivers and streams. The type of windmill found in Majorca is based on designs that date back to Alexandrian times and the first windmills reached Europe from Persia in the 11th century.
During the middle Age, the number of windmills grew. Most were flourmills, but there were also watermills. All had rotors with sails of fabric. Windmills were not really put to use to extract water from the ground until 1845, with the work of the Dutch engineer Paul Bouvy and the plan to drain the plain known as the PIA de Sant Jordi. From then on, there was a spectacular increase in number. There are well over two thousand windmills on the island of Majorca.

Main aims

The "Molins de Campos" project was created as a result it is the result of a partnership between the RES and the heritage. For this reason, the project does not only involve the windmills' structural restoration ' but it also has a global environmental objective: to convert the windmill into a generator of wind energy - a clean, renewable source of energy - whilst also carrying out a series of parallel activities within the immediate vicinity, focused on promoting the use of windmills and their adjacent lands in ways which will lead to the generation of income and a number of different economic activities, within the framework of the sustainable use of natural resources and the protection of the environment.
The global idea of the project seeks not only the architectural restoration and obtaining wind power, but also to make the mills turn into reference elements for tourist use, as centres for craftsmanship and valorisation of the rural products of the area.

Overall evaluation

Having carried out the experimental study, in the light of the excellent results achieved, it was necessary to continue with the initial objectives. With this in mind, given the high cost involved in the restoration of the windmills, it was decided to start by concentrating on a first stage of the "Molins de Campos" project, which would focus on a group of about one hundred windmills.
The mills recovering process especially cared after energy aspects, that meant a far from negligible technological challenge, since the project's engineering had to resolve aspects such as adapting traditional rotors to present-day generators, within investment conditions that allow investment recovering in an acceptable time space.
The restoration of the cultural heritage that the windmills represent and the recovologically-friendly produce).

The initiative

There are four main aims behind the project, which is planned to focus on a figure of about 100 windmills:

- The restoration of the windmills, in their capacity as a part of historical heritage, thus reducing and indeed improving the negative visual, aesthetic and environmental impact of the windmills that presently exist in the area.
- The conversion of the windmill, by introducing technology that will take advantage of the island's wind energy, and the introduction of a new innovation, the small-scale production of electricity for use, energy-saving and, indeed, to replace other sources of energy.
- The creation of a sustainable environment in association with the windmill, using the resources of the surrounding area. Designing and creating the most suitable type of outdoor gardens and guaranteeing, above all, Majorca's biodiversity by the use of native island species of plants.
- Parallel activities, which help to guarantee the feasibility of the project as a whole. Introducing the concept of sustainability to rural farms and to the development of tourism and cultural attractions.

Results

More than 100 windmills have been restored until the present. Currently it is being widening the initiative with the project of a visitors center (RES and Heritage).

Enabling factors

Support of Ministry of Environment.
Good perception by the creation of a new tourist product.
Reinforcement factor of the local economy and the rural productions.

Challenges

Administrative processes for connection to net and need to unify the maintenance services.

TENERIFE
ITER - Renewable Energies and Bioclimatics

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ITER (Technology and Renewable Energy Institute) is nowadays one of the main research and development centres working on RET applied to island areas. Among its activities, an ambitious and complex project dealing with RE promotion, dissemination and development has to be emphasised: a Visitors' Centre dedicated exclusively to energy issues, a development formed of 25 bioclimatic houses, and an open-air technological walkway for Renewable Energies, are the highlights of the dissemination centre that will be inaugurated in ITER installations on January 9th 2004.

Main aims and motivations

ITER is a company founded by Cabildo de Tenerife, the island government. One of its aims was to promote Renewable Energies and become a centre of reference on these issues. Moreover, ITER is a UNESCO Centre of Excellence for training and dissemination of RET, with the support of INSULA.

Therefore, this dissemination platform is a way to achieve a higher impact of awareness and information to the public at several levels: children, students, decision makers, professionals, etc.

Project Detail

The installations work as a whole. Visitors will begin their visit in the Bioclimatic Visitors' Centre, where they will learn about energy and its impacts with a multimedia exhibition. The monitoring of the bioclimatic development also takes place here, and information will be constantly displayed in 25 computers. Afterwards, the visit continues in the Technological Walkway, where RE technologies are shown and explained, and the development with the 25 bioclimatic houses.

The rest of installations of ITER, such as the three wind parks, the PV concentration plant EUCLIDES, the desalination plants, the flat PV plant and the wind tunnel among others, will also be available for visiting. Another 22 MW wind park is foreseen for 2004-2005.

Conferences, working meetings, seminars and other dissemination activities will take place in the Conference Room of the Visitors' Centre.

Main Innovative Aspect

The innovative aspect relies on the pioneer showcase of RET on a single place, with the necessary infrastructure for dissemination. All infrastructures to guarantee the development of promotion and training activity is associated to the ITER Technological Centre which includes a wind park of 30 MW. Another highly innovative aspect is to open the centre to the tourist activity.

Regarding the bioclimatic approach of the development, the trends have evolved to reduce costs in buildings even if it implies the addition of expensive, energy-consuming, and unhealthy conditioned air systems. A significant number of different solutions from architects all over the world are proposed, proving that rational criteria used during the designing phase can considerably reduce the energy requirements of the building. RE implementations considered incorporate several innovative features as high efficiency and maximum integration of PV solar cells and wind power in the designs. There is no such installation where 25 different dwellings from different architects from all over the world may be analysed altogether.

Overall Evaluation

This project has the general purpose to increase popular knowledge on energy and renewables, as well as to promote energy saving by individuals. The project itself may not contribute to a significant reduction in energy consumption (besides the production of the 70 kW PV panels included in the development), but it is expected that the energy balance of the village will be even, without increasing the overall consumption of the island. Furthermore, as a demonstration and dissemination project, it would enable the application of successful solutions in other buildings in the medium term.

Challenges

The main challenge has been the large investment that was done to implement the idea of the development and other infrastructure just for demonstration and dissemination purposes, as well as the planning for all of the installation to come together on a limited amount of space.

Replication Potential

Some similar and smaller installations have been made in other places, some of them after examining the outcome of the Technological Walkway at ITER. It is expected that the enlargement of the dissemination activities and infrastructure will help for this experience to be widely spread and replicated in other areas and countries.

EL HIERRO
100% RES
A Biosphere Reserve island

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The island of El Hierro, Canary Islands (Spain), declared a Biosphere Reserve by UNESCO in 2000, has an area of 276 km², a population of approximately 10.000 inhabitants, and is not connected to a continental electricity grid. Currently, the electricity demand is covered by a conventional thermal power station (diesel system: 8'285 MW). The island has a big RES potential, mainly wind, and wants to implement a 100% RES project for its energy supply. In order to reach this objective 3 different programmes are to be implemented:

- Energy Saving Programme
- The "100% RES for Electricity Production" Programme
- The Transport Programme (conversion from Fossil Fuels to Clean Transport)

With the financial support of the DG TREN of the European Commission, a consortium of 7 partners, coordinated by ITC (Instituto Tecnológico de Canarias), will carry out a project that will focus on the "100% RES for electricity supply" programme, which aims, in a first phase, at covering 70-80% of the electricity demand of the island by means of several actions. The set objective can only be reached by the integration of several RES. In this context the following actions are in focus:

- Implementation of a Wind - Pumped Hydro Power Station (with the target of covering 75% of the island's electricity demand and achieving 30% direct wind penetration into the grid)
- Implementation of a Solar Thermal Energy Programme
- Implementation of a PV Roof Programme
- Implementation of a Biofuels Programme

Main motivations

The bet on a strategy aiming at the attainment of a 100% RES island already appears within the Sustainable Development Plan of the island, supported by UNESCO, which defends an advanced concept of Biosphere Reserve as an insular development model and laboratory. The Reserve is characterised by a high degree of participation of the local population in the strategic decisions affecting development, where energy options are linked to the productive model, to the integral exploitation of endogenous resources, and to population's quality of life.

Hundreds of European islands (with more than 5 million inhabitants), and thousands of islands worldwide, could benefit from the results of this project. As a consequence of the foreseen actions, the following results are expected:

- Reduction of GHG emissions
- Increase of life quality on islands
- Increase of energy independence on islands
- Demonstration of the fact that RES integration is a way of providing 100% energy supply on isolated islands
- Demonstration of the fact that synergies between RES (e.g. combination of wind, hydro, solar, etc.) can highly contribute to increase RE penetration into weak grids in isolated areas
- Demonstration of the fact that pumped water storage is an economic way of accumulating energy
- Optimisation of the available potential of RES using them together in integrated systems for local power supply

Innovation

The most innovative part of the project from the technical point of view is the Wind-Hydro power station (WHPS). This is an innovative concept of combination of 2 RES: wind and hydro power, using the water as energy storage. The system overcomes the usual problems of intermittency (discontinuity) and power fluctuations caused by the random character of the wind resource and, thanks to the potential energy storage (pumped water) and the controllable power output of hydro turbines, can establish a stable grid in terms of frequency and voltage. This is the first experience world wide of a WHPS that will provide, on a yearly basis, approx. 75% of the electricity demand of an isolated area and, in some months (like in June, July and August), 100% of the electricity demand. Another innovating aspect is the creation of a utility for the development of the 100% RES Hydro-Power project. Consistently with the strategy set in the Reserve, an important part of the new company's shareholders are within the local population, the others being the former utility and the Cabildo (Local Government).

Replication

An important part of the project is devoted to the construction and monitoring of the WHPS on El Hierro, but also feasibility studies for WHPSs on Crete and Madeira will be elaborated and potential for other islands will be assessed. Furthermore, aspects concerning integration and involvement of the island population in the foreseen actions (in order to guarantee acceptability of RES) will be addressed. In order to try to replicate the project, emphasis will be put in identifying islands that could benefit from this kind of systems and also in elaborating a dissemination plan.
The project demonstrates that, in conditions of liberalisation and for isolated areas with acceptable resources, the RES option is viable and competitive.

BIOSPHERE HOTELS
Renewable Energies to build Sustainable Tourism

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The Responsible Tourism System is an independent system of certification, which publicly recognises the environmental quality of the management, technological innovation and services on offer in tourist establishments.

The RTS meets a need for external and visible recognition to distinguish the efforts made by member establishments. This recognition is given by an independent agency, the Institute of Responsible Tourism (IRT), that certifies and guarantees an establishment's commitment to responsible tourism practises, with the RES like the best tool for continual improvement.

The Institute of Responsible Tourism (IRT) was created after the World Conference on Sustainable Tourism (1995). It is an independent agency that has been set up to implement Sustainable Development actions and programmes in the field of the tourist industry, in line with the recommendations contained in Agenda 21 of the Rio Conference, the Sustainable Tourism Charter and the guidelines that have emerged from different UNESCO programmes related to sustainable development and the protection of the world's cultural and natural heritage.

RES objectives

The objective "Toward 100% RES" has been implemented by the Institute of Responsible Tourism by means of the RTS in accordance with a voluntary Programme of Energy Efficiency Policy (compulsory for each hotel) that should include not only measures related with rational use of energy, but also those regarding the Plan of RES implementation of each hotel (including also the incorporation of solutions like the green certificates).

Enabling factors

Through the Biosphere Hotels certification system it has been possible to create a favourable environment for the use of renewable energies in hotels.

The case of Lanzarote is a model to follow. Since 1998, when the RTS started to be introduced and the first BIOSPHERE HOTELS were certificated, the total area of solar panels installed is now a significant reality. In 2003 10,000 m^2 of solar panels are working in Lanzarote (in the framework "A new sun project" with ICAEN and ASOLAN). The number of establishments that joined this solar thermal initiative is encouraging enough. The objective for 2004 is to achieve 20,000 m2 of solar panels installed in hotel establishments that joined the RTS.

Replication Potential

Between 1998 and 2003 more than 50 hotels of island regions have been incorporated in the system. The target is to reach 100 accreditations in 2004.

In order to facilitate the transfer of experiences and the dissemination of a sustainable tourism culture, the IRT carries out and promotes a whole series of complementary activities and accompanying measures.

The IRT systematically promotes international seminars, workshops and meetings with a view to disseminating successful initiatives in the area of Sustainable Tourism and especially the experiences that emerge from within the International Network of Biosphere Hotels.

A promotion example

The IRT, in cooperation with the ICAEN, which is the coordinator of this initiative, and INSULA, launched a sensitisation campaign aimed to promote renewable energies in the tourist sector on islands that have been declared "Biosphere Reserves" by the UNESCO.

The campaign is centred on the islands of Minorca, Lanzarote, El Hierro, Galapagos and Guadeloupe, and relies on the support of local governments and associations. In these emblematic island territories, commitment for a tourism sustainable development started to forge important projects in the fields of energy, water and waste management.

This initiative involves a commitment with islands' tourist associations and technology providers in favour of the promotion of a maximum use of renewables in the sector. Their status of Biosphere Reserve give them an outstanding capacity of experience dissemination through the International Biosphere Reserve Network.

The main actions planned in the Solar Marketing Campaign are based on tourist sensitisation, with the support of the local tourist associations, including:

- Self-supported posters placed in small-island's airports and in the most visited places in order to attract the attention of visitors, with few text and concepts such as sustainability, RES and RUE technologies, eco-labels, etc.
- Display for containing brochures to be placed in Hotels, city halls, tourism offices, local associations, etc.

A questionnaire to be distributed to the tourist could be defined in case a survey is considered an important aspect of the Campaign.

The Campaign is part of a wider unit of actions and projects aimed to consolidate, in the medium term, tourist destinations which are energetically clean, 100% RES supplied and environmentally friendly.

In the same way, the IRT is now implementing this campaign of sustainable tourism in Cuba, La Palma, Eastern Island (Chile) and Sea Flowers Archip. (Colombia).

LAUSANNE
Solar City

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The city of Lausanne in Switzerland and its Utilities (SIL) has already received international recognition and several prizes, among which the European Solar Prize, for the city's major effort in developing RES. City's activities aim to develop PV: among others a 570 m^2 surface of solar panels was installed on a city Sport stadium. Other activities are in the area of solar thermal, biomass and district heating systems (DHS).

The Initiative

Lausanne has for some time been committed to an annual investment to guarantee a minimum installation of 10 kWp PV capacity. This program stopped in 2000 and was replaced by a «solar stock exchange».

The broad PV activities encompass the installation of a PV roof on the sport stadium. Hence, the 65 kWp solar generator occupies a surface of 570 m^2, composed of 1.296 panels. The electricity current is re-injected after having been transformed into AC of 220 volts.

Another project offered the possibility to citizens to buy a solar kit, largely subsidized by the city to reach the price of 550 Swiss francs (about 350 euros). This campaign introduced in 1999 has had so much success that there were no solar kits available any more.

More than 400 m^2 of solar thermal panels have been installed by the Lausanne Utilities on residential buildings property of the City of Lausanne.

Other activities include RES when making urban planning. For instance, the SIL pushes to integrate biomass DHS instead of choosing a cheaper but unclean option. The investment is minimal for the owners, but is transferred to the cost of the people renting the houses.

Overall Evaluation:

The overall RES approach has been very successful, partly because it has been able to approach citizens by giving them ready-for-use products (the solar kits), and partly because one of the most symbolic place of the city, the Pontaise stadium, has become a symbol for an innovative and clean approach to energy supply of a city.

Main innovative aspects

Subsidies on photovoltaics range between 1,000 and 2,000 CHF (640–1,300 euros) according to the installed peak power of the PV plant.

Lausanne utilities also introduced in 1997 a local tax of 0.025 CHF/kWh (0.016 EUR/kWh) on the increase of the annual consumption of electricity. The amount of money in the so-created fund is thus directly proportional to the variation of the Lausanne's annual consumption and can only be used for investments made in the renewable energy for electricity production (hydro excluded!) and energy efficiency for electrical appliances sectors.

Enabling factors

The fact that Lausanne developed this original fund combined with the influence of a strong Green party and a charismatic person representing the party have played a major role by influencing energy efficiency and renewable energy projects.

Challenges

The introduction of a tax is a sensitive issue: only an increase in energy consumption will lead to further investments in RES, whereas RES and EE efforts should ideally go together. The push for houses to be connected to a biomass DHS is also a delicate step: All the cost is reported onto the renters, a majority in Switzerland, without having given them the choice to do so.

Replication Potential

Inspired by the example of the PV stadium of Lausanne, another PV stadium was inaugurated in 2002 in Basel (Switzerland). Several regions of Switzerland have also finalized their interest in PV kits and bought 400 of them.

Environmental targets

A good example of concerted approach between the regional authority dealing with transport emissions, and the electricity utility dealing with electricity and heat emission in houses is, for instance, in the case where a big supermarket is planned in the periphery of the city, because this generates many traffic emissions, the electricity utility pushes to convince the legislative power to declare the obligation to connect the building zone to DHS.

Innovation	Installation of a PV roof on the sport stadium for a surface of 570 m^2, for 1,296 panels; more than 400 m^2 of solar thermal panels installed by the SIL on residential buildings property of the City of Lausanne.
Photovoltaics	17 installations PV plants have been installed and are owned by the Services Industriels de Lausanne (SIL) for a capacity of 190 kWp 8 PV installations for 234 kWp are in private ownership but under the contract of SIL in the framework of the Solar programme (bourse solaire); three electrical boats (each powered by 3.5 kWp of PV, are operational on the lake of Geneva for tourists). The proportion of PV represents 0.02%.
Solar thermal	The total m^2 surface of solar thermal integrally covers the yearly consumption of hot water for 200 people
Biomass DHS plant	The DHS is powered by the waste burning plant, the wasted water treatment plant and a wood-fired plant
Overall RES increase	Still a very low % compared to large hydropower and nuclear power
Creation of jobs	Small local enterprises active in PV have been able to survive and are well established by now, thanks to the mandates of the SIL

POWYS
Renewable Energy Development Plan

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Powys decided to become 100% RES supplied between the period of 2000-2010. To achieve this target they implemented various projects and established an Energy Agency in 2000.

Main aims and motivations

The combined aim of all the projects is to completely cover the county´s energy demand with a supply of renewable energy. Powys wishes to establish Mid-Wales as a model utiliser of Renewable Energies for the UK and therefore to get the community better known on a national and European level. Increasing public awareness of RES issues is also a concern of the campaign.

Project Details

With the calculation of approx. 49,000 homes in the County in 2000 the following targets were established:
Establish an Energy Agency, 5,000 solar thermal water collectors, 100kWp PV, 20 hydro schemes, wood fuel heating projects, anaerobic digestion, Energy database for resource within the county.

Overall Evaluation

Other than wind power the projects are starting from a very low base. It can be seen, however, that a continuation of the work will start to make significant headway on the issues. There has already been a larger acceptance of wood fuels but the overall awareness has not increased significantly as yet.
10 long-term jobs have been created so far, 5 of which are directly dealing with RES matters. There are 2 indirect posts but this will increase dramatically as income is retained locally and wood fuel projects grow.

Involving the community

Shares from the community wind turbine were sold to the community. This served not only to generate income but also to raise local confidence in the turbines through participation. Due to PV, the electricity bills were reduced and a certain amount of free electricity supplied to the community.

Enabling factors

The campaign has support from many sources. There is financial aid from DG-TREN SAVE and ALTENER projects, technical support from The Carbon Trust, political support from the National Assembly Sustainable Energy Group, legal support from the County Council, administrative aid from the Welsh Development Agency. The campaign is also supported by the Forestry Commission, Utility Companies, Wales OPET Cymru, other energy agencies and many more.

Challenges

There was a general lack of public awareness of Renewable Energy issues and also opposition to large wind farms as the negative aspects are more widely known than the positive. It was vital to engender confidence in the
Energy Agency in order for the project to be a success but also to use best practise case studies both from the UK and elsewhere in Europe.

Replication Potential

The same potential exists in many other places. Powys County Council knows of no other similar initiatives to be set up so far but people have expressed interest.
It has been learnt that using project partners to influence local decision makers is very effective and that projects like Powys are very important as national policy can probably be influenced by local example.

Perception of the RES situation at the end of CTO

People are more concerned about RES issues today than in 1999 and this is reflected in greater support from the population. Obstacles to the establishment and implementation of RES projects have also decreased in this time.

RES Increase

The results of the Powys project so far constitute a 2% rise in RES share on a local level. There is already a CO_2 reduction of 45,000 tonnes; an NO_x reduction of 156 tonnes and a SO_x reduction of 520 tonnes.

Key facts of the project:

- 1 community owned wind turbine with a capacity of 75kW
- 19.8 MW supplied by large commercial wind turbines with a further 10.2 MW in the planning stages.
- It is difficult to determine the overall capacity of the utility owned wind turbines, as there is some repowering being undertaken.
- From a goal of 100 kWp to be supplied by PV systems, in 2003 59 kWp were generated from 8 systems, which though not the optimum amount, still represents a significant increase.
- 80 m^2 of solar thermal collectors for domestic hot water
- 124 m^2 of solar thermal collectors providing district heating
- 1 Biogas installation
- 2 sustainable energy settlements established
- Establishment of an Energy Agency

ISLE OF WIGHT
Powering the island through renewable energy

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The project brief was to prepare a renewable energy strategy for the Isle of Wight as part of a larger project called IRESSI (Integrated Renewable Energy Systems for Small Islands). The study outlines the RES exploitation potential of the Isle of Wight, taking into account a wide range of factors including economic, technical and social considerations. The UK government set a target for the Isle of Wight to reach 67MW of energy coming from renewables by 2010 and this project was the subsequent reaction.

The Project

Background analysis : discussing the options for the Isle of Wight in terms of RES potential and giving the technical potential for various options. States possible upper and lower bounds for the contribution renewable energy could make to the Island by 2010.

Cost Benefit Analysis: gives the indicative economic costs in detail and discusses the environmental and social issues concerned with each technology option.

Flagship projects: identification of six projects covering a range of technologies with greatest potential for short-term implementation.

Overall evaluation

The active participation of the community was sought as a fundamental first step. Public opinion is now in favour of trying to achieve more than the ambitious target of 10% of electricity generation supplied by RES by 2010 and making greater efforts to conserve energy.

As a result of the project here is now a greater technical knowledge; an awareness of the potential of each technology; what the Island can support in terms of generating capacity and how to maximise local gain. On the other hand, the project was unable to overcome some local opposition to wind energy (mostly onshore) as it is believed that it will spoil the unique environment and landscape of the island.

Enabling factors

The Isle of Wight Council along with various voluntary and community organisations participated in public awareness campaigns. ITC (Intermediate Technology Consultants) produced technical and cost benefit analysis for the study. The EC ALTENER programme provided 50% of the funding. Gotland Energy Agency became project partners and acted in an advisory capacity.

Challenges

The study shows that the provisional targets for local generation could be reached although the necessary action has not yet been taken.

Similarly, job opportunities and R&D have not yet occurred, but the study has raised awareness of the opportunities.

There was difficulty in analyzing the domestic use of solid fuels and heating oil for the baseline data. There would also be difficulty in being entirely accurate about the renewable energy potential although this was overcome by stating upper and lower bounds.

Replication Potential

Similar analysis was undertaken on three other UK islands at the same time. The same methodology could be used anywhere but it would be more difficult to map energy flows in non-Island areas.

Change in perception of implementing RES projects (1999 – 2003)

Planning obstacles to RES projects are decreasing and there is likely to be a more positive role for local authorities in promoting RE.

More funding (grant-aid) is available and greater public awareness of the need for local generation.

The local population is more prepared to work alongside the local authority to find appropriate solutions for the local area. The Anti-wind lobby is, on the other hand, becoming more organized and more vocal.

Type of energy	Practical Resource		% Achievable Contribution	
	Lower Bound	Upper bound	Lower Bound	Upper bound
Wind				
On-shore wind	12.0 MW	18.0 MW	5.1%	7.7%
Off-shore wind	0.0 MW	50.0 MW	0.0%	27.2%
Biomass Anaerobic digestion using Dairy cow	0.2 MW	0.5 MW	0.3%	0.7%
Centralised CHP plant using 2.8 MW SRC and forest resi	2.8 MW	5.3 MW	3.6%	6.7%
Tidal Currents	0.0 MW	3.0 MW	0.0%	1.6%
Existing RDF/CHP Plant	1.7 MW	1.7 MW	1.1%	1.1%
PV	0.0 MW	0.1 MW	0.0%	0.02%

WARMIA & MAZURY
Biomass utilisation for energy purposes

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The Region of Warmia and Mazury is located in North East Poland and has a structure of fuel consumption for heat production that is dominated by coal. Other major fuels include light oil and in larger towns also natural gas is used. District heating is common even in rural areas of this region which is among the least industrialised of Poland, and where there is high unemployment especially in rural areas.
This project describes how biomass district heating plants (DHP) have been developed in the region to replace traditional fuels with a more environmental source of energy, at a time where refurbishment, or even replacement, of the old coal district heating systems is needed anyway for a significant amount of them.

Main motivations

The region is characterised by availability of wood fuels derived from forestry and local wood industry and a significant surplus of straw existing in the agricultural sector (forestation in 2001 was 30%), there was the opportunity to put an end to the heavy reliance on local fossil fuels.
The typical owners of local district heating systems are local authorities, which in that region seem to be often poorer than in other regions of the country. As such, local investors have to search for external funding, which since the end of 90's is hardly available for fossil fuels while it can be accessed for RES projects. Typically this difficult situation led to biomass replacing the old heating systems, while at the same time creating new jobs.

The Project

Having gained inspiration and knowledge of modern applications of biomass technologies already implemented especially in the EU, the regional authorities of Warmia & Mazury recognised the opportunities for the wider deployment of renewable energy in the region. The political will to stimulate wider deployment of biomass technologies was then translated into allocation of a high priority by the Regional authorities set in the list of priority investment to be co-funded by the Regional Fund for Environmental Protection. At the end of 90-ties some pilot investment projects were developed, that later became a basis for spreading out good practices and further replication in other communes of Warmia & Mazury.

Innovative aspects

The first projects have been to a certain extent the direct replications of technological solutions from the EU. However, growing interest in the utilisation of biomass for heat production in the region led to using some local engineering and manufacturing capacities and using some locally invented technological improvements helping to decrease the cost of biomass application while improving their efficiency.

Challenges

- A major barrier faced especially in the initial period of the development of biomass DHP in the region was a mental barrier among the local decision–makers. Typical prejudices about biomass resulted from the lack of knowledge and a strong perception of coal or gas/oil as the only modern and secure options for local energy production. Especially the utilisation of straw faced a strong distrust as it was believed to have too low calorific value and also perhaps considered as going back to " stone age technology".
- Financing tools to support biomass projects on the regional level were provided by the Regional Environmental Protection Fund. At the end of the 90's they started to provide soft loans and subsidies with a high priority given to biomass projects. At an early stage, special conditions were created for local authorities, allowing to write off up to 50% of debt provided that these funds are then used for further environmental investments. First investments were characterised by high costs typical to applications of new technologies and the lack of experience in this field. However, with a growing number of biomass investments, investment costs of further replication projects decreased (e.g. by 30 % in case of some straw-fired installations).

Replication Potential

Warmia & Mazury Region can be used as good example for the other regions of Poland and other countries of CEECs. It seems that regional authorities may indeed play an important role in the deployment of RES technologies at a local level especially if they can access some regional financing schemes such as environmental funds.

Boosting Regional Bioenergy Utilization (1999 – 2003)

The efforts of Warmia and Mazury regional authorities have been well in line with the Polish National RES Strategy endorsed by the Council of Ministers in 2000 and approved by the Polish Parliament in August 2001 that set a target to increase the share of RES in the primary energy balance of Poland from 2.5% in 1999 to 7.5% in 2010. In 1999-2003 in the Region of Warmia and Mazury over 30 local biomass DHP were installed with the total capacity of 90 MW.

INGALINA - DIDZIASALIS
Biofuel Boiler House and District Heating

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Ignalina and Didziasalis are neighbouring towns on the Northeastern part of Lithuania in the Utena region, relying upon heat supplied from biomass. The biofuel boiler installation and district heating projects are part of Sweden's International Climate-Related Energy Program. The Ignalina project was implemented in 1999 and the Didziasalis project followed the example of it's success in 2001.

Main aims and motivations

Ignalina: The regional administration wished to reduce the use of heavy fuel oil (mazout) and to start to use local fuel as biomass.
Didziasalis: The district heating system was installed in the 1980's to support the building material industry. When the industry was closed down in the early 1990's the heating system became inefficient to heat the remaining buildings in the town due to it's high production costs, being designed to supply a larger market than was actually needed. Following Swedish Energy Agency (STEM)'s financing of the first Ignalina project, Ignalina regional council turned to STEM for some financial support in the restructuring of the heating system in Didziasalis.

Project details

The Ignalina project concentrated heat production into one newly renovated, already existing boiler house and closed down two old boiler houses. Mazout, with a lower level sulphur content, will still be used but to a far lesser degree for peak load and reserve capacity instead of the previous 60% of supply. The Ignalina project includes the installation of new pre-insulated pipeline of 300 meters to connect the existing networks as well as 30 new substations in buildings and block centers. In Didzaiasalis a new more cost effective boiler house was built nearer the town. Furthermore the distribution system has been partly renovated and 43 substations installed.

Overall evaluation

Ignalina regional administration fulfilled the aim to reduce the use of heavy fuel oil (Mazout) and to start using local fuel as biomass to create local employment and adhere to stricter environmental rules that came into force in 1999 from the Lithuanian government. Biofuel is expected to replace 2,300 tonnes of Mazout for each project. The energy saving from the pipeline and substation networks amount to 1000 MWh/y per project.
Recently Ignalina town inagurated further biofuels boilers in the same boilerhouse as the first project. This means that the heat supply in the whole town and practically the whole surrounding Ignalina region is based on woodfuel.

Enabling factors

Both projects received financial support from STEM in the form of loans. The Didziasalis project also received 50% of costs from the Lithuanian government. Ignalina has 6 different suppliers of biomass so there is now possibility of price competition.

Challenges

All municipal heating plants and distribution networks were decentralized in 1997 and many municipalities became shareholders in district heating companies. This caused problems as big towns and smaller communities had different requirements. Further reorganization took place and municipalities took over the direct management and responsibilities of the heating companies in their area. This can cause credit problems, as most lenders normally require a 5-6 year economic result history before providing loans. STEM was prepared to take the risk here as state guarantee was provided but this is only the case for few regions.

Replication Potential

The population is quite evenly spread out which is important for the implementation of biofuels projects. Therefore the conclusions of the Ignalina project will contain valid insights for Lithuania in general. Biofuel resources in the country are good and the technology is available, nearly every municipality has a District Heating system installed that could be renovated and reworked to make it more efficient and utilize biofuels.

Change in perception of implementing RES projects

It was easier to implement the Didziasalis project as financing was sought from the same source as for the Ignalina project.
The Lithuanian authorities assert that the projects have played a role in the early introduction of RES into the country.

RES Increase

The savings caused by the plant from 1998 to 2000 in Ignalina alone are as follows:

- Expenses from heat energy production in the company decreased by 26.5%
- Total heat energy costs per unit were decreased by 17.7%
- Expenses for fuel import were decreased by 93.4% due to the fact that all the biofuel is produced locally in contrast with the imported fossil fuels.

	Ignalina	Didziasalis
	Energy MWh/y	
Biofuel Mazout	25,000 10,000	145,000 1,500
	Reductions	
CO_2 SO_2 No_x	8,112 t/y 123 t/y 3 t/y	6,300 t/y 50 t/y 5 t/y

BULGARIA
National RES Programme

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Bulgaria imports 70% of the primary energy carriers it needs and the National GDP energy intensity is higher than the EU country average. The RES share is less than 0.4%. Since 1999 legislative initiatives have started to be developed. The National Programme on RES is designed to support these developments by increasing the share of renewables with the aim of reaching 8% by 2010.

Main aims and motivations

- to reduce dependency on energy imports
- to introduce modern clean and green energy generation technologies from the EU
- to realise prospective investments of 1647 MUS$
- to create 2000 more jobs by 2010, and
- to save 4373 thousand tons of CO_2/y

The Programme

920 investment projects and project proposals within the NPRES have been collected by the Energy Efficiency Agency (EEA). They include solar hot water, solar PV, wind power generators, small and medium hydro, geothermal, biomass and biogas installations. The EEA will organize seminars, workshops, mass media transmissions and be responsible for training courses and brochures. NPRES has the task of amending the legal framework by drafting new laws and harmonizing them with those at EU level. Another aspect is the establishment of regional and communal programmes for sustainable RES technology development.

Overall evaluation

Many projects are underway (see table) and some municipalities have developed local plans for the use of RES. Local investors and entrepreneurs have become interested. Though the campaign is taking more time than planned, it is setting good guidelines for future campaigns as this is the first ever national programme on widespread application of Renewable energies in the Republic of Bulgaria.

The process would be made easier through better interaction between the institutions involved and greater networking would be advantageous. Of primary importance are the favourable changes to legislation as they enable the projects to be conceived and completed, e.g the New Energy law with a special chapter for RES.

Main Innovative Aspects

Public private partnership should be used in projects. A Green certificate system is planned to be put in force to regulate and facilitate the electricity produced by RES and CHP. The EEA is also promoting a performance contracting model for the Bulgarian conditions, various mixed financing schemes and special credit lines for RES projects.

Enabling factors

Technical assistance was provided by technical universities, the Bulgarian academy of science and private companies. Government policy also supported the campaign objectives. Financial backing came from ALTENER, PHARE and SAVE. The Ministry of Energy and Resources, The Ministry of Environment and Water, The Ministry of Regional Development are also involved in this promotional process.

Challenges

Still there are insufficient financial means to implement projects. There is a necessity for a real open energy market and relevant energy efficient and renewable legislation that ensures such a market will work to decrease financial difficulties.

Insufficient public knowledge of RES and related issues can be combated through the establishment of more examples of different RES installations within the country.

Change in perception of implementing RES projects (1999 – 2003)

The issue of sustainable energy is of greater concern today than in 1999 due to better training courses and awareness and obstacles to RES development are decreasing due to the same reasons and also supportive legislation.

Technology	Objective	To be achieved
PV Systems	86 Solar PV projects with a total value Of 49.7 MUS$; power capacity 12.34 MW	replaced conventional energy 43,484 MWh/y 52.5 thousand tons/y reduced CO_2 emissions
Thermal collectors	509 Solar Thermal collector projects with total Value 81.09 MUS$; heat capacity 202.72 MW	replaced conventional thermal energy 709,506 MWh/y; 248.3 thou t/y reduced CO_2 emissions
Privately owned wind farms	30 wind power projects with total value of 162.19 MUS$; total power capacity of 62.22MW	replaced conventional electric energy 373,260 MWh/y; 451.1 thou t/y reduced CO_2 emissions
CHP biomass Installations	89 Biomass, biogas, and natural gas (detander) projects. Value 393.22 MUS$; total heat capacity 498.71 MW; total power cap 244.26 MW	replaced conventional heat energy 3,118,233 MWh/y; 1,372.1 thou t/y reduced CO_2 emissions
High temperature geothermal	48 projects with value 393.22 mUS$; total heat capacity of 786.44 MW	replaced conventional heat energy 3,145,728 MWh/y; 1,100.1 thou t/y reduced CO_2 emissions

TRHOVE SVINY
Biomass Heating System

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A biomass heating boiler in the municipality of Trhove Sviny replaced an old type of heating boiler. The alternative heating systems installed were based on the criteria of cheaper, environmentally friendly and locally accessible renewable energy sources. The heating biomass boiler has reached an installed output of 2,500 kW.

Main aims and motivations

The installation of a biomass heating boiler has solved the problem replacing the traditional and nonfunctional heating boilers with coal (previously in two pieces). As a result, 1 million m^3 of natural gas was saved, which had been the normal way of heating until then.

The Project

The local municipality of Trhove Sviny established a heating management system in 1998 that integrated the property of the Trhove Sviny town (boiler plant, conveyance of heat, etc...). Despite the fact that the town of Trhove Sviny had trouble in obtaining support from the ministry level, the local authorities and population were very motivated and managed to collect funds from the national energy agency and from Austria.

Innovative financing scheme

Costs have been saved on natural gas, which is becoming increasingly expensive. There is also a loan that can be repaid back (roughly 20 millions Czech crowns (CZK), about 630,000 euros). From 1999 until 2003, 10 millions CZK have already been paid back. Four blocks of heating boilers were settled and by connecting to this particular biomass heating boiler, the town was able to save the above mentioned expenses.

Enabling factors

The interest and awareness of local people were raised to facilitate fast realization of the project. Although the heating boiler was made in Austria, the construction process was entirely managed by local Czech companies.

Challenges:

Despite the project being approved by representatives of the municipality and supported by the interest and approval of citizens who had a unit already installed, the Ministry of Environment of the Czech Republic refused to deliver a subsidy for the realization of this project. Support was hence found from the Czech Energetic Agency (3 millions CZK, about 94,000 euros, which represents about 15 percent of the total realization costs) and from the Austrian Ministry of Environment in Vienna (similar amount: 3 millions CZK – again representing 15 percent of total realization costs).

Although this project was first of its kind in Czech Republic, no political interest and political will existed for such an initiative at the time of implementation. According to the project partners it was also not yet time politically to implement such a project. But the present situation has very much improved.

Replication Potential

This project attracted a lot of people – representatives of local municipalities (villages, towns), students of universities, members of different associations, societies….

This model project helped to start similar projects in Czech republic and was replicated in many towns and villages.

Change in perception of implementing RES projects (1999 – 2003)

It is getting easier to implement RES projects: even if it is still a slow process, it is generally heading to the right direction. This project contributed to a much better perception of RES initiatives in the country. The political interest and political will have both increased and environmental awareness of local people has risen.

RES Increase

The fuel consumption for 2002 was approximately 13.300 prm.

25,000 GJ of heat was made. The total CO_2 emissions were reduced.

Follow-up

On the basis of previous success, the project developers are willing to continue their activities in this field. They have already begun to implement a biomass cogeneration unit. They can now apply for funds from the State environmental Fund of the Czech Republic and obtain a non-returnable grant of 50-70 percent and a loan with a low interest rate 10-30 percent. If they are successful, they will be able to produce 600 kW of electricity per hour. According to the Czech law the Energy Regulatory office in Czech Republic is obliged to buy the "Green energy" for 2.50 CZK/1 kWH. They have huge support from the mayor of Juhocesky kraj and are trying now to get similar support from the Czech Minister for Environment. If the project is realized this would make it unique in the entire Czech Republic as a model solution which could be followed by many replicators in the very near future.

Biomass Heating boiler	2,500 kW installed output
Gain	25,000 GJ of heat The fuel consumption for 2002 was approximately 13,300 prm.
Community	saving of fuel expenses, electric energy, emissions, storage of waste, personal costs (wages) free labour force was used by the municipality in public service

ALQUEVA Multipurpose Project

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The Multipurpose Alqueva Project is located in Alentejo, a region in the south of Portugal that occupies an area of approximately one third of the country mainland. The region population is around 543 000 inhabitants, equivalent to a population density of nearly 20 inhabitants per $km^{2.}$ Alentejo is mainly a rural region, on which 1,7 million hectares of its area is agricultural land; the primary sector accounts for 16% of the region total employment and represents 12% of the region Gross Domestic Product.

The Alqueva Project has a direct influence on 19 municipalities located around Alqueva lagoon and / or benefiting from the installation of new irrigation areas.

Main aims and motivations

Besides Alqueva and Pedrógão hydropower plants mentioned above, EDIA strategy on Renewable Energies has been developed by the implementation of some actions on wind energy, biofuels and solar energy. All this actions are based on the establishment of important partnership with local authorities, research institutions and other private companies on the energy sector.

EDIA strategy is also in compliance with the national energy policy, approved by the Portuguese Government and published on the Ministries Council Resolution n. 63/2003 of 13th March, and, in particular, regarding the strategic objectives of energy supply security and sustainable development, on which the following measures were contemplated:

- To Support the development of renewable energies;
- To Promote multipurposes hydropower projects for energy production and water supply;
- To incentive the use of clean energies;
- To Manage energy demand, namely by the promotion of technological innovation and improvement of energy efficiency.

Main objectives

The RE-Alqueva Partnership general objective is the promotion of endogenous renewable energies use, strengthening its contribution to a sustainable development of Alentejo region.

The RE-Alqueva Project has set the following energy objectives to be achieved by the end of 2006 :

- The improvement of hydropower capacity along the Guadiana River; and, as a consequence, the reinforcement of the regional and national electricity grid capacity and the implementation of the Electricity Ibero Market through the connection Alqueva-Balboa;
- The assessment of wind energy potential in the area and, if technical and economically feasible, the promotion and installation of a wind turbine / wind farm;
- The assessment, the design and the installation of a small photovoltaic plant; the main objective is to demonstrate and disseminate photovoltaic technologies viability and its potential application in the region;
- The development of a biodiesel chain production in Alentejo, regarding its opportunity for the regional agriculture and agro-industry activities and contribution for the biofuels Directive objectives fulfilment;
- The improvement of energy performance and integration of renewable energies in EDIA's buildings and in rural villages around Alqueva and Pedrógão lagoons.

Overall evaluation

The Alqueva hydropower plant is equipped with two generating sets, with an electricity capacity of 120 MW each. The estimated annual average production is 380 GWh, the equivalent to the electricity consumption of a Portuguese city of 200 thousands inhabitants.

The Pedrógão small hydropower plant will be equipped with two generator sets with a electricity capacity of 4,7 MW each. The annual average electricity production estimated is 22 GWh.

The biodiesel studies will evaluate the feasible dimension of a biodiesel production unit in Alqueva area, benefiting of the a proximity location to raw materials suppliers (agriculture and agro-industry) and to the refinery plant and harbour in Sines. The installation of a biodiesel production unit of 40.000 ton/year capacity has been considered as a possible assumption.

The photovoltaic plant capacity considered on the pre-feasibility study was 100 kWp, since it is, according to Portuguese legal regulation, a capacity limit for low tension electricity production. The estimated annual electric production is 110 MWh.

Actions	Timing	Degree of achieve
Construction of Alqueva dam and large hydropower plant	1995-2003	93%
Construction of Pedrógão dam and small hydropower plant	1997-2005	25%
Wind energy assessment	2003-2004	10%
Feasibility studies related to the development of a biodiesel chain	2003-2004	5%
Assessment, design and installation of a small photovoltaic plant	2003-2005	1%
Energy performance and integration of RE in EDIA's buildings and in rural villages	2002-2006	1%

SLOVENIA
Removing barriers to the increased use of biomass

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The focus of the project, sponsored by UNDP and GEF, is on wood biomass based district heating (BDH). The projects to be supported will be selected through a «public call for tenders». The objective of this project is to facilitate the financing for at least 3 BDH projects over its 3-year duration. Based on the results of these projects to promote further initiatives in other communities.

Main aims and motivations

The project aims to reduce and remove barriers to the increased use of biomass. It also supports the sustainable development of the local economies by creating new income and jobs.
There is also concern to reduce energy dependence and to push for the prioritization of RES issues in Slovenia.

Project details

To achieve the goal of exploiting the biomass potential of Slovenia the GEF project created many initiatives. Activities include feasibility studies and business and finance plans for at least 20 projects.
The Biomass Energy Fund was established in 2002 to finance biomass projects. Training seminars, workshops, public calls for preparation, dissemination of information, airtime 3-5 times per year on both television and radio networks are amongst the areas the project covers.

Overall evaluation

In bigger municipalities and ones with coherent political interests the reaction was positive. There are some problems, however, in municipalities with political tensions. The perception of biomass energy use at a national level has also had some negative review due to unsuccessful biomass district heating projects in the past.

Main innovative feature

The project made use of private-public pooling and involved the local community through allowing them to invest in their own heating substations. The Biomass Energy Fund was also set up to distribute project funds to those applying through calls for tender.

Enabling factors

The Ministry of Environment, Spatial Planning and Energy gave the project grants and also helped in public awareness campaigns along with the Agency for the Efficient Use of Energy and the INTERREG IIIB Project Alpenwood. The Ministry of Finance provided both legal and administrative support.

Challenges

There is a lack of a competent consulting market to provide feasibility studies and appropriate design systems. This was overcome by training consultants and the GEF project team demonstrating examples to the local experts.

- It is necessary to find sources of initial investment and partners due to the poor investment capacity of small municipalities. Maintaining close contact with and close involvement of four strategic partners tackled this problem. One private investor is already participating in the financing of one of the projects proposed for financial support within the GEF project framework.
- The EU Accession process has influenced the legislative framework in that administrative conditions for creation of equity funds and financing of some small activities are less favourable due to strict EU environmental state aid support regulations. This was overcome by liaising closely with all the relevant ministries throughout the designing process. As a result, the project implementation and financing models were approved as they conformed to the standards required.

Replication Potential

The project in Slovenia is not a replication in itself and has not yet been replicated. The main activities are applicable for a variety of projects due to their comprehensiveness and horizontal structure. The successful execution of the project in Slovenia could stimulate replications in other Accession countries.

Change in perception of implementing RES projects (1999 – 2003)

The issues of sustainable energy are of a greater concern today than in 1999 and the obstacles to implementing RES projects are decreasing. The population in general is more willing to support such projects and it is also getting easier to finance them.

RES Increase

This is not yet known. The estimated CO_2 emissions avoided as a result of the first two large scale projects applying for the GEF equity investment and Government grant is 3,600/CO_2/yr.

Key facts of the pr

- 3-5 Wood biomass district heating installations were planned and so far 1 has been approved for financing in three months time
- 23 feasibility studies are currently in preparation
- 30 municipalities had signed the Letter of Interest in the project by the end of 2002.
- The Biomass Energy Fund was established in 2002 to finance biomass projects.

POLAND
from coal to biomass from green urban areas

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A wood fired heating system has been implemented as a pilot project under the Joint Implementation mechanism of Kyoto. The realizations that aimed at replacing the two old coal-burning tanks started in 1998 in Poland as a cooperation project between the Dutch Government (who was also the main financing body) and the Polish Government with a cleaner source: biomass.

The actors involved were: Biomass Technology Group B.V. (BTG) from the Netherlands was the coordinator of the project, KARA Energy Systems from the Netherlands supplied the boiler, EC Baltic Renewable Energy Centre/Institute for Building Mechanization and Electrification of Agriculture (EC BREC/IBMER) from Poland was a local coordination and the Municipal Company of Communal Management of Jelenia Gora was the project partner and the local investor.

Main motivations

The reason for the project was the replacement of the two old, inefficient coal burning tanks that belonged to the Municipal Waste Disposal Company. Due to the fact that the same company is responsible for the maintenance of green areas, the concept arose to replace the low efficiency coal-burning tanks with a wood fired heating system that would utilise waste wood. The plant is located in the area belonging to the Municipal Waste Disposal Company, which simultaneously is the owner of the plant, and provides heat to the complex of greenhouses that cover an area of 1,200 m^2.

Project details

In Jelenia Gora and its neighbourhood, waste wood from the maintenance of green areas, to be utilised immediately for energy production purposes is 700 m^3 and the entire technical potential is equal to 2,540 m^3. Directly, it refers to the potential of 2,100 and 7,500 GJ respectively. Such a potential equates to a possible energy production capacity of 350 and 1,250 kW respectively.

The waste wood is shredded in the storage place and then undergoes the process of pre-drying. After some time it is transported to another storage place for long-term storage (a few months). One of the storage places houses the wiping feeder installed in the floor of the storehouse and screw feeder, which automatically feeds the wooden chips directly to the tank. The storage house of a capacity of 50m^3, depending on the humidity of the fuel and the ambient temperature and ensures constant heating for the period of c.a. 24 – 48 hours.

An example of "Joint Implementation"

The basic idea behind "Joint Implementation" is the decrease of carbon dioxide (CO_2) emission reduction costs (EUR per ton CO_2). As this is often more expensive to do in the Western European countries, the idea of "Joint Implementation" for a project in one of the Eastern European countries became possible to realise. The Dutch government finances the lion share of the project and assists the receiving country (Poland) in the implementation of its CO_2 reduction projects, in return for CO_2-credits. The estimated share of emission reduction units between projects partners governments equals: the Netherlands 55%, Poland 45%.

As a result, the Polish and Dutch government agreed on a bilateral co-operation in the field of joint abatement of greenhouse gases. A wood fired heating system has hence been implemented in Jelenia Gora.

Financing

The project was financed under the umbrella of the Dutch Programme for Bilateral Co-operation with the Dutch Ministry of Economic Affairs by Government Agency SENTER and by virtue of the agreement signed among the Polish and Dutch Governments.

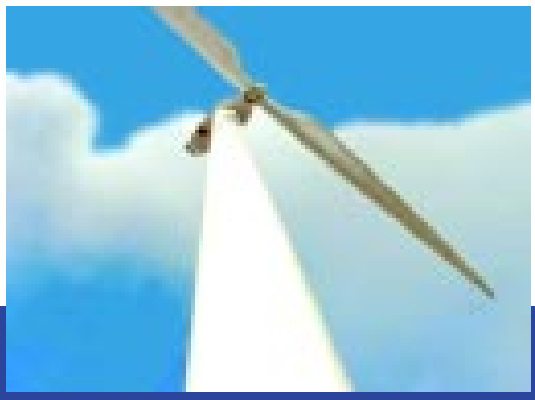
Total cost of the investment was 928,160 PLN (206,258 EUR). The infrastructure prepared for the purposes of the technology application included: tank by KARA with equipment, stack (purchase and mounting), "moving floor" feeder additional grid connection, storehouse for wooden chips including drying system located under the floor, air solar collector, shredder, tank installation (mounting and crane), documentation, other (truck loader, roads and squares)

The Dutch government had financed the purchase of the boiler, the preparing of all investment: technical project, the feasibility study and the monitoring system. The Polish investor had financed mounting costs and the costs of building other equipment e.g. floor drying channels.

Environmental benefits

The following benefits were realised by the installation of the biomass technology: savings of 220 tones of coal by its replacement with biomass, abandonment of the storage of 385 tones of waste wood at the landfill, and thus, reducing the greenhouse gases emission resulting from the decay of organic material, and a decrease in the fees for using the environment. It was estimated that throughout the period of the project (15 years), the total reduction of carbon dioxide emissions would be 21 thousand tones of CO_2 equivalent.

Action Plan for Large Scale Deployment of RES in Crete



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Crete is fourth largest island in the Mediterranean, with an area of 8335 km^2. Tourism is the most dynamic activity in the island (more than 3 millions tourists in 2000) and economic growth rates double the national average.

Because of a net increasing population trend in recent years, of a high growth rates in economy, as well as of fast development of a tertiary sector (mainly the seasonal tourism), Crete faces problems of high rates of electricity and mainly of power demand (8% per year compared to 4% of the national average). Additionally there is a reluctance of the population to accept the installation of new thermal power stations.

For the above reasons, the project of large-scale RES development has a particular importance in Crete, where it exemplifies an important part of the island issues.

The initiative

The Region of Crete – through the proposals of its Regional Energy Agency – has adopted since 1999 an integrated energy policy and programming, which gives particular emphasis on the RES and RUE promotion and implementation.

The Regional Energy Agency of Crete and the National Technical University of Athens have formulated the "Implementation Plan for RES in Crete". The defined Implementation Plan for the period 1998 – 2010 is focused on the exploitation of RES for electricity production, is formulated on the basis of available RES potential, on the technical constraints for the RES penetration and on the existing legislative framework.

The objectives of the Implementation Plan are:

- to cover the additional electricity demand in a sustainable way
- to cover the maximum average net hourly production,
- to provide the electrical system with an adequate safety margin
- to require the minimum interventions to the existing grid, and
- to use the most mature and cost-effective RES technologies.

Short-term actions refer to the period 1998-2005 and medium-term actions to the period 2005-2010. The plan promotes electricity production by exploiting several RES technologies (wind farms, biomass, small hydroelectric units, photovoltaic installations, pumped storage units) at a maximum possible penetration rate in order to cover the increase of electricity demand. Moreover it suggests additional actions among at electricity savings (solar hot water systems, replacement of incandescent bulbs, passive and hybrid systems for cooling, time-zone pricing system, etc.). The strategy of the Action Plan is complemented by a number of initiative regarding demand side management for the period 1998-2010, with a special incidence in the tourist and residential sectors.

With the implementation of this plan the total RES electricity production could reach 39.4% in 2005 and 45.4% in 2010.

Enabling factors

The region of Crete has developed an energy policy, which has been unanimously approved by the Regional Council and has its full support, as well as the support of relevant national authorities: Ministries for Development and National Economy, and Public Power Corporation (PPC).

Replication

The Crete Action Plan was used as a model to start similar projects, especially those dealing with European island regions. At present Crete is working, together with other island territories, on a feasibility analysis for storage solutions that could allow increasing the rate of penetration of renewables, in particular with regard to wind-hydropower solutions.

Electricity Production

Maximum figures	2000	2006	2010
Energy demand (GWh)	1,815	2,484	2,700
1. Conventional	1,470	1,508	1,474
2. RES	345	976	1,226
2.1.Wind Parks	223	499	624
2.2. Biomass Units	120	238	356
2.3. Small Hydro-Electric Units	2	25	27
2.4. Photovoltaic Installations	0.2	2	5
2.5. Pumped Storage Units	0.0	211	213
Safety Margin	21%	36%	20%
Total non-intermittent sources (MW)	491	717	776
Mean Net Power of Conventional Units(MW)	469	546	585
Mean Net Power of RES (MW)	110.2	373	445
1. Wind parks (MW)	89.3	200	250
2.Biomass units with agricultural by products (MW)	20	40	60
3. Small Hydro-Electric units (MW)	0.6	6	6
4. Photovoltaic installations (MW)	0.2	2	4
5. Pumped-Storage units (MW)	—	125	125

List of photographs and sources

Pag. 5	Renewables walk, Tenerife. Source: ITER.
Pag. 6	Lüchow. Source: Timo Vogt/Randbild.
Pag. 8	Gleisdorf, Austria. Source: AEE–Arbeitsgemeinschaft Erneuerbare Energie.
Pag. 9 Up	Plaatje AEE. Source: Soltherm.
Pag. 9 Down	CTP awards ceremony 2004. Source: Harald & Erhard.
Pag. 11	Isle of Wight. Source: CPCU, County Hall, Isle of Wight.
Pag. 12 Up	Llandrindod Wells County Hall. Source: Dulas Solar.
Pag. 12 Down	Chieti. Source: Energy Department, Province of Chieti.
Pag. 13 Down	Caruggio Liguria. Source: Agenzia Regionale per l'Energia della Liguria.
Pag. 14 Up	Gotland. Source: Municipality of Gotland.
Pag. 14 Down	Mill at San Lluis, Majorca. Source: Cipriano Marin.
Pag. 16	Liguria. Source: Agenzia Regionale per l'Energia della Liguria.
Pag. 17	Photovoltaic Field. Source: ITER.
Pag. 18	Vidy Theatre. Lausanne. Source: ECO.
Pag. 20Up	Source: ITER.
Pag. 20 Down	Samsø. Source: Samsø Energi-og Miljøkontor.
Pag. 21	Source: Dulas Ltd.
Pag. 22 Down	Source: Municipality of Weiz.
Pag. 27	Wood pellets storage. Source: Vapo Energy. Finland.
Pag. 28	Installing PV on a rooftop. Source: Shell Solar.
Pag. 29 Up	Trhove Sviny town (boiler plant). Source: Heating management of Trhove Sviny city.
Pag. 29 Down	Source: ASHOTEL. Tenerife.
Pag. 30	Solar thermal in the Alps. Source: ADEME.
Pag. 31	Middelgrunden Offshore Wind farm. Source: Middelgrunden Wind Turbine Co-operative.
Pag. 32	Source: Soltherm.
Pag. 33	EHN's cereal straw burning plant at Sangüesa, Navarra. Source: EHN.
Pag. 34	Photovoltaic plant 1.2 MWp, Montes de Cierzo, Navarra. Source: EHN.
Pag. 35	Lanzarote. Source: Alberto Luengo.
Pag. 36	Installation of a large solar system on a hotel in Gieres, France. Source: ACCOR.
Pag. 37 Up	Photovoltaic "pergola". Source: Forum Bercelona 2004.
Pag. 37 Down	Samsø. Source: Samsø Energi-og Miljøkontor.
Pag. 38 Left	Middelgrunden Offshore Wind farm. Source: LM Glasfiber.
Pag. 38 Right	European Conference "Renewables 2004", Berlin. Source: Harald & Erhard.
Pag. 39	A large solar thermal system installed on a flat roof. Source: Bundesverband.
Pag. 40	The Berlin Bank rooftop PV installation. Source: BP Solar.
Pag. 41	Pozo Izquierdo, Gran Canaria. Source: ITC.
Pag. 43	Braunschweig, Germany. Source: SOLVIS GmbH & Co KG.
Pag. 44 Up	Source: IEA.
Pag. 44 Down	Bioclimatic dwellings. Source: ITER.
Pag. 45	New building at ECN, the Netherlands. Source: BEAR architects.

The images within the "Programmes, Initiatives and Projects Showcase" chapter have been kindly contributed by each initiative.

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