Centre for Renewable Energy Sources

METHODS OF FINANCING RENEWABLE ENERGY INVESTMENTS IN GREECE

Nicholas P. Vassilakos

Nicholas Karapanagiotis

Dimitris Fertis

Kostas Tigas

September 2003

Produced by:
Centre for Renewable Energy Sources (CRES),
19th km Marathonos Ave., GR- 190 09 Pikermi, Attica, Greece
Tel: +30 210 6603300, Fax: +30 210 6603301-2
http://www.cres.gr
Contact: Dr. N. Karapanagiotis, e-mail: nkaras@cres.gr

Written by:
Dr. Nicholas P. Vassilakos, Vice President of ELFORES
Dr. Nicolas Karapanagiotis, Dr. Dimitris Fertis and Mr. Kostas Tigas

Printed in Greece

ΚΑΠΕ
CRES

CRES - CENTRE FOR RENEWABLE ENERGY SOURCES
19th km Marathonos Av. 190 09 Pikermi Attika
Tel.: +30210 6603 300 Fax: +30210 6603 301-2

METHODS OF FINANCING RENEWABLE ENERGY INVESTMENTS IN GREECE

Authors:

Dr. Nicholas P. Vassilakos, Vice President of ELFORES & Member of the Governing Board of the European Renewable Energies Federation (EREF)
Dr. Nicolas K. Karapanagiotis, CRES – Senior Expert, Market Development Department
Dr. Dimitris Fertis, Inergy Development SA
Kostas Tigas, CRES – Director, Division for Energy Information Systems, Dissemination & Market Development

September 2003

*(Brochure design and technical coordination: M **Markos Kapiris**, CRES - Department for Energy Information Systems)*

TABLE OF CONTENTS

CHAPTER 1

STATUS OF RES & RET DEPLOYMENT IN GREECE

1.1 Introduction

During the last decade a continuously increasing interest in renewable energy technologies, was noted in Greece. This was a combined effect of: a) the favorable legal and financial measures that were implemented, b) the rich potential of Renewable Energy Sources (RES) that exists in the country and c) the rising environmental awareness.

Greece has a significant potential of wind, biomass, solar and geothermal energy. With 300 sunny and warm days a year, over 1,000 islands with sea wind, an average wind speed exceeding 7.5 m/s and an important number of geothermal fields, Greece is an ideal country for wind, solar and geothermal energy production. As the countrie's energy demand is projected to grow by 3 to 5 percent over the next several years, the biomass potential can cover a high percentage of its total energy consumption, since the annual available agricultural and forest residues are estimated to 10 Mt.

The development of Renewable Energy Sources has been among the major energy policy lines of Greece for the last 10 years. It is seen as an important contribution to the improvement of the Greek environmental indicators and, in particular, to the abatement of CO_2 emissions. Legal and financial incentives are the tools of the government's strategy to support renewable energy technology (RET) investments.

The main financial instruments for the support of RES in recent years were the Operational Programme for Energy in the 2nd Community Support Framework (CSF II) for Greece and the National Development Law 2601/98, while Laws 2244/94 and 2773/99 provided the legal framework for RES deployment.

The legal framework currently governing RES electricity is Law 2773/99, which also sets the rules for the liberalisation of the electricity market in the country. Starting in February 2001, any private investor can produce electricity, subject to the issuing of a generation lisence by the Regulatory Authority for Energy (RAE). A specific mention to RES-electricity production is included in Law 2773/99, which states that the Transmission System Operator (TSO) is obliged to grant priority access (priority in load dispatching) to RES electricity-producing installations.

Following the successful implementation of the Operational Programme for Energy (1994-1999), the Operational Programme for Competitiveness (OPC) in the 3rd CSF was initiated in 2000 by the Ministry of Development. The OPC offers financial incentives for RES investments, and is expected to have a significant impact on the development of RETs within the next years. The total budget of the programme for RES, cogeneration, energy efficiency and fuel subsitution by natural gas is 1,100 MEuro for a seven years period (2000-2006).

One of the main obstacles in the penetration of RETs in the electricity generation, is the limited capacity of the transmission network to absorb and transmit the RES electricity produced. Therefore, the OPC, in parallel to direct subsidies to electricity generation plants using RES, will also provide an indirect support to such projects, through 50% financing of the upgrading of the electricity transmission network, mainly in areas of high wind potential, as well as 50% financing of the interconnection of RES facilities to the grid. Two actions will be taken towards this direction:

- The electric interconnections of the islands with the mainland and with each other will be upgraded, strengthened or newly constructed in the case of some non-interconnected islands.
- The electricity transmission grid in some parts of the mainland that have high wind potential and attract high interest from private investors will be reinforced and/or extended.

An estimation of the evolution of the installed capacity of Renewable Energy Sources in Greece is presented in Figure 1.1, taking into consideration the existing financial support schemes and the experience gained by the response of private investors to the public funding mechanisms that were used in the past (OPE, National Development Law).

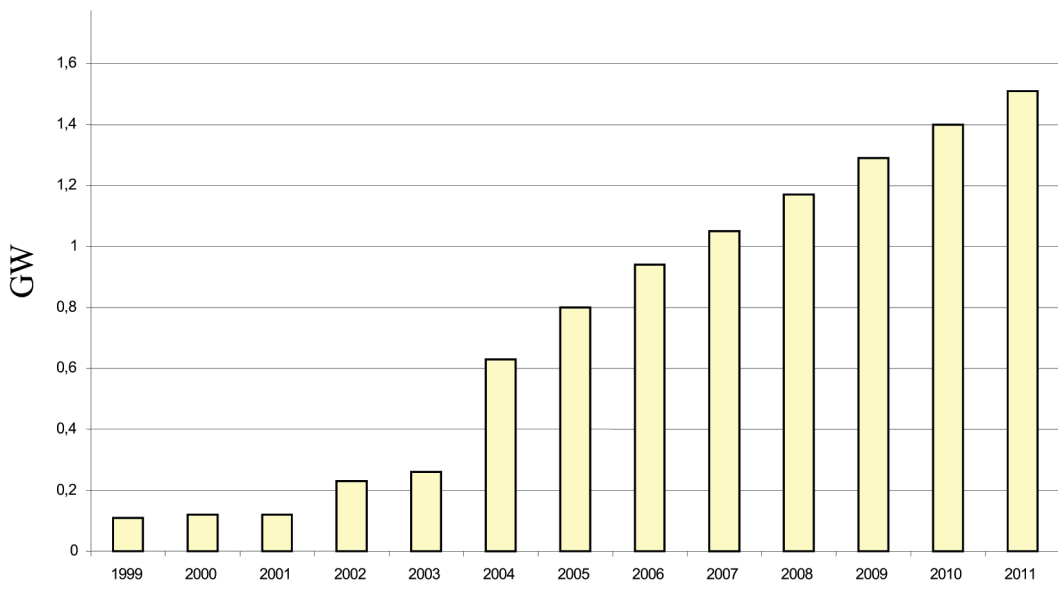

Figure 1.1
Projection of installed capacity of Renewable Energy Sources in Greece for electricity generation ([18] business-as-usual scenario)

Although the Operational Programme for Competitiveness will end at the end of 2006, the actual construction and operation of some RES projects could take more years. It is expected that the main interest in investments will turn towards wind energy projects, since the tech-

nology of wind energy converters is well established and the corresponding costs are now comparable to those of conventional power stations. Small hydro plants are expected to have a relatively smaller share, mainly due to the scarcity of suitable sites. An indication for this has already been given in the course of the Operational Programme for Energy, where the construction rate of funded small hydro projects was rather slow, compared to that of wind energy projects.

Energy sector restructuring is gaining strength and increased competition will drive costs down. Deregulation will provide opportunities for promoting renewable energy, because there will be new industrial participation that will be aggressive and innovative and because deregulation will lead to greater customer choice.

Financing the installation of renewable energy technologies remains a major concern, and in this prospect the present analysis is aiming to identify key-financial instruments that would help overcome barriers associated with “access to capital” for RE investments. However, it should be noted that new innovative financing mechanisms, in a gradually restructuring energy market such as the Greek one, should be supplemented by adequate policy measures, in order to ensure that these tools will be further deployed in a “mutual-interest” basis.

1.2 RES Deployment in Greece[1]

Renewable Energy Sources contributed a total of 1,403 ktoe to the Greek Energy system in 2000. This corresponds to 5% of the Greek Total Primary Energy Supply (TPES), which was about 28,100 ktoe. Biomass and hydro electricity provided most of the energy produced; biomass (mostly wood, used directly in the domestic sector) accounted for 67.42% of the total energy produced from RES, and hydro for 22.63%. Wind, solar heat and geothermal heat constitute the remaining 9.95%. The average contribution of RES in the TPES is about 5% in the last eight years, the small annual variations being mainly attributed to the weather conditions that affect the performance of large hydro installations. Excluding biomass for household consumption and large hydro, the contribution of RES is 1.41% of the TPES. This quantity represents the part of the energy produced by RES that is affected by national policies and measures and has increased from 783 ktoe in the year 1990, to 1,403 ktoe in 2000. Electricity generation from renewables was 4,145 GWh in 2000 with a total installed capacity of 3,334 MW. The major contribution to the electricity generation was from hydroelectric plants (3,693 GWh), the majority of which belong to the Public Power Corporation, (PPC). Wind energy contributed a total of 451 GWh of electricity, while photovoltaics contributed only a small amount, mainly in installations that are not grid connected. Solar energy applications are almost exclusively used for water heating. Greece is one of the European Union’s leading countries in terms of surface installed solar thermal applications, representing about 32% of the total installed surface among the 15 EU member states and the 27% of the total heat production.

A more detailed analysis for the contribution of each RES is given below.

1.3 Hydropower

Hydro gross output was 0.32 Mtoe in 2000 (3693 GWh). Most of this electricity was produced from large hydro plants that belong to the PPC and have a total installed capacity of 3,052MW.

Electricity production from hydro plants is varying from year to year, mainly due to operational characteristics (lower total rainfall, less hours of operation for some plants, use of water for irrigation purposes). Small hydro plants (<10MW), belong both to the PPC and private investors and their overall installed capacity in 2000 was 55.6 MW. This is estimated to rise to about 100 MW by the end of 2001, after the completion of a number of projects that are under construction at the moment.

1.4 Wind Power

The wind energy installed capacity was 110MW in 1999, and increased to 226MW in 2000. The significant increase was mainly due to the installation of wind parks by private investors. Based on the favourable wind regime, coupled with the high cost of providing electricity in isolated areas, the best sites for the installation of wind turbines are located in Evia, Laconia, Thrace, the Aegean Islands and Crete.

1.5 Solar Thermal

Solar energy applications are almost exclusively used for water heating. With about two million square meters (2,000,000 m^2) in 2000, representing about 32% of the total surface installed in the EU and 27% of the corresponding solar heat production, Greece is one of the European Union's leading countries in surface covered by solar thermal installations.

1.6 Photovoltaics

Photovoltaic applications (PV) are much fewer due to their high capital cost. The total installed capacity of photovoltaic systems in Greece (comprising relatively large autonomous PV units) in 2000 was 332 kWp.

1.7 Biomass

Biogas from municipal waste landfills is an important source the utilisation of which has only recently began in Greece. Small cogeneration installations are in operation in Thessaloniki, Heraklio and Chania (Crete). A relatively large plant (13MWe) has recently been commissioned, utilising the biogas produced in a large landfill near Athens. There are also immediate plans for six additional plants of this type, by operators of municipal waste treatment plants or landfills. During 2000, a cogeneration plant, using the biogas produced from the sewage treatment plant of the Greater Athens area, has also begun operation (7.4MWe of installed capacity).

Domestic use of wood (0.702 Mtoe), mainly for cooking and space heating, accounted for about 74% of the estimated energy (0.946 Mtoe) produced from biomass in 2000.

Wood residues are mainly used by the wood industry, in the framework of waste reuse, with an estimated energy production of 33.5 ktoe. Estimates of the heat produced for on-site use, from the combustion of solid waste in industry, are usually based on qualitative estimates of the site manager (usually, an estimate is given for the percentage of the total amount of raw material used that ends up in the burner).

Heat production (exclusively) for on-site use in industry from the combustion of wood / wood waste / other solid waste, was about 208 Ktoe in Greece in 2000.

There is currently no production of biofuels in Greece, but use of bioethanol in the transport sector is being considered for the future.

A CHP plant using cotton ginning residues with a capacity of 2.1 MWth and 0.5 MWe, exists at Davlia, but its current use is only for heat production.

1.8 Geothermal Energy

The estimated geothermal resources of the high enthalpy fields in the Aegean islands of Milos and Nissiros are estimated to be able to support over 170MWe of installed power capacity for a time period exceeding 20 years. To date, only one unit was installed on the island of Milos with a capacity of 2MWe. The unit, which was installed in 1985, has been shut down since 1988, following opposition against its operation from the inhabitants and local organisations and poor project management. In recent years, an investigation of the high enthalpy field on the island of Lesvos is in progress by PPC, and the prospects appear promising.

Currently, geothermal applications in Greece are restricted to greenhouse heating, with the exception of a geothermal heat pump system used for heating and cooling of a 4,500m^2 building. In any case, only about 29 MW_{th}, i.e., a very small part of the total, economically viable, low-enthalpy potential of Greece (estimated at 450 MW_{th}) has been exploited to date.

In 2000, fifteen greenhouses, one heat pump system for a building, one plankter dam, one desalination unit and two pisciculture plants were operating geothermally under a valid license (permit), totaling a covered area of approximately 246,500 m^2, with a total installed capacity of 29 MW_{th}. There is a number of geothermal greenhouses which still operate without a permit; an unofficial estimate of their covered area is around 39,000 m^2, with a total installed capacity of 5 MW_{th}. Because of the low temperatures experienced in regions of northern Greece, most of the geothermal applications for greenhouse heating are situated in that region.

The following tables and figures give an detailed description of the energy produced from RES (Tables 1.1 & 1.2; Figure 1.2), the current status of RE Technologies (Table 1.3) and the national energy balance sheet for RES in 2000 (Table 1.4).

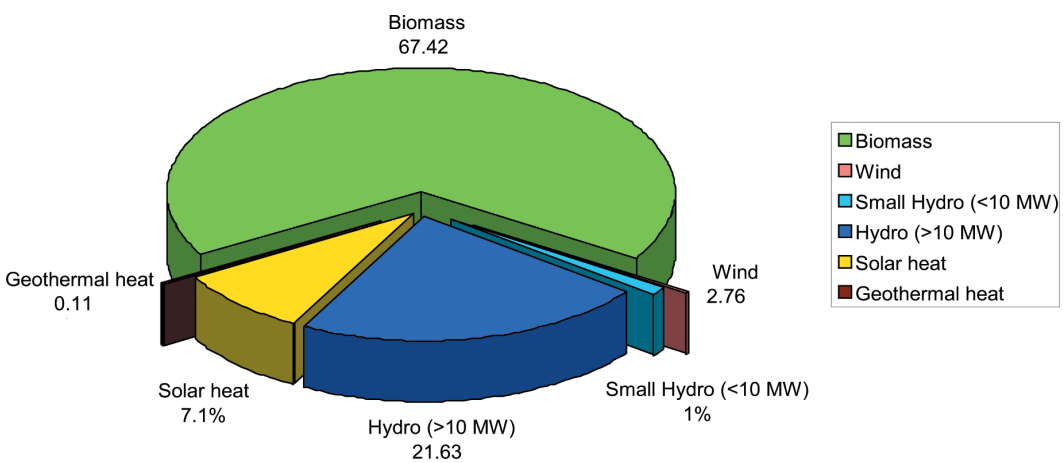

Figure 1.2

Relative contribution of each RES to the Total Energy Production (2000)

Table 1.1
Energy produced from RES in 2000

Source	ktoe
Biomass	946
Wind	38.8
Small Hydro (<10 MW)	14.28
Large Hydro* (>10 MW)	303.5
Photovoltaics **	0.024
Solar heat	99
Geothermal heat***	1.61
TOTAL	**1,403**

* *production through pumping, 35.97 ktoe is excluded*
** *Grid connected and autonomous island systems (non-connected systems for electricity supply)*
*** *Sites with official permits*

Table 1.2
Evolution of electricity produced from RES (GWh) in the period 1989-2000

Technology	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*
Hydro -1 MW	3.6	6.1	5.4	5.4	5.4	7.6	6.5	7	11.3	8.2	18.3	25.8
Hydro 1-10 MW	80.6	54.3	70.5	43	77.1	96.6	88.9	119	138	137.3	163.7	140.1
Hydro 10+ MW	1932	1733	3034	2174	2297	2589	3460	4236	3756	3585	4446	3527.1
Wind energy	1.3	1.6	1.8	8.2	47.5	37.4	33.8	36	36.9	73.1	162.3	451
Photovoltaics	0.05	0.06	0.05	0.12	0.25	0.23	0.22	0.16	0.15	0.15	0.18	0.243
Biomass-CHP	0	0	0	1.5	1.5	1.4	0.9	0	0	0	0	0
Landfill gas	0	0	0	0	0	0	0	0	0	1.1	1.56	0
Sewage sludge	0	0	0	0	0	0	0	0	0	0.3	0.72	0.66
Total RES	*2017*	*1795*	*3112*	*2232*	*2429*	*2732*	*3590*	*4398*	*3942*	*3805*	*4793*	*4145*

Table 1.3
Current status of renewable technologies in Greece for the year 2000

Technology	Status				Current utilization and capacity	
	*C**	*D**	*Planned*	*No*	*Output (ktoe)*	*Capacity (MW)*
Wood	X				*702*	*N/A*
CHP with biomass	X				*0.8*	*2.1 MW_{th}* *0.5 MW_e*
District heating with biomass	X				*0*	*1.4 MW_{th}*
Wood, Vegetal waste in industry	X				*242*	*510*
Biogas from agrofood and farm slurries	X				*0.3*	*2.1 MWth*
Landfill gas	X				*0*	*0.240 MW_e*
Sludge / Sewage gas	X				*1.7*	*2.2 MW_{th}* *0.359 MW_e*
Municipal Waste			X			*10 MW_{th}* *7.4 MW_e*
Bio-fuels			X			
Geothermal electricity				X		
Geothermal heat	X				*1.61*	*29 MW_{th}*
Solar thermal				X		
Solar heat	X				*99*	*2.94 x 10^6 m^2*
Hydro (>10MW)	X				*303.5*	*3,052*
Small Hydro (1 -10MW)	X				*12.06*	*42*
Small Hydro (< 1 MW)	X				*2.22*	*13.6*
Wind	X				*38.8*	*226*
Photovoltaics**	X				*0.021*	*332 kWp*

* *C = commercial, D =demonstration*
** *Grid connected and non-connected systems in islands (does not include small scale isolated panels)*

Table 1.4
National Energy Balance Sheet for RES for the year 2000

		Geothe-rmal Heat	Solar energy heat	Biomass			
				Total	Wood etc.	MSW	Biogas
		TJ	TJ	TJ(GCV)	TJ(GCV)	TJ(GCV)	TJ(GCV)
1	Primary production	67	4,135	39,547	39,488		59
2=1	**Gross inland consumption**	**67**	4,135	39,547	39,488		**59**
3	Total transformation input						
4	*public power stations*						
5	*autoproduc. power stations*						
6	*district heating plants*						
7	Consumption of the energy branch						
8	Distribution losses						
9	**Available for final consumption**	**67**	4,135	39,547	39,488		**59**
10	**Final energy consumption**	**67**	4,135	39,547	39,488		**59**
11	Industry of which:			10,108	10,108		13
12	*Iron and steel Industry*						
13	*Food, drink and tobacco Industry*			13			13
14	*other*			10,095	10,095		
15	Households		4,135	29,393	29,393		
16	Agriculture	67					
17	Other			46			46
18	**Statistical Difference**	**0**	**0**	**0**	**0**		**0**
	Electricity Production (GWh)	0	0	0.66	0	0	0.66
	Total heat production (TJ), of which:	67	4,135	39,547	39,488	0	59
	- sales to third party (TJ)		0	0	0	0	**0**

1.9 Costs for RE Deployment

Increased use of renewable energy entails costs as well as benefits. In most cases, the cost of renewable energy is higher than that of other energy sources, although extremely site-specific. This incremental cost has been the largest impediment to increased use of renewable electricity in Greece, as well as in most EU countries.

The incremental cost of many renewable electricity sources is partly due to the dispersed nature of renewable energies, and partly because many RET (e.g. solar thermal electricity production) are not yet mature, and sales are not yet at a high enough level to benefit from significant economies of scale. Moreover, the valuing in monetary prices, of the environmental and social liabilities has not yet become a policy driver, so the benefits from RE deployment are ignored in purely economic comparisons of renewable energies with other energy sources. In addition, RES are in the unenviable position of having to compete with established energy

sources that can benefit or have previously benefited from advantages such as subsidies, available infrastructure and fully amortised capital investments.

Costs associated with increased use of intermittent renewable electricity relate directly to the electricity system itself, for strengthening both the transmission and distribution system and for providing backup capacity.

The cost of connecting renewable electricity systems to the electricity grid may also be high, especially for wind farm developments in Greek islands. The use of wind and solar electricity in Greek islands is relatively recent and still small-scale, while the majority of electricity generation in these islands is diesel-based. Any change in pricing structure aimed at bringing the price of island electricity, or off-grid electricity, more in line with its real cost, would help to promote renewable electricity (although such a price revision is difficult to be undertaken, because of public service provision requirements on the electricity utility).

In order to support the Greek government in RES policy analysis CRES developed a computerised methodology[19] for the assesment of the wind energy and small hydro economic potential, in the context of the Operational Programme for Energy. The idea was to provide a link between the physical potential of RES and all the economic indices (IRR, PBP, etc.) expressing the economic viability of RES investments. The tools are giving the possibility to perform a parametric analysis of RES investments using as parameters the physical potential on one hand and the RES supporting measures on the other hand.

A parametric analysis of wind farm investments is presented in Figure 1.3. The Pay-Back Period as a function of the level of public subsidy is presented for a number of values of the wind utilisation factor. For the given example, constant buy-back rate of electricity is assumed and the level of own capital is taken to be 20%. It has to be noted that the Pay-Back Period is a strong function of the subsidy for wind utilisation factors lower than 35%.

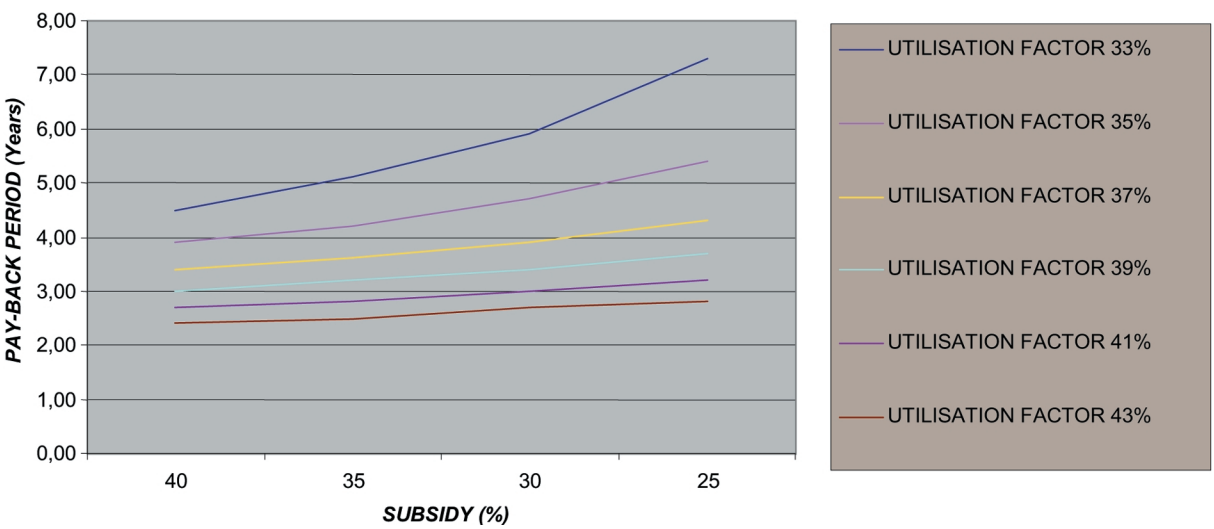

Figure 1.3
Own Capital 20%, Constant RES electricity buy-back rate

CHAPTER 2

OVERVIEW OF POLICY OPTIONS & MARKET DRIVERS

2.1 Introduction

Security of supply and the development of its diverse indigenous energy resources have been the central pillars of Greece's strategic approach to energy. In light of the ongoing liberalisation of the Greek electricity market and the unique opportunities blossoming across the Balkan Peninsula due to energy-sector privatisation, the successful implementation of the country's Peripheral Development Plan for energy has become even more crucial for the Greek government.

The Greek Ministry of Development has set the following strategic objectives for energy:

– Securing sufficient energy supply across all Greek territory;
– Competitive operation of the energy markets;
– Strong contribution of the energy sector to the overall competitiveness of the Greek economy;
– Protection of the environment; and
– Strengthening of Greece's role in the development of the energy sector in the southern Mediterranean Sea, the Balkans and the Black Sea regions.

Greece is expected to have a very busy energy policy agenda in the next few years, with the deregulation process of the internal market, acting as the prime driver. The size of the Greek energy market is estimated to be approximately 5 billion Euro in the 2000-2006 period (i.e. the period of CSF III). Important initiatives have already been implemented for the move towards energy market reform and the greater role of private capital:

⇨ Issuing of a number of Laws and Decrees, which deal with such key issues as the partial privatisation of the State Electricity Company, PPC, the establishment of an independent Transmission System Operator (HTSO) in December 2000 and the regulator, the Regulatory Authority for Energy (RAE) in July 2000. Market operators are now required by law to unbundle their accounts. TSO will control a power pool of producers, based on 24 hours ahead bids; PPC will own and develop all new transmission and distribution facilities, which will remain under the control of the State.

- ⇨ From 19th February 2001 the government with Law N.2773/99, opened up officially 30% of the electricity market and in theory all customers with 100GWh of annual consumption or more have been assigned as eligible customers. They constitute 34% of total electricity consumption in Greece and they amount to 7,500 individually metered customers.
- ⇨ The award of the franchise contracts for the regional natural gas supply companies (EPAs), in Athens to CINERGY/SHELL and in Thessaloniki and Thessalia to ITALGAS. The rights for the development and operation of the low pressure distribution network of the system have been transferred from DEPA to the respective Regional Distribution Companies (EDAs), in which the foreign investors (CINERGY/SHELL and ITALGAS) participate, holding 49% of the equity and undertaking the management and market policy of these companies.
- ⇨ The launch of the Operational Programme for Competitiveness, supporting private investments in energy, industry, commerce, tourism, research and technology, etc., under the 3rd Community Support Framework (CSF III; 2000-2006). The private energy investments mount to 1.07 billion Euro (16.8% of the Programme's total budget), whereas the ratio of private funding to public (Community + national) funding will be about two to one. The indicative total budget for investments in co-generation of heat and power and in rational use of energy is about 320 M Euro, while in renewable energy is about 750 M Euro.
- ⇨ The forthcoming establishment of an Energy Options and Futures Contracts Exchange Market, aiming to become the dominant Energy Exchange Market in South-Eastern Europe.

Many RE technologies have now reached a point of development where they have become economically viable, giving practical solutions to the twin problem of energy supply and environmental pollution. Cogeneration systems (biomass and/or natural gas), small hydropower, wind and solar energy are expected to win substantial market shares in the immediate future. As a result of the change and the gradual transformation towards a deregulated energy market in Greece (the electricity market has been liberalised at a starting share of 34% from February 2001), the costs for energy consumption will be changing. The restructuring and anticipated development of the energy sector provides a potentially large market for RE investments.

2.2 Overview of RE Policy

The Greek energy sector is undergoing significant changes, under the combined effect of EU policies to introduce competition in the energy market (the Internal Energy Market programme), the national initiatives to liberalise and privatise the energy industry, and the environmental policies at both the EU and national levels. These forces may not all act in the same direction. The introduction of competition may result in lower prices for energy, while policies to ensure a high level of environmental protection may, on the contrary, aim at increasing prices, limiting demand increases. The overall effect on energy supply/demand may, therefore, not be very visible especially in the short to medium-term. Indeed, the structural effects of those policies will take a while to make their way through the energy system.

The impetus behind renewable energy promotion, in addition to having a very significant RES potential in Greece, is the Government's aim of supporting modest demand growth in electricity and the high priority placed on reducing urban air pollution. Land constraints are

unlikely to limit the exploitation of renewable energy. Promotion of renewable energy in Greece is based on a number of measures at the national level, such as:

- Providing strong economic incentives, in the form of both capital subsidies and favourable buy-back electricity rates.
- Setting national targets for future RE use.
- Realising programmes promoting information, dissemination and support of R&D in renewables.

All activities are taking place in the context of an overall Government policy of economic structural reform and of reducing the role of the state in the economy. The Government accepts that these broad policy principles apply equally to the energy sector, which today is still characterised by heavy state involvement. Policies used to promote renewable energy development are described also in the revised Greek National Programme for Climate Change[17], which estimates realistic CO_2 savings of 4.5 Mt CO_2-eq from the increased use of renewables.

The main financial instrument to support RE investments has been in the past (1994-99) the Operational Programme for Energy, under the 2nd Community Support Framework. Through its two calls for proposals, released between 1996-1999, there were 78 renewables projects funded, corresponding to 161 MWe and 102 MWth, with a total budget of 213 MEURO. The following Table 2.1 shows the breakdown by RE technology of these projects.

Table 2.1
Operational Programme for Energy, CSF II (1994-1999)
RE Investment Projects Funded

RE Technology	Number of Projects	Electrical Capacity (MW_e)	Thermal Capacity (MW_{th})	Total Budget (MEURO)	Public Funding (MEURO)
Wind	17	125.1		131.2	52.5
Biomass	9	20.4	94	47.7	22.5
Small Hydro	11	14.3		21.7	9.7
Photovoltaic	15	0.9		7.0	4.8
Active Solar	25		8	5.1	2.5
Passive Solar	1			0.3	0.1
TOTAL	**78**	**160.7**	**102**	**213.0**	**92.1**

2.3 The Legislative and Administrative Framework [2]

2.3.1 Laws

The basic law governing RES electricity is Law 2773 of 1999, on the liberalisation of the domestic electricity market, and, specifically, its Chapter 10, Articles 35-41. This law has incorporated the majority of provisions of the earlier Law 2244 of 1994, which, unlike Law 2773, was devoted entirely to RES electricity matters. At present, there is no Greek law dealing specifically with heat production from RES.

The key provisions of Law 2773/99 concerning renewables are as follows:

i. The Hellenic Transmission System Operator (HTSO) is obligated to grant priority access (priority in load dispatching) to RES electricity-producing installations up to 50 MWe in power capacity (up to 10 MWe in the case of small hydroelectric units).
ii. The HTSO is obligated to enter into a 10-year contract (PPA) with the RES-electricity producer for the purchase of his electricity. The contract always includes a renewal option.
iii. The RES-electricity production of an independent power producer, or the surplus electricity production of a RES autoproducer, is sold to the HTSO at a predetermined buy-back rate, which is fixed percentage of the corresponding consumer electricity rate.
iv. Every RES-electricity producer is subject to a special reciprocity charge (annual fee), specified by a joint decision of the Ministers of Finance and Development, and equal to two-percent (2%) of the producer's electricity sales to the grid. This charge is collected by the HTSO and is given to the Local Authority, within the area of which the RES generation unit operate, for the purpose of realising local development projects.

Law 2773/99 instituted a new license, the so-called electricity generation license, which is now the first license required to be obtained by any electricity-producing station, conventional or RES-based, in a long planning/licensing procedure that also includes presiting permit, land-use permit, approval of environmental terms and conditions, installation license, operation license, etc. (see below).

Law 2941 of 2001 supplemented Law 2773/99 with certain important provisions about renewables, including: a) the definition of the general terms and conditions, under which it is allowed to install RES stations in forests and forestry lands, and b) the characterisation of all RES projects as projects of public utility status, which gives them the same rights and privileges in land expropriation procedures as those given to public works, independently of the legal status of the RES project owner (being private or public).

2.3.2 Ministerial Decrees

Laws 2244/94, 2773/99 and 2941/01 on renewables are supplemented by a number of Ministerial Decrees, which specify:

a) The procedures, required documents, fees, etc. for issuing the generation, installation and operation licenses, necessary to all RES-to-power projects.
b) The general technical and financial terms of the contract to be concluded between the Transmission System Operator (HTSO) and each RES power producer, the details of the electricity tariffication system to be applied, the terms and conditions for connecting the RES station to the grid, etc.
c) While the new Law 3010/2002 and the JMD 15393/2332/2002, MD 25535/3281/2002 and JMD 11014/703/Φ104/2003 delineate the revised procedure for the environmental planning and authorisation process and the approval of environmental terms and conditions.

The most important of the above Ministerial Decrees (MD) are summarised below:

1. MD 17951/2000: Terms and procedures for obtaining the electricity generation license.
2. JMD 15393/2332/2002 and JMD 11014/703/Φ104/2002 (in conjuction with the enactment of the new Environmental Law 3010/2002): Terms and procedures for obtaining the necessary environmental licenses (preliminary environmental impact assessment and evaluation, approval of environmental terms and conditions).
3. MD 2000/2002: Terms and procedures for obtaining the RES installation and operation licenses, as well as a model contract (PPA) between the HTSO and the RES power pro-

ducer. The multi-step RES licensing procedure and the corresponding jurisdictions are depicted schematically in Figure 2.1.

4. MD 31928/1993 *(in conjunction with Law 1475/1984*): Terms, procedures and fees for obtaining the necessary concession license, for the right to exploit a geothermal field.
5. MD 5813/1989 (*in conjunction with Law 1739/1987*): Terms and procedures for obtaining the necessary "unified water license", which is a license for water use and for carrying out any project of exploitation of water resources (including energy valorisation).

In 1995, the Greek Ministry of Environment, Urban Planning and Public Works prepared an Action Plan, entitled **"Energy 2001"**, aiming at promoting the use of RES, as well as the application of energy-efficiency technologies, in the building sector. The Action Plan was prepared in order to define specific measures for the reduction of greenhouse gas emissions in buildings, in accordance with the "National Action Plan for the Abatement of CO_2 and Other Greenhouse Gases". Following official adoption of the Action Plan by the Greek Government, **"Energy 2001"** was further reinforced by the enactment of MD 21475/98, which incorporated the provisions of Council Directive 93/76/EC (SAVE Directive) for the stabilisation of CO_2 emissions and the efficient use of energy in buildings.

Concerning the incorporation of RES systems in buildings, the MD 21475/98 specifically refers to, in Art. 2:

- active solar systems, such as hot-water solar heaters and photovoltaic modules
- other (non-specified) RES systems which convert renewables to electricity or thermal energy.

In addition, Art. 4 of the Ministerial Decree provides for the future issuing of a Regulation for the rational and efficient use of energy, which will be in compliance with the Greek General Building Code. The drafting of the Regulation has been assigned by the Ministry of Environment, Urban Planning and Public Works to the Centre for Renewable Energy Sources (CRES), and it is to be carried out in accordance with the provisions and specifications set out by MD 21475/98. As far as the incorporation of RES in buildings is concerned, the Ministry's specifications for the drafting of the Regulation encompass the following:

- determination of the building's energy requirements and their potential degree of coverage through RES
- specifications of active solar systems (ASS)
- determination of the ASS contribution to space and water heating (compulsory)
- determination of the contribution of photovoltaic systems (PVs) to the coverage of the building's electrical loads (optional)
- study for the incorporation of ASS (compulsory) and PVs (optional) in buildings
- determination of the requirements for the installation of building energy systems for the exploitation of RES.

Finally, it is also important to mention here the legally binding EU Directive 2001/77/EC on RES electricity and its indicative target for Greece, i.e. 20.1% coverage of the country's total electricity demand by renewables, until 2010. This target corresponds to about 2500 MWe of RES installations, an eightfold increase over the currently installed RES capacity of about 320 MWe.

Figure 2.1
RES licensing procedures and jurisdictions

CHAPTER 3

FINANCIAL INSTRUMENTS [2]

3.1 Introduction

Financial – support instruments for RE projects can be divided into **a)** governmental incentives and **b)** other financial resources. Governmental incentives are often investment subsidies, feed-in tariffs, payback regulations and tax regulations, such as:

- Flexible depreciation of RE investments.
- Favourable tax treatment for third party financing.
- Start-up subsidies for new production plants, for SMEs and for the creation of new jobs.
- Fiscal measures for consumers to purchase RE equipment and systems.
- Market incentives in order to help increase the market share of RES.

The costs of encouraging RE investments and further deployment of RE technologies include the direct costs of incentives, such as capital costs, output subsidies, tax rebates and costs of promotion / dissemination / training / education campaigns. They also include indirect costs, such as those of implementing legislation, standards or other regulations that promote the use of renewables.

There are two main financial-support instruments that provide substantial public subsidies to RES investment projects (among others): a) The so-called "National Development Law" (Law 2601 of 1998, currently under revision), and b) the Greek Operational Programme for Competitiveness, one of the eleven (11) National and the thirteen (13) Regional Operational Programmes, in which the Third Community Support Framework (CSF III ; 2000-2006) for Greece is divided.

These two instruments are detailed below.

3.2 National Development Law

This is a financial instrument-umbrella, covering all private investments in Greece, in all sectors of economic activity. It has a strong regional character, in that the level of public support depends strongly on the particular geographic region, in which the given private investment

is planned to materialise. Regions with high unemployment rates and low incomes per capita receive the highest investment subsidies from the State.

Investments in RES installations (both electricity- and heat- producing ones) have a special status under Law 2601/98, similar to the one bestowed to other selected categories of investments, such as investments in high technology, environmental protection, etc. More specifically, the main provisions of Law 2601/98 concerning public support of RES investments are as follows:

- 40% public subsidy (grant) on the total eligible RES investment cost + 40% subsidy on the interest of loans obtained for the purpose of financing the RES investment
- Alternatively, 40% subsidy on the loan interest + 100% tax deduction on the RES investment cost
- Level of subsidy (40%) is independent of the RES technology and the geographical region of the country
- Required own capital: 40% (min) of the total investment cost
- Minimum investment cost required: 176,000 Euro
- Maximum subsidy granted: 14.7 million Euro
- Maximum investment cost subsidised: 36.7 million Euro

Proposals for private investments can be submitted to the National Development Law 2601/98 at any time and they are evaluated on their own merit, i.e. independently of other submitted proposals. Law 2601/98 does not have any total budget cup, thus there is (theoretically) no limit in the number and budget of proposals that can be funded.

3.3 National Operational Programme for Competitiveness (CSF III)

The Measure 2.1 of Subprogramme 2 of the National Operational Programme for Competitiveness (OPC)/CSF III (2000-2006) is devoted entirely to providing State support (grants) to private investments in: **a)** renewables, **b)** rational use of energy and **c)** small-scale (<50 MW_e) cogeneration. The total budget of Measure 2.1, for the 2000-2006 period of CSF III, is 1.07 billion Euro, of which 35.6% or 382 million Euro is the public subsidy available to RES/RUE/CHP investments. About two-thirds of the total available subsidy (~ 260 million Euro) are foreseen to be awarded specifically to RES investment projects.

The main provisions of Measure 2.1 of OPC, concerning public support of RES investments, are as follows:

- Public subsidy (grant) on the total eligible RES investment cost:
  - – Wind parks, conventional solar thermal units : 30%
  - – Small hydro, biomass, geothermal, high-tech solar thermal units, passive solar : 40%
  - – Photovoltaics : 40-50%
- Level of subsidy (%) is independent of the geographical region of the country with the exception of PV
- Required own capital : 30% (min) of the total investment cost
- Minimum investment cost required : 44,000 Euro
- Maximum investment cost subsidised : 44 million Euro

Grants are awarded to RES projects by Measure 2.1 of NOPC following rounds of public calls for RES investment proposals and subsequent competitive evaluation of the submitted proposals (per round).

As already mentioned in Chapter 2.2, a RES investment-subsidy programme, very similar to that of Measure 2.1 of OPC/CSF III, existed also in the Second Community Support Framework (CSF II ; 1994-1999) for Greece. This CSF II programme granted cumulatively about 92 million Euro of public subsidies to 78 RES investment projects, having a total budget of about 213 million Euro (i.e. mean subsidy rate ~ 43%) and a total installed capacity of 161 MW_e + 102 MWth. This programme was very instrumental in stirring up substantial RES activity and in materialising a large number of commercial-scale RES projects in Greece, particularly in the period 1997-2000.

3.4 Tax and Other Fiscal Incentives

The one legislative provision, that was in effect till recently in the area of tax incentives for (domestic) RES installations, was incorporated in Law 2364 of 1995. This law, although dealing primarily with the importation, transmission, distribution and sales of natural gas in Greece, contains an important provision regarding the purchase and installation of domestic RES appliances. According to Article 7 of the law, up to 75% of the total cost for the purchase and installation of domestic RES appliances and systems (as well as of gas appliances) can be deducted from the taxable income of natural persons. Such appliances and systems are deemed to include installations for the common use of the occupants of apartment buildings, in which case the deduction is calculated on the basis of the co-ownership percentage of each owner. It is estimated that the tax deduction of Law 2364/95 can, today, reduce the cost of domestic RES systems (e.g. of solar heaters) by up to 30%.

For legal persons and companies taxed on the basis of coefficient of profits, or on the basis of objective criteria, 75% of the total expenditure for the purchase and installation of the aforementioned appliances or systems is deductible from the total profit established by the application of the tax coefficient or the objective criteria. Legal persons and companies in the commercial or service sectors, which keep simple revenue and expenditure books, are entitled to amortise such costs at an annual rate. This provision however in the recent revision and simplification of the tax system by the Ministry of Finance has been abolished for the finanancial year 2003 onwards.

Following the enactment of the Ministerial Decree 21475/98 (see Ch. 2.3.2), a separate Presidential Decree had been planned, entitled “Incentives for energy savings”. According to the latest draft of this Decree, an integrated set of financial, administrative and other incentives is to be instituted for domestic applications of techniques and systems, including RES, that demonstrably contribute to energy savings in buildings. These planned incentives are outlined below:

i. All expenses related to the purchase and installation of RES systems and materials in existing buildings can be deducted from the taxable income of owners / possessors / usufructuaries, up to a certain percent which will be defined, according to a specific set of criteria, in a later Ministerial Decree.
ii. Owners of existing or new buildings (domestic / commercial / tertiary) who, within a period of six (6) years from the date of enactment of the above Presidential Decree, will install RES exploitation systems in their buildings, for space heating and/or cooling, hot

water production or lighting, demonstrably meeting at least 30% of their energy needs with RES, will be entitled to receiving certain subsidies or attractive, low-interest loans from State or private banks, in order to cover their RES-related costs. The maximum amount of the loan, the interest rate, the time and terms of loan repayment and all other relevant details will be set out in a separate Ministerial Decree.

iii. In case the building owner opts for the low-interest loan, he will not be eligible for the income tax deduction of point (i) above.

iv. In regions with autonomous electricity networks (for example, in islands), or in regions of the interconnected system where the Public Power Corporation (PPC) of Greece is unable to cover the peak load, PPC can provide relevant subsidies or financial incentives, through mass purchases of domestic RES systems (solar heaters, photovoltaics, etc.) for interested customers. The RES systems will be selected by PPC to suit the specific load characteristics of the given residential area and will be offered to its customers at attractive low prices (due to mass-purchase discounts). The system cost will be repaid to PPC by customers joining the programme through their electricity bills, in a number of equal instalments.

It is interesting to note that the issuing of the above Presidential Decree has stalled for almost three years now, mainly because it is considered that the State's financial burden, from the application of the above measures, will be excessive.

As far as tax incentives for corporation investments in renewables are concerned, we note that such incentives are actually provided as alternative choices to capital subsidies in the National Development Law 2601/98 (see Ch. 3.2). According to the law, investments and equipment - leasing programmes by corporations in: a) electricity production from renewables (wind, solar, hydroelectric and geothermal energy), and b) cogeneration of heat and electricity (e.g. from biomass), can receive one (but <u>not</u> both) of the following subsidy packages:

i)	• Capital subsidy	:	40% of the total investment cost
	• Interest-rate subsidy	:	40% of the interest paid on loans related to the RES investment
	• Leasing subsidy	:	40%
ii)	• Tax deduction	:	100% of the total investment cost
	• Interest-rate subsidy	:	40% of the interest paid on loans related to the RES investment

The first subsidy package has been discussed in Ch. 3.2. The second subsidy package, for which a corporation may opt <u>instead</u> of the first one, contains two components of State financial support to RES investments: a 40% interest-rate subsidy and a tax deduction equalling 100% of the total investment cost (or equipment - leasing cost). This last form of financial support regards the exemption of the corporation from payment of income tax on the non-distributed net profits of the first decade following the materialisation of the RES investment, by creating an untaxed (tax-exempt) reserve, equal in amount to the total RES investment cost. The 100% tax deduction is normally made from the profits of the particular tax year in which the RES investment is made. If there are insufficient or no profits in that year to cover the tax deduction, this deduction is made from the profits of subsequent tax years (and up to the tenth year), until the total RES investment cost is fully covered.

3.5 Other Public RES - Financing Sources

Projects in RES research, development, demonstration and exploitation can, in principle, receive financial support from a number of specialised national programmes, not specifically targeted towards renewables, but, nonetheless, covering this thematic area, as well. These programmes are administered primarily by the Ministry of Development / General Secretariat for Research and Technology, the Ministry of Agriculture and the Ministry of Environment, Physical Planning and Public Works.

The Ministry of Development / General Secretariat for Research and Technology included several R&D-related national programmes, co-financed by the Greek 2nd CSF, including:

i) PAVE, which is a programme supporting the development of industrial research and innovation in Greece.
ii) PEPER, which is a programme supporting pilot (demonstration) projects, in two stages: a) feasibility study; b) realisation of the pilot project.
iii) SYN, which is a programme of R&D co-financing.
iv) PENED, which is a programme supporting the development of the Greek research potential (academic institutions and laboratories).

The above Research and Technology (R&T) programmes of the Operational Programme for Research & Technology (OPRET II) are now incorporated in the OPC and seven R&T Measures are administered by GSRT of the Ministry of Development in several priority axes.

Measure 4.3 'Encouragement of research and the transfer and spread of technology in companies' gives support for activities of international scientific and technological cooperation and technology transfer and aims to intensify research and related activities (technology transfer, dissemination, information etc.) within businesses and also to promote collaborations in scientific and technological activities with a large number of countries, for the purpose of transferring technical knowledge and technology to and from Greece. The following three out of the six Actions are included in the Measure, which are the continuation of precedents.

Action 4.3.1 Programme for the Development of Industrial Research and Technology (PAVET) from companies with an already developed productive and commercial activity.

The total budget of the programme amounts to 30.3 MEuro with 14.67 MEuro of public funding and 15.55 MEuro as private contribution. The public expenditure is covered at 70% from Community resources and 30% from national. A tender for the PAVET Programme was issued in 2000 and about 150 proposals were approved for funding. Seven of the project proposals with a budget of 1.43 MEuro deal with renewables and one of them is for wave energy.

Action 4.3.2 Programme for Development of Industrial Research and Technology for enterprises that begin their productive and commercial activity (PAVET-NE).

The action is for new companies less than 5 years old, which have no capital connections with already established and operating businesses and rely on the continuous renewal of the knowledge they use in their productive and commercial activities, demand special treatment and support.

Action 4.3.3 Promotion of demonstration and innovation projects (PEPER).

The main objective of the projects is the application of new technologies successfully tested abroad or in other branches, with the aim of creating infrastructure for the further development and demonstration of innovative methodology, products or services, and documenting their technical and economic viability. The programme has already been implemented on a

pilot scale during the course of OPRET II, and satisfactory experience has been obtained from the participation of those involved with positive results.

The action is materialised in two phases, phase A for the feasibility studies of demonstration projects from interested companies with a maximum budget for proposals in this phase of 58,000 Euro (with 50% private contribution), and phase B for the materialisation of selected proposals from phase A with a maximum budget of 587,000 Euro (with 50% private contribution). Proposals can submit enterprises of all sectors of economy. In the first call of 2000 for phase A proposals, 82 feasibility studies were selected for funding in phase B with seven of them being for demonstration of innovative renewable technologies.

Several other Measures are also included in the Energy – Natural Resources Sector of the OPC-CSF III that can support directly or indirectly RES and contribute to the development of renewable investments.

Measure 1.3: Simplification of the business environment.

Coordination of public services for the solution of institutional, organisational and tariffication issues, which will simplify administrative procedures, facilitate investment initiatives and more generally promote the development of RES projects, co-generation and energy savings with a budget for RES of 1 MEuro.

Measure 3.1: Promotion of business excellence in the energy sector.

Interventions for the financing of demonstrative energy technology projects in the private and public sectors, and actions to support the determination of the reliability and efficiency of energy equipment by SMEs of a total budget of 7.7 MEuro.

Measure 4.4: Increasing public awareness of new technologies. Support and formulation of R&T policy. Management of R&T information.

This measure also includes the financing of actions for dissemination and increasing public awareness on the advantages and the environmental benefits from the application of RES and energy saving. The total budget of this activity amounts in 4,7 MEuro.

Measure 4.5: Cooperatives for research and technological development in sectors of national priority.

This Measure continues the financing of major research and technological projects, up to the stage of the industrial prototype, in fields of high priority for the national and / or regional economy. The projects are undertaken by cooperatives of enterprises, research centres, educational institutions and other interested agencies, with the aim of increasing the competitiveness of businesses and of the economy in general. One of the priority areas that are clearly relevant to the competitiveness of the economy and businesses is RES / RUE with a budget of 16 MEuro. This Measure is a continuation of the PENED programme of the previous OPRET – CSF II.

Measure 6.3: Special energy infrastructures for islands and for the promotion of renewable energy sources.

The Measure supplements the promotion of investments of Measure 2.1 and aims to improve the quality and reliability of electricity supply to islands and to cover their energy needs by innovative solutions in common with other needs for water and waste management. In addition, it aims to promote investment in RES in parts of the country with high wind potential, where the existing transmission system is in need of improvement and / or the distribution network should be extended or improved. The total budget for these actions amount to 118 MEuro.

Measure 6.3 also includes projects on islands, whether or not related to the above, that will promote innovative solutions to the more general problem of supplying the islands with energy, and at the same time probably addressing their needs for water and waste management. Emphasis will be given to applications of high-enthalpy geothermal energy intended to provide support for technology and its further diffusion and wider acceptance, with priority for the development of co-generation units that will make rational use of waste heat in lower temperature applications with a total budget of action 62,8 MEuro.

Another operational programme of the 3rd CSF III, the **"Operational Programme for the Information Society" (OPIS)** has also actions for the energy sector and the Ministry of Development participates in several Measures. The OPIS is an innovative horizontal programme, cutting across government departments, that aims to the promotion of the Information Society in Greece in a coherent and integrated manner. It thus constitutes a group of integrated and complementary interventions in various sectors of the economy and social life, so that they can have a catalytic function for the development of the Information Society.

The OPIS constitutes the main instrument for realising the government's IS strategy and achieving the targets set by e-Europe. The general strategic objectives for period 2000 – 2006 are Services to Citizens and Improvement of Quality of Life and Development and Human Potential.

For the implementation of the general and special objectives, the OPIS is structured in priority axes that include also measures that concern provision of economic incentives aiming to the support of the economy and employment with the use of new technologies, the promotion of links between the scientific and technological potential of the country with industry and the development of dexterities of human potential.

More specifically in the framework of Priority Axis 3 «The digital economy, employment and social cohesion», in Measure 3.2 «Aid for enterprises for their inclusion in the digital economy» special actions are included also for the support of companies inter alia and in the energy sector. The action for the energy sector concerns provision of grants (subsidies), of a total of 13.35 million Euro in investments of energy savings with the integration of information systems, automation and telematics in existing enterprises of the secondary and tertiary private sector.

The Ministry of Agriculture has provided financial support, through the Greek CSF II (1994-1999), to several projects, throughout the country, dealing with the utilisation of renewable energy sources (biomass, geothermal and solar energy), specifically for heating purposes in greenhouses. The Ministry has already incorporated a similar programme in the Greek CSF III (2000-2006).

Finally, the Ministry of Environment, Physical Planning and Public Works has financed in recent years a number of pilot projects, mainly concerning the integration of RES systems in public buildings, such as photovoltaic panels in schools, bioclimatic design, construction or rehabilitation of public - building complexes, etc.

3.6 The Buy-back Pricing System for RES-Electricity

The current RES-electricity tariffication system, established by Law 2244/94 and retained by Law 2773/99, distinguishes between: a) RES electricity produced and sold to the national grid (interconnected system); and b) RES electricity produced in the non-interconnected islands. The buy-back rates for the two cases are differentiated as follows:

3.6.1 Autonomous (non-interconnected) Islands

The applicable rates (below) are all independent of the actual voltage level of the grid, to which the RES power station is connected.

i) *Autoproducer*

- Energy (all kWh) : 70% of the kWh selling price of the Γ22 consumer tariff of the Public Power Corporation (this is a low-voltage, general-use tariff, billed monthly)
- Capacity credit : None

ii) *Independent power producer*

- Energy (all kWh) : 90% of the kWh selling price of the Γ22 consumer tariff
- Capacity credit : None

3.6.2 Interconnected System (mainland)

i) *Autoproducer*

- Energy (all kWh) : 70% of the kWh selling price of the Γ22 low-voltage consumer tariff (for connection of the RES producer at low voltage), or the B2 mid-voltage consumer tariff (for connection at mid voltage), or the A high-voltage consumer tariff (for connection at high voltage). The 70% rate is applicable to all three (3) time zones of the A high-voltage tariff (peak-load hours, mid-load hours, low-load hours)
- Capacity credit : None

ii) *Independent power producer*

- Energy (all kWh) : 90% of the kWh selling price of the B2 mid-voltage consumer tariff (for connection at mid or high voltage).
- Capacity credit : 50% of the capacity charge (Euro / kWp / month) of the B2 mid-voltage consumer tariff (for connection at mid or high voltage).

The capacity credit is calculated on the basis of the peak measured output of the RES station, P_m (kW), between two successive measurements, as follows :

RES power capacity used as basis for capacity-credit calculation (kW) $=\sigma \times P_m$ (kW)

where : $\sigma = 0.50$ for wind and solar stations
0.70 for small hydroelectric stations
0.90 for geothermal and biomass stations

At today's (2002) electricity consumer prices in Greece, an independent RES producer is paid as follows :

Interconnected system:	Energy	– 0.063 Euro / kWh
	Capacity	– 0.81 Euro / kWp / month *(for wind and solar)*
		– 1.13 Euro / kWp / month *(for small hydro)*
		– 1.45 Euro / kWp / month (*for biomass and geothermal)*
Non-interconnected islands:	Energy	– 0.078 Euro / kWh

CHAPTER 4

THE ROLE OF FINANCIAL INSTITUTIONS[i]

4.1 Introduction

Financial markets present an opportunity for the promotion of RE policy, particularly useful in view of the need for a wider range of policy instruments.

The deregulation of the Greek financial system has been almost completed. Banks and other financial institutions operate in a new environment, characterised by the emergence of small private banks, the modernisation of existing ones, the intensification of competition and the introduction of numerous new products and services. On the other hand, as a result of wider changes and developments in the Greek financial sector, the role of the stock market has been significantly upgraded. However, there are still major weaknesses, which have prevented the financial system to take advantage of the full range of benefits derived from deregulation.

Financial markets can be very conservative. The rewards from acting in a new or different way are often outweighed by the risks. For example, trustee investors who are required to invest prudently on behalf of others (e.g. in pension funds) often find that the least risky course is to invest in a similar manner to their peers. Regulators also often act as a brake on innovation, with some justification. While certain areas of the financial markets can be highly innovative, for instance in derivative products, inertia remains a significant problem for areas where financial institutions ought to be promoting sustainable development.

In recent years, there has been a visible acceleration in the development and integration of EU financial markets and three main interrelated factors have underpinned this acceleration of integration of EU financial markets. The first factor is globalisation, the second factor is the advances in creating a common regulatory framework across the EU as part of the effort to complete the Internal Market in financial services and the third factor is the adoption of the euro.

---

i. Further information on the role of Financial Institutions can be found in [4].

Despite recent progress, however, the EU financial system remains fragmented. Successive European Councils have declared the integration of EU financial markets as a high priority of economic reform in the EU. This priority is reflected in a coherent policy strategy at the EU level and in the urgency which has been attributed to its implementation. The issue is being addressed mainly within the context of the Commission's Risk Capital Action Plan (RCAP) and the Financial Services Action Plan (FSAP). The RCAP focuses on improving the provision of finance to new enterprises, often working in high technology, high-risk areas. At the Cardiff European Council in June 1998, financial services were given a high profile and the European Commission was asked to prepare a framework for action. The result was the Financial Services Action Plan, a package of 42 policy initiatives aimed at improving the functioning of the EU financial system by 2005. Among the objectives underlying the plan are the creation of a single wholesale financial market in the EU and open and secure retail markets.

4.2 Motivating the Financial Sector

Financial markets will only use their influence for the benefit of the environment if they see that this is in their broad interest - i.e. it will help them generate profits, either directly or indirectly. The indirect considerations are particularly important in the investment business, where they can be interpreted as improving investment performance through better advice or management.

While this is straightforward, to apply it is rather more difficult. Beforehand it can be very difficult to know whether a particular activity will be profitable or will enhance investment returns. Past returns are no guide to future performance. Before considering any new or different activity, financial institutions will want to consider what they are letting themselves into very carefully.

To encourage the financial markets to support the RE sector, there is a need for measures at both a macro level, such as clear policy development and dissemination, and micro level, such as training on financial markets for environmental entrepreneurs. There is scope to support innovation in finance to the sector. In addition, public sector financial support programmes to the RE sector could be adapted to work more closely with the financial sector.

Financial institutions could see the RES as offering the potential for profitable lines of business. Examples include:

- building expertise in providing finance for key energy sectors (such as environmental technology, renewable energy)
- developing financial products to assist in the use of RES (e.g. energy efficiency)
- developing "green" investment products for clients and customers.

For this approach to offer attractive opportunities to financial institutions it will require the existence of growing, profitable market segments. The extent to which such opportunities exist is clearly open to debate, but there is some evidence to suggest that substantial unexploited opportunities exist.

4.3 Financial Sector & RE Projects

Banks and financial institutions may offer so-called "golden" or "green" funds addressed to capital markets. Such funds are financed from accounts, which attract lower interest rates. The

margin consented by the lower interest rate is passed on by the bank to the investor in the form of discount rates. Furthermore, institutional banks offer soft loans and special facilities. Public RE funds have been introduced and managed by regulated agencies. The facilities offered could involve revolving funds as well as venture capital and credit guarantees.

In certain countries, e.g. Germany, the “Green tariffs” are introduced by energy distributing companies. This is the result of a voluntary environmental solidarity of large groups of consumers who buy “green electricity” for a higher rate than normal.

Project Finance

Project finance is investment into specific, stand-alone projects, with only limited recourse to outside parties if the project runs into difficulties. Project finance normally depends on a key contract to supply or charge for the services provided (e.g. power or heat). If these contracts are secure there can be some flexibility over ownership of the facility - such as build-own-operate-transfer (BOOT) structures.

Leasing

Leasing is the provision of finance to acquire a piece of capital equipment, with the finance secured by title to the equipment. It is a highly flexible form of finance used throughout business to finance everything from photocopiers to aircraft. Leasing works best where the equipment is movable and saleable, although it has been used more generally. It can be regarded as a form of sales financing -i.e. it helps customers of a company buy that company’s equipment. Leasing has been used to buy various sources of RE technology from monitoring equipment to wind turbines.

Leasing can often be combined with tax advantages (by transferring a tax credit to an organisation that can use it). If RE equipment is given particular tax allowances, then leasing can play a very useful role.

Environmental Sector Funds

These funds invest specifically in the environmental sector. Several such funds were launched at the height of environment interest in the early 1990s. Many of the funds have performed poorly - they were launched with little understanding of environmental trends and too narrow a definition - and this is one reason why many in the investment community have a negative view of environmental issues.

Venture Capital

Venture capital is a specialist form of investment, which provides equity capital to small, new companies. Small companies with no track record can have difficulties raising capital from most investors, and venture capitalists aim to fill the gap. Venture capital is normally high return / high risk and venture capitalists expect to see returns of over 25% from their investments but accept that a certain number will fail. Normally, venture capitalists have a relatively long-term focus, aiming to hold companies for several years before selling them. Venture capitalists generally take a significant stake in a relatively small number of companies and have a more active approach than most other types of investors, in terms of partici-

pating in management of the company. They will often have a seat on the board and will aim to advise and help companies in business strategy, finance etc.

Initial Public Offerings

Obtaining a stock market listing and using the opportunity to raise capital is a mainstream financing activity, which has been used by the energy sector. The growth of second tier stock exchanges around Europe should help make it easier for RE sector companies to obtain listings and raise finance. This process would be made easier still if investors were properly informed about the potential of RE sector and had faith in the development of environmental policy.

Public Sector Investment Banks

Public sector investment and development banks can play a role in encouraging the private financial sector to support RE investments, by supporting research and innovation, providing part funding and by working through intermediary financial institutions. A number of development banks have recognised that with the expanded provision of private finance in many markets, they must redefine their roles. A natural step for them to take is to lead in the provision of finance in new or underfinanced areas, particularly those relevant to broader societal goals, such as sustainable development. Thus financing the RE sector may appear a suitable opportunity for them.

4.4 Obstacles

For Greece, in financial market terms the RE industry represents something of a paradox: great fundamental prospects but poor performance.

Financial markets, particularly those that are developed along and equity-driven, are often accused of short-termism. Many listed companies feel under pressure to deliver immediate profits at the expense of longer-term business development. Sustainable development is perhaps the ultimate long-term issue. While this is a concern, it is not always insurmountable: Long-term projects have been able to attract funding despite a long delay until payback. For example, biotechnology companies have gained listings despite their work being years from commercial application.

Most investment (e.g. pensions funds and life insurance) is essentially long term. Thus concern has been expressed that organisations with a long-term view are investing in companies taking a long-term view, but through the short-term perspective of the financial markets. Many in the markets would respond that maximising short-term returns is the best way to maximise long-term returns. One interesting observation here is that for this to happen a necessary condition is that short-term investment in any one period does not affect the ability to generate returns in any future period. This condition is essentially the same as that of sustainable development. The implication is that short termism in investment will only maximise long-term returns if sustainable development is achieved.

This debate could be largely resolved if accounting systems could reflect all of a company's capital, including aspects such as reputation, human development and environment. This in itself provides a reason to support the development of broader accounting systems.

A key limitation to the inclusion of environmental factors is the patchy quality of information on environmental issues, and a lack of understanding or awareness of the potential of such information.

While the quality of such information is improving major gaps remain, making it easy for sceptics to ignore environmental issues. Examples including inadequate reporting of risks, where for instance a company can appear to improve profitability by failing to take out adequate insurance or the tendency by analysts to ignore one-off gains and losses despite recent accounting reforms intended to incorporate them. Analysts rarely see as material one-off write downs and exceptional losses relating to environmental liabilities and higher than expected capital expenditures on projects and instead concentrate on year-on-year or 'normalised' earnings figures.

CHAPTER 5

EU FINANCING SOURCES FOR RE PROJECTS

5.1 Introduction

For the European Union, the Directorate General for Transport & Energy (DG TREN) is responsible for the energy policy. Although the promotion of renewable energy has been an integral part of the EU energy policy, renewable energy sources (RES) are currently insufficiently exploited in the EU. The promotion of renewable energy has become a European Union priority policy objective, with the following ambitious targets:

- The share of renewable energy in gross domestic energy consumption in the EU should be doubled (from the present 6% to 12%) by 2010[ii].
- Electricity produced from renewable energy sources should represent 22% of electricity consumption by 2010 (in 1997, it represented 14% of electricity consumption)[iii].

Overall emissions of greenhouse gases should be reduced meeting the Kyoto objectives by at least 8% below 1990 levels for the period 2008 to 2012[iv].

The Gothenburg European Council in June 2001 confirmed the EU consumption target of 22% and also invited "the member states to promote the Sustainable Development Strategy and to cooperate with the Commission in implementing the EU policy on climate change." The promotion of renewable energy is a major feature of the European Climate Change Programme[v].

With regard to renewables, the second phase of the ECCP (2002-2003) is focussing on the promotion of renewables in heating applications («RES-H»). The Commission is analysing the potential for increased uptake and the ways in which both existing (such as the Directive on

ii. European Commission White Paper on Renewable Energies COM (97) 599 and Council Resolution of 08/06/1998 on Renewable Sources of Energy.

iii. Directive 2001/77/EC of the European Parliament and the Council on the promotion of electricity from renewable energy sources in the internal electricity market (27 September 2001, OJ L283, 27.10.2001).

iv. Council Decision of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder (2002/358/CE, OJ L130, 15.5.2002).

v. "European Climate Change Programme" (ECCP), Commission, June 2001.

energy performance of buildings or the proposed CHP Directive) and new measures can contribute to the promotion of RES-H.

Recognising that policy efforts and initiatives have been insufficient to break down the barriers, which hamper the penetration of RES, the European Commission has decided to formulate a comprehensive strategy for RES in 1997. The strategy and action plan in the EC White Paper are directed towards the overall EU target of achieving 12% penetration of renewables in the Union by 2010. The main objectives of the EU renewable energy Action Plan are:

- ⇨ Internal Market measures (fair access for RE to the electricity market; fiscal and financial measures, such as tax exemptions for RES; new bioenergy initiative for transport, heat and electricity; improving building regulations).
- ⇨ Reinforcing Community policies (environment; growth, competition and employment; competition and state aid; research, technological development and demonstration; regional policy; common agricultural policy (CAP); external relations).
- ⇨ Strengthening co-operation between Member States.
- ⇨ Support measures (targeted promotion, such as the ALTENER programme; market acceptability and consumer protection; increased visibility of RES on the finance market; renewable energy networking).

To guarantee that the objectives are achieved, a campaign has been launched to promote large-scale projects in RES. The White Paper identifies a number of key actions to be part of the campaign.

5.2 Campaign for Take-Off (CTO)

The CTO proposed in the White Paper forms an integral part of the Community Strategy. It is designed to kick-start the implementation of the Strategy and is expected to have reached its goals by 2003. Focusing on certain key sectors proposed and elaborated below, it 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 sectors, and, in the process, to complement private investment.

Investments necessary to achieve the goals of the CTO would have to come primarily from the private sector. A strong commitment from industry and other potential investors is therefore crucial. Equally important, Member States close involvement is required, both through marketing the ideas of the Campaign and focusing programmes and schemes on its objectives. A Renewable Energy Partnership could strengthen the necessary co-operation at Community level.

The following key sectors are proposed to be promoted during the Campaign:

1,000,000 PV systems
15 million m^2 solar collectors
10,000 MW of wind turbine generators
10,000 MWth 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

For each key sector an indicative target is proposed, which corresponds 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 present status of development of the particular sector, the highest percentage (25%), for example, being set for wind energy.

Following a detailed analysis each key sector has been divided into segments according to specific markets, fields of application or particular technologies. In the framework of the Campaign, for each segment, the installed capacity needed, has been estimated. While the most appropriate territory for each segment has also been identified. Finally the indicative costs of each application in the territory concerned have been estimated as these costs include the average unit cost during the period of the Campaign and the total investment needed.

In addition to the key sectors, a stated goal of the CTO as presented in the White Paper is the identification of "100 communities" aiming at 100% of RES supply. The "100 communities" programme as initially proposed in the WP has already aroused much interest across the EU. The "100 communities" programme could also be a benchmark for the implementation of decentralised energy supply.

Table 5.1:
Indicative Scenario for Developing Key Sectors 1999 – 2003

Sector	Campaign Key Actions	Estimated Installed Capacity	Estimated Total Investment Cost billion EURO
Solar Energy	650,000 PV systems : EU 350,000 PV systems : TC	650 MWp 350 MWp	2,85 (2,45)
	15 million m² solar collectors	15 Mm²	4,7
Wind Energy	10,000 MW of wind turbine generators	10,000 MW	10,1
Biomass	10,000 MWth of combined heat and power biomass installations	10,000 MWth	5,5
	1,000,000 dwellings heated by biomass	10,000 MWth	4,4
	1,000 MW of biogas installations	1,000 MW	1,2
	5 Mio tonnes of liquid biofuels	5 Mio tonnes	1,25
Total			**30 billion EURO**

In February 2001, the Commission published its first report on the progress made towards achieving the objectives set in the White Paper[vi]. The data presented in this report, shows that advances are being made, but not at the same speed in each sector of renewable energy technology.

vi. Communication on the implementation of the Community Strategy and Action Plan on Renewable Energy Sources (1998-2000), COM(2001) 69 Final of 16 February 2001.

5.3 Green Paper Towards a European strategy for the security of energy supply

On 29 November 2000, the Commission adopted a Green Paper on supply security[vii], in order to launch a debate on the: geopolitical, economic & environmental stakes involved in securing the EU's energy supply.

The European Union's external dependence for energy is constantly increasing. The Union imports 50% of its energy requirements and if no measures are taken within the next 20 to 30 years this figure will rise to 70%. This external dependence has economic, social, ecological and physical risks for the EU. Energy imports represent 6% of total imports, which means in geopolitical terms that, 45% of oil imports come from the Middle East and 40% of natural gas comes from Russia. The EU does not yet have all the means possible to change the international market. This weakness was clearly highlighted at the end of 2000 by the strong increase in oil prices.

The Green Paper outlines the plan of a long-term energy strategy by:

a) Curbing the growth in demand by: completing the internal market, reviewing of energy taxation, energy saving and diversification plans and dissemination of new technologies;
b) Managing the dependence on supply by: development of less polluting energy sources, maintaining access to resources, ensuring external supplies, new and renewable forms of energy are the first options for action in relation to security of supply, the environment and rural populations.

With respect to the development of new and renewable energies the Green Paper also stresses the doubling of their share from 6 to 12% in the energy balance and that passing from 14 to 22% for electricity production is an ambitious objective to be achieved between now and 2010. Under current conditions, renewables will stagnate around at 7% in 10 years. Only financial measures (State tax aid, tax deductions, and financial support) could support such an ambitious aim. Among the ways to be explored, one could envisage that profitable energies (oil, gas, nuclear power) finance the development of the renewable energy, which did not benefit, like other conventional energy, from consequent support.

5.4 Directive on the promotion of electricity produced from renewable energy sources

According to the EU Directive on the promotion of electricity produced from renewable energy sources(RES-E) in the internal electricity market adopted in September 2001 (OJ L283, 27.10.2001), EU member states shall have their own national indicative targets (of renewables) at 12% share of gross national energy consumption by 2010 and 22% share of electricity generation by 2010.

The Commission is thus proposing a series of immediate and long-term measures.

Firstly, the directive:

- obliges the Member States to set national objectives for future domestic consumption of electricity produced from renewable sources of energy;

vii. COM(2000) 769 final.

- requires the Member States to define quantitative objectives to maximise the foothold of electricity produced from renewable sources in the global production of energy;
- calls on the Commission to monitor compliance of the national objectives:
  – with the global objective of 12% of gross internal energy consumption at Community level;
  – the specific objective of 22.1% consumption of electricity produced from renewable energy sources;
  – with Community commitments on climate change.

In this context, the Commission will have to propose amendments to the national objectives where these contradict Community objectives.

Secondly, as regards aid to electricity produced from renewable sources of energy, the directive:

- does not propose a harmonised system of aid at Community level. Nonetheless, the Commission may make a proposal for a more harmonised system of aid within four years of the entry into force of the directive. This proposal would take account of the experience made by the Member States in operating the various national support systems. It would be based on an assessment by the Commission of the various systems of aid, not only to renewable sources but also to conventional sources of energy. Whatever the case, it will allow for transitional periods of seven years after that date;
- confirms the wish of the Member States that the revised framework of State aid for environmental protection, which the Commission has adopted in 2001, should allow national support systems designed to promote electricity produced from renewable sources of energy to be maintained and systems that have been notified to be put into effect.

Thirdly, Member States must:

- ensure priority access to electricity produced from renewable sources of energy;
- confirm this within two years of entry into force of the directive;
- improve and accelerate the authorisation procedures applicable to the establishment of production centres for green electricity;
- guarantee that the calculation of connection costs for new producers are transparent and non-discriminatory.

The Member States must adopt and publish, by 27 October 2002 at the latest, and every five years subsequently, a report setting the indicative Member State targets for future RES-E consumption for the following ten years and showing what measures have or are to be taken to meet those targets.

Directive 2001/77/EC *on the promotion of electricity produced from renewable energy sources in the internal electricity market* provides in its annex for Greece an indicative target of meeting by 2010 a part of its gross national electricity consumption[viii] from RES equal to 20,1%, the contribution of the large-scale hydroelectric plants being included. That target is compatible with the international commitments of the country resulting from the Kyoto protocol signed in December 1997 within the context of the Rio UN framework agreement for the climate change.

viii. It is termed the mean national electrical power production including autoproduction plus imports minus exports.

The Kyoto protocol foresees for Greece a 25%[ix] restraint on the increase of CO_2 and other gases that aggravate the greenhouse effect by the period 2008-2010 with respect to the base year 1990.

5.5 State aid regulations

The Commission has adopted new Community guidelines on State aid for environmental protection[x] providing transparent criteria, indicating under which circumstances it holds "green" State aid to be compatible with the common market.

This is important to the RES sector, as most EU Member States offer subsidies to producers / users of renewable energy in order to create a "level playing field" for renewable energy, in the face of competition from conventional energy sources, for which the external costs are not all passed on directly to the end-user of the energy.

These subsidies may, in many cases, fall under the State aid rules of the EC Treaty and are thus subject to Commission approval. The new guidelines now offer Member States several new possibilities to support renewables while complying with the State aid rules.

5.6 EC Directive Proposals

Proposal for a directive on the energy performance of buildings

The Commission has adopted a proposal for a directive (Directive 2002 / 91 / EC), which aims to promote improvements in the energy performance of buildings[xi]. This proposal focuses to a large extent on energy efficiency issues but also has relevance for the supply side. It includes a methodology for establishing integrated energy performance standards for buildings, that takes into account on-site energy production, for example through the use of PV electricity or solar heating / cooling technologies.

Implementation of the new directive would provide a valuable opportunity for the PV industry to demonstrate to a wide range of building owners and users how PV can contribute to reducing the share of energy consumption in the EU attributable to buildings, which currently stands at 40%.

Proposal for a Directive on Combined Heat and Power (CHP)

The EC in July 2002 presented a proposal for a Directive on Combined Heat and Power (CHP) (COM(2002) 415 final, 22.7.2002) aimed at saving energy and combating climate change by promoting the co-generation of heat and power. The Directive proposed would encourage Member States to promote co-generation through a systematic **identification and progressive realisation** of the **national potential** for high efficiency co-generation. Member States would have to report on the progress achieved towards meeting this potential and on the measures taken in this respect.

---

ix. It is a intra-Community quota within the framework of a burden-sharing agreement of the Ministers of Energy.

x. OJ C37, 3.2.2001, p.3.

xi. COM(2001) 226 final of 11 May 2001, & OJ L1, 4.1.2003, p.65.

- The draft Directive obliges Member States to guarantee that electricity from cogeneration will be transmitted and distributed on the basis of objective, transparent and non-discriminatory criteria;
- Obliges Member States to facilitate access to the grid for electricity produced from cogeneration units using renewable energy sources and from units with a capacity less than 1 MW_e;
- Obliges Member States to publish an analysis of the national potential for high efficiency cogeneration, an analysis of the barriers to high efficiency cogeneration and a report on progress towards increasing the share of high efficiency cogeneration, including the measures taken to promote it.

It also introduces basic cogeneration definitions that Member States will have to comply with by amending national legislation, including definitions for:

- "electricity from cogeneration": will eliminate the current ambiguity resulting from the different definitions of cogenerations;
- "high-efficiency cogeneration": to determinate high efficiency cogeneration in terms of energy savings in comparison with separate production. Only cogeneration production providing energy savings of at least 10% will qualify as high-efficiency cogeneration.

And finally, the directive introduces the scheme of guarantee of origin. Member States will have to ensure that guarantee of origin of electricity from cogeneration can be issued on request by one or more competent body.

Commission package for the promotion of biofuels

In November 2001, the European Commission adopted a legislative package aiming at putting into action its new White Paper on transport policy. The package contains a communication and two proposals for directives: "Communication on an Action Plan and two Proposals for Directives to foster the use of Alternative Fuels for Transport, starting with the regulatory and fiscal promotion of biofuels[xii] (COM (2001) 547 final).

The Commission considers that the use of fuels (such as ethanol) derived from agricultural sources (i.e. biofuels) is the technology with the greatest potential in the short to medium term. The action plan outlines a strategy to achieve a 20% substitution of diesel and gasoline fuels by alternative fuels in the road transport sector by 2020. It concludes that only three options would have the potential to achieve individually more than 5% of total transport fuel consumption over the next 20 years: biofuels which are already available, natural gas in the medium term and hydrogen and fuel cells in the long term.

The first proposed Directive would establish a minimum level of biofuels as a proportion of fuels sold from 2005, starting with 2% and reaching 5.75% of fuels sold in 2010. The second proposed Directive would give Member States the option of applying a reduced rate of excise duty to pure or blended biofuels, when used either as heating or motor fuel.

xii. COM (2001) 547 final of 7 November 2001.

5.7 EU Supported Programmes

5.7.1 Intelligent Energy for Europe

The Commission has proposed a new multiannual programme of action in the field of energy for the period 2003-2006 (COM (2002) 162 final). «Intelligent Energy for Europe -IEE»[xiii] implements the course of action outlined in the Commission's Energy - Security of Supply Green Paper. It aims at strengthening security of supply, fighting against climate change and stimulating the competitiveness of European industry. «Intelligent Energy for Europe» will provide financial support to local, regional and national initiatives in the fields of renewable energies, energy efficiency, energy aspects of transport and their international promotion. Of particular note are the Commission's communication[xiv] on a sustainable Europe, subsequently approved by the Gothenburg European Council and the Johannesburg conference on sustainable development.

Actions that can benefit from EU financial assistance must aim at stimulating the European market, and, among other things:

- Increase energy efficiency by around 1% per year;
- Increase the use of renewable energy in consumption from 6% to 12% by 2010;
- Increase to 22.1% by 2010 the percentage of electricity produced from renewable sources;
- Increase the production of electricity produced from cogeneration by 2010;
- Develop the potential of renewable sources of energy;
- Promote Kyoto mechanisms

The new "Intelligent Energy for Europe" programme is adopting a more integrated approach regarding the promotion of renewable energies (ALTENER) and energy efficiency (SAVE), offering at the same time a higher level of European support. International action regarding the RES and RUE priorities is brought in line with the COOPENER sub-programme. Finally, the STEER sub-programme will include a new package of measures on the energy aspects of transport, in line with the new guidelines of the common transport policy.

In the current financial context, the Commission will allocate the "Intelligent Energy for Europe" programme a budget of 215 millions for the period 2003-2006. This budget takes into consideration the EU's political guidelines, notably the European Union strategy for sustainable development, approved by the Gothenburg European Council in June 2001. The Energy Framework Programme (1998-2002) was allocated an overall budget of 175 millions.

The provisional budget for the above programme is broken down as follows:

xiii. http://www.europa.eu.int/comm/energy/res/intelligent_energy/index_en.htm

xiv. A sustainable Europe for a better world: a European strategy for sustainable development, COM (2001) 264.

€ million	2003	2004	2005	2006	TOTAL
SAVE	21	18	18	18	75
ALTENER	23	21	21	21	86
STEER	4	11	9	11	35
COOPENER	2	5	7	5	19
TOTAL	**50**	**55***	**55***	**55***	**215**

** An additional budget of 50 million could be envisaged in the context of EU enlargement.*

Joint funding will in principle be limited to 50% of the total cost of projects, but for certain studies, or measures undertaken on the Commission's own initiative, there is provision for 100% funding. In order to be eligible for support, projects must help to reduce the EU's energy dependency and combat climate change. The first call for proposals is expected during spring 2003 following the adoption of the common position on the draft Decision of the European Parliament and the Council establishing the programme.

The work programme of the IEE is organised in KEY ACTIONS (KA), and inside each Key Action a number of TARGET AREAS (TA) have been defined. The key actions are of vertical (VKA) and horizontal (HKA) character. The Vertical Key Actions (Save, Altener, Steer and Coopener) contain the sectoral objectives of each of the fields, including the potential instruments that could be used to achieve them.

The Horizontal Key Actions are, by nature, transectoral, covering several (or all) fields. Some of the Horizontal Key Actions have as a main objective the integration of actions addressing Renewable Energy Systems, Rational Use of Energy and Transport. This is the case for the Key Actions: "Think globally, act locally", "High performance communities" and "Monitoring and evaluation". The other two Horizontal Key Actions, "Dissemination and valorisation of results" and "Innovative financing schemes" have as their main objective the creation of a sound basis for the promotion of Renewable Energy Systems, Rational Use of Energy and Transport specific measures.

In addition elements that have the same character as those of the Horizontal Key Actions could logically appear in each Vertical Key Action, applied to that sector. In these cases, the horizontal elements of the Vertical Key Action will be co-ordinated and empowered through the Horizontal Key Action.

The European Union's "Energy" Framework Programme (1998-2002) on actions in the energy sector and most of its energy programmes expired in December 2002. They included among others the SAVE and ALTENER programmes. In the current IEE the ALTENER programme concerns the promotion of new and renewable energy sources for centralised and decentralised production and their integration into the local environment and energy systems, including the preparation of legislative measures and their application.

5.7.2 The Sixth Framework Programme

The Sixth Framework Programme (FP6)[xv] is the Union's main instrument for the funding of research in Europe. Proposed by the Commission and adopted by the Council and Parliament in co-decision, it is open to all public and private entities, large or small. The main focus of

xv. http://fp6.cordis.lu/fp6/home.cfm

FP6 is the creation of a European Research Area (ERA) as a vision for the future of research in Europe. It aims at scientific excellence, improved competitiveness and innovation through the promotion of increased co-operation, greater complementarity and improved co-ordination between relevant actors, at all levels.

New support instruments have been introduced: Networks of Excellence and Integrated Projects, which will give EU activities a bigger impact and bring about a stronger structuring effect on research conducted in Europe. FP6 will make it possible to assemble genuine critical masses of resources, to better co-ordinate national research efforts and to diversify support activities in key areas such as the mobility of researchers, research infrastructures and science and society issues.

The overall budget covering the four-year period 2003 - 2006 is 17.5 billion, representing an increase of 17% from the Fifth Framework Programme and making up 3.9% of the Union's total budget (2001), and 6% of the Union's public (civilian) research budget. There are no national quotas for FP6 funds. FP6 represents the third operational budget line within the overall EU budget, after the lines of Common Agricultural Policy and Structural Funds. It will be instrumental in achieving the March 2000 Lisbon European Council goal of turning Europe into the world's most competitive, knowledge-based economy by 2010. It will also greatly contribute to the creation of the ERA, a true European internal market for research and knowledge, where EU and national R&D efforts are better integrated.

The Sixth Framework Programme (FP6) sets out the priorities for the European Union's research, technological development and demonstration (RTD) activities for the period 2002-2006. Much of the 17.5 bn budget will be spent on seven thematic priority areas:

- Life sciences, genomics and biotechnology for health
- Information society technologies
- Nanotechnologies, multifunctional materials and new production processes
- Aeronautics and space
- Food quality and safety
- Sustainable development, global change and ecosystems
- Citizens and governance in a knowledge based society

One of the main aims of FP6 is the establishment of the European Research Area (ERA). To this end, part of the budget has been allocated to the co-ordination of research activities, and developing research and innovation policies. In addition to this money, the following activity areas have been set up to help structure the ERA:

- Research and innovation
- Human resources and mobility
- Research infrastructures
- Science and society

There is also special support for multi-sector research activities involving Small and Medium Size Enterprises (SMEs) and for international co-operation activities. In addition to this a part of the budget has also been set aside for the EURATOM framework programme, which co-ordinates research into nuclear energy.

On 3 June 2002 the Council adopted the FP6, after the European Parliament had agreed to it on 15 May 2002. FP6 covers, *inter alia*, the priority area "Sustainable development, global change and ecosystem", with a total budget of 2,120 million. More than a third of this budget will be dedicated to non-nuclear energy and will address RTD activities to promote clean

energy, in particular renewable energy sources and their integration in the energy system, together with storage, distribution and use, as well as alternative motor fuels.

The **Non-nuclear energy (NNE) research** falls within the FP6 thematic area "Sustainable Development, Global Change and Ecosystems". The NNE Research programme objectives are the reduction of greenhouse gases and pollutant emissions, the security of energy supply, the increased use of renewable energy and the enhanced competitiveness of European industry.

RTD into sustainable energy systems is divided into two areas:

Research activities having an impact in the short and medium term

Research in this area is focussed on bringing innovative and cost competitive technologies onto the market by demonstration projects and research into technical, institutional, financial and social issues.

- Clean energy, in particular renewable energy sources and their integration into the energy system, including storage, distribution and use.
- Energy savings and energy efficiency, including those to be achieved through the use of renewable raw materials.
- Alternative motor fuels.

This part of the Thematic Priority is managed by DG Energy and Transport and has a budget of 405 M.

Research activities having an impact in the medium and long term

In the longer term the aim is to develop new, clean energy sources and carriers which are affordable and can be integrated into energy supply networks.

- Fuel cells, including their applications.
- New technologies for energy carriers / transport and storage, in particular hydrogen.
- New and advanced concepts in renewable energy technologies
- Capture and sequestration of CO_2, associated with cleaner fossil fuel plants.

This part of the thematic priority is managed by DG Research and has a budget of 405 M.

The first calls for the Sixth Framework Programme (FP6) were published on 17th December 2002. The work programmes and the first calls were built upon the 12,000 proposals, which were submitted in the recent expression of interest.

5.7.3 The LIFE Programme

LIFE Programme[xvi] is the Commission's financial instrument for the environment. The general objective of LIFE is to contribute to the implementation, updating and development of Community environment policy and of environmental legislation, in particular as regards the integration of the environment into other policies, and to sustainable development in the Community.

LIFE consists of the three thematic components, namely, LIFE-Nature, LIFE-Environment and LIFE-Third Countries. The specific objective of Life-Environment is to contribute to the development of innovative methods and techniques and to the further development of Community environment policy.

xvi. http://www.europa.eu.int/comm/environment/life/home.htm

Projects financed by Life-Environment must be:

- demonstration projects which integrate considerations relating to the environment and to sustainable development in land-use development and planning, promote the sustainable management of water or minimise the environmental impact of economic activities;
- projects which prepare new Community initiatives, instruments or legislation relating to the environment;
- accompanying measures.

LIFE-Environment does not finance research or investment in existing technologies or infrastructure. The purpose of the programme is to bridge the gap between research and development results and their large-scale application. To this end, demonstration projects based on the results of projects which have been supported under past or ongoing technological research and development programmes are encouraged.

The maximum rate of Community cofinancing is 30% for projects generating substantial revenue, 50% in other cases and 100% for accompanying measures. The European Union has allocated approximately 300 million euros for LIFE-Environment for the period 2000-2004. About fourteen projects that included the demonstration of RE have been financed since 1992.

5.8 Community indirect support for the consumption of energy produced from renewable sources (tax measures)

The Commission proposal for the taxation of energy products (COM (97) 30) also provides for tax reductions or exemptions for energy from renewable energy sources. More information is provided in Chapter 6.5.

5.9 Indirect support to sources used to generate renewable energy (agricultural subsidies, etc.)

The most important support in this field is provided through the CAP to certain crops, such as rapeseed, which are, *inter alia*, used as energy crops. However, the amount of subsidies is not easy to quantify, as support is granted for particular crops and not for particular uses. Thus, the exact amount of subsidies could only be established if the exact quantity of crops used for energy generation, either in the form of biomass or in the form of biofuels, is determined.

The CAP also provides support to RES through some of its rural development projects. However, as these programmes are implemented by Member States using different calculation methods, and as most of these programmes are not primarily and exclusively aimed at RES promotion, it is at present not possible to estimate with reasonable precision the order of magnitude of the support offered. In its Communication on the Mid-Term Review of the CAP, the Commission proposes replacing the existing arrangements for support on set-aside land with a specific energy crop payment (“carbon credit”).

5.10 European Multilateral Financial Institutions

The involvement of Multilateral Financial Institutions (MFI) in any project requires compliance with competitive bidding rules, putting market pressure on the costs and ensuring transparency. Following the example of the World Bank Group, other financial institutions now require a satisfactory environmental assessment of the project, something, which has raised the awareness of commercial banks on environmental issues. For their assessment procedures, MFIs often rely on third party advisors.

In all cases, MFIs involvement in a project is a factor of comfort because:

- The heavy weight of the MFI in the lending group, which leads one to think that the host government will not impede the repayment of debts.
- The MFI will have concluded favorably on the economics of the project and will have used independent consultants to do so.

There are a number of other sources of EU support for Risk Capital Financing. Besides the Structural Funds these include the *European Investment Bank* (EIB); and the *European Investment Fund* (EIF), support from which is sometimes combined with aid from the Structural Funds.

5.10.1 European Investment Bank (EIB)

The European Investment Bank[xvii] is an autonomous public institution within the European Union, responsible to its own decision-making bodies, which operates on a non-profit basis. The EIB is the European Union's long term lending institution financing priority capital investment projects for a balanced European economic development and integration.

The EIB finances public and private sector projects which meet EU policy objectives. Its main goal is to finance investments promoting economic development in the European Union's less favoured regions. EIB is involved in financing renewable energy projects through:

- Horizontal co-operation to address regional infrastructure financing, which can have an effect on the EU.
- Low interest rates (3%) on loans for environmental protection projects.
- Risk capital investments, from the EU budget.

The EIB loans from its own resources, either to the public or private sector, must be backed-up by Government guarantees. In addition, EIB lends no more than 50% of the total project cost.

The Bank has been involved in the financing of renewable energy schemes since the 1970s, mainly in the field of medium and large-scale hydroelectric plants. Due in part to the lack of suitable new sites for such projects and their often adverse impact on the local environment, the Bank's renewable energy focus has shifted to smaller-scale schemes employing an increasing number of energy sources.

Recently the EIB has issues a sector policy paper in June 2002 for the financing of renewable energy projects (Update of Renewable Energy Review – Period 1993-2001). The Bank's activity in support of renewable energy is modest in both absolute and relative terms – average lending over the past 9 years has been around EUR 220m per annum. This figure represents

xvii. http://www.eib.org

6.5% of its total energy sector direct lending in 2000. In the last few years, the share of renewable energy in its total investment in the energy sector has even decreased.

EIB loans provided for renewable energy projects have, in the past, been concentrated on the more commercially and technically developed sectors (hydroelectric, wind power and some geothermal). Biomass lending has increased in recent years, amounting to EUR 61m and EUR 53m in 2000 and 2001, respectively. This is significant, given that these projects are primarily restricted to heavily forested regions in Northern Europe. Wind energy development is quite mature in countries such as Denmark, the Netherlands, Spain and Germany, with the focus now shifting from smaller to larger-scale applications and from onshore to offshore in North West Europe.

The Bank assigns a very high priority to the expansion of its lending for renewable energy projects. Within existing rules, it is working to overcome the constraints for lending in this area, for example by a flexible application of the minimum project size criterion.

To underline its support for the EU's policy, the Bank is to at least double its loan volume (individual and dedicated global loans) for renewable energy over the next five years. This objective will take into account lending both inside and outside the EU and will be measured as a proportion of the Bank's lending in the energy sector as a whole, using its lending in the period 1997-2001 as a base. Individual loans for renewable energy in the period 1997-2001 amounted to 7.4% of lending in the energy sector.

5.10.2 European Regional Development Fund (ERDF)

The European Regional Development Fund is one of the EU's Structural Funds which co-finance actions to help reduce the gaps in socio-economic development between the various regions and member States of the Union.

The ERDF's resources are targeted at certain disadvantaged regions and are mainly used to finance improvements in infrastructure, productive investment, local development, human resources and the environment. There are two kinds of programmes that are administratively distinct: National Programmes and Community Incentives. Funding from ERDF comes in the form of non-reimbursable assistance.

The new regulation on the European Regional Development Fund (ERDF)[xviii], which was adopted in the framework of AGENDA 2000, expressly states that the ERDF should foster the development of renewable energy sources, and the definition of the scope of the fund includes action in support of renewable energy sources.

In the latest guidelines for the Structural and Cohesion Funds[xix], renewable energy is highlighted as a strategic priority, particularly because of its potential to contribute to the development of local resources and to reduce import dependency. Whilst it is not appropriate to establish specific budgets for renewable energy in the regional funds, Member States were nevertheless called upon to guarantee at least 12% of the global budget of their energy sub-programmes for supporting renewable energy sources. This could result in regional investments of around 487 million in RES (2000-2006). Nevertheless, measurement of the precise

xviii. Regulation (EC) No. 1783/1999 of the European Parliament and of the Council of 12 July 1999 on the European Regional Development Fund, OJ L 213, 13.8.1999, p.1.

xix. COM (1999) 344 final.

amount of support would involve searching all such projects for possible RES implications, a task that is beyond the current scope.

5.10.3 European Investment Fund (EIF)

The European Investment Fund[xx] is a financial institution which was established as a joint venture by the European Investment Bank, the European Union and private and public financial institutions from all 15 Member States of the European Union.

Unlike the EIB, EIF is not a lending institution. As a complement to the other institutions, EIF offers guarantees on debt finance and invests in venture capital funds. The Fund helps the financing of European infrastructure projects in the areas of telecommunications, transport and energy by issuing direct guarantees for debt finance. The growth of smaller businesses throughout the EU is also supported by the Fund through the issuance of guarantees for debt finance; in this case a wide range of financial intermediaries are the beneficiaries of the guarantees.

More recently, a transaction structured around the credit insurance, namely the Growth & Environment Scheme, is supporting RET projects implemented by SMEs. Through the Growth and Environment Scheme, the EIF offers a guarantee to financial institutions that grant loans to European SMEs for the financing of environmentally friendly investments, including renewables. This guarantee is free of charge for the financial institution and for the company due to sponsorship of the Scheme by the European Union. The EIF guarantee operates on a portfolio basis. At its own risk, the EIF provides a 50% residual loss cover for eligible credits included in the portfolio by the financial institution. Guarantee fees are paid out of EU budget funds under a co-operation agreement between the European Commission and the EIF.

A network of financial intermediaries (for Greece is ALPHA Bank) has been built across the EU following calls for expression of interest and careful selection by the EIF. Interested companies should directly approach the financial institutions participating in the Scheme in their own Member State for more details.

In particular, it should be noted that the EIF implements the financial instruments of the *EU Multiannual Programme for Enterprises and Entrepreneurship (MAP 2001-2005)*[xxi]. The financial instruments include:

– the *SME Guarantee Facility* for guaranteeing (or co-guaranteeing or counter-guaranteeing) banks' SME loan portfolios;
– the *ETF Start-up Facility* for investments in venture capital funds or incubators specialising in early-stage finance of SMEs;
– the *Seed Capital Action*, which seeks to support the recruitment of investment managers for those seed capital funds that the EIF invests in.

The EIF uses banks, venture capital funds and guarantee institutions as intermediaries towards the SMEs.

---

xx. http://www.eif.org
xxi. 2000/819/EC, OJ L 333, 29.12.2000, p 84.

5.10.4 Black Sea Trade & Development Bank

The Black Sea Trade and Development Bank (BSTDB)[xxii] was established by the eleven Member States of the Organisation of the Black Sea Economic Co-operation in 1998 as a regional multilateral development financial institution.

The purpose of the Bank is to accelerate development and promote co-operation among its shareholder countries. The Bank's eleven Member States include Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russian Federation, Turkey and Ukraine. The Bank benefits from a subscribed capital base of approximately 1.35 billion USD.

The Bank provides funds for projects and trade financing under the terms and conditions stipulated in Rules and Procedures for Financing Projects (Project Finance) and Commercial Activities (Trade Finance). The Bank's operational strategy is formulated along the lines of its mission to facilitate the progress of each member country and the Black Sea Region towards balanced economic and social development. In particular, the Bank's strategy aims at:

- The facilitation of economic cooperation and acceleration of intra-regional integration via promotion of trade and investment activities between and among the member countries.
- The mobilisation of resources within the region and improvement of its access to foreign investment and capital markets.
- The development of private enterprise sector, including SME promotion.

The single objective of the Bank's energy sector operational strategy is to facilitate the development of a regional energy market. The strategy is inclusive and in its implementation will build on the common interests of the member countries.

The objective can be achieved through carefully selected investments in financially viable projects in the following broad categories:

- Niche energy production opportunities both in oil and gas production (not exploration) and electricity generation;
- Energy transportation infrastructure projects such as oil and gas pipelines and the associated equipment and high voltage electricity transmission lines;
- Local sustainable development oriented projects, which incorporate the revenues and costs of the social and environmental impact of the project into the financial appraisal.

This strategic objective reflects the common concerns of the member countries:

- Diversification of supply;
- Interconnection and security of supply;
- Increased energy efficiency and development of environmentally friendly technologies.

As well as the current trends in the global energy market:

- Consolidation and emergence of local niche players;
- Development of international energy markets through market liberalisation and infrastructure development;
- Growing concern with the efficient and environmentally sensitive production, transport and consumption of energy.

Energy efficiency is a key element in every member country's energy strategy. Renewable sources of energy already play a significant part in the electricity generating capacity of many

xxii. http://www.bstdb.gr

of the member countries. On the whole this is in the form of hydroelectric schemes, but other new technologies such as solar and wind energy are also being put into operation.

Energy efficiency and renewable energy are complimentary; energy efficiency deals with demand management, renewables with supply. Together they offer the opportunity to make substantial improvements to both the competitiveness of regional industry (through reduced energy consumption) and the environmental problems associated with hydrocarbon based electricity generation.

The Bank will support energy efficiency projects from its energy investment allocation. Renewable energy projects that have a local development benefit, or where there is a widely applicable knowledge transfer benefit will also qualify for support.

5.11 Funding Mechanisms in the European Union

There is a multitude of funding opportunities[xxiii] for businesses, offered within the framework of different Community policies - for example, Community programmes in the fields of research and technological development, training or Community schemes supporting the setting up of joint ventures. Community funding usually takes the form of grants, loans or guarantees. More recent Community initiatives aim at developing the European venture capital markets, where support can take the form of equity or quasi-equity.

These funding instruments are directed to the support of SMEs, in facing obstacles related to access to finance and therefore can be viewed as supportive mechanisms for enhancing job creation and establish a more favourable financial environment in a European level, rather than stimulating a specific market or technological sector i.e. renewables.

A special focus is put on stimulating the development of EU risk capital markets, and this remains one of the European Commission's priorities for 2000 and beyond. The European Investment Bank (EIB) and the European Investment Fund (EIF) support some of the Community activities in this field.

The Commission is facilitating the financing of innovative enterprises through an investor identification and guidance service, Gate2Growth. The service is operated by a team of investment analysts with venture capital or entrepreneurial background, and it has an online database of investment opportunities. Since its start in March 2002, 1300 entrepreneurs and 60 active investors have registered to the database. The initial experiences in terms of the value added the service brings to entrepreneurs' investment readiness have been positive.

The *Gate2Growth.com* website functions also as a single access point and an operational platform to thematic networks of early stage venture capital investors, incubator managers, managers of industrial liaison offices at universities and research institutes and providers of entrepreneurship training. This makes it easier for innovative entrepreneurs to identify the most appropriate support available locally. Gate2Growth will also establish partnerships with local operators of business plan contests, business angel networks, and investment forums.

---

xxiii. Further information for EU funding opportunities for businesses in:
http://europa.eu.int/comm/enterprise/funding/index.htm &
http://www.cordis.lu/finance/home.html

5.11.1 Business Angels

Informal Investors or "Business Angels" are wealthy individuals who are prepared to use their financial resources to make risk investments based on their experience and interests. They may often be retired senior executives of major enterprises, or people who have sold their companies and now wish to use the money. Their motivations are many and they may invest alone or in small groups.

Typically, Informal Investors or "Business Angels" tend to invest locally and in business sectors in which they have some experience. In general, they apply less restricted investment criteria and may have lower growth and IRR expectations than Venture Capital funds. Non-economic factors, however, like the personal fit with the entrepreneur, may be quite important.

The size of the investment is a major factor. Individually, their investments may be quite small (around 50,000 Euro initially) but in syndication, considerably larger sums may be available. If the company keeps growing rapidly, other sources may have to be sought for follow-on financing. Typically, they are good for investments below 250.000 Euro.

5.11.2 CREA ("Capital-Risque pour les Entreprises en Phase d'Amorcage")

Under the CREA programme, which succeeded the European Seed Capital Fund Network (ESCFN), the Commission encourages seed-capital funds to finance businesses in the start up phase and SME business transfers.

CREA provides for a repayable loan for a maximum period of three years to cover up to 50% of the operating costs of the seed capital fund manager.

The funds must be new (set up since 1 October 1997 or currently being set up) and must have a minimum capital of Euro 4 million, of which 25% is fully paid up at the time of signing a contract with the Commission, with a maximum of 50% being of public sector origin. Currently the budgets have been exhausted and the scheme is closed for new applicants.

5.11.3 Eurotech Capital

EUROTECH CAPITAL is an initiative of the European Commission, which aims to stimulate private capital investment in trans-national high technology developments being undertaken by Small and Medium sized Enterprises (SMEs) through a network of European venture capitalists. At present the Network is composed of 14 European venture capital funds specialised in high technology sectors.

An eligible investment for the Eurotech Capital scheme is identified under certain Transnational Criteria; Projects derived from a Community or European R&D programme; or Projects having a research phase and an industrial application phase in two or more EU countries; or Projects stemming from a company whose shareholders originate from at least two EU countries.

Although most of the participating venture capital funds are by now fully invested, the network of operators is still supported. No new members are admitted, however. Some participants have recently raised new funds, which have been taken up in the European Commission's I-TEC Network of Venture Capital Operators.

5.11.4 Joint European Venture

The JEV initiative aims to support the creation of transnational joint ventures between SMEs within the European Union. Through JEV, the European Commission provides a financial contribution to cover part of the costs incurred in setting up a joint venture.

JEV is about creating new activities and new jobs, which can be sustained in the long term. A network of Financial Intermediaries, specialised in investment finance (commercial banks, investment banks, venture capital funds), provides the link between the European Commission and the applicants.

The concept of a "joint venture" will be interpreted broadly, that is including any form of consortium, partnership or joint venture in the strict sense, which should lead to a new legal entity, of an industrial, service, commercial or craft nature.

The joint venture must be newly created by at least two SMEs from two different Member States and the maximum contribution per project shall be Euro 100,000. If one of the partners owns more than 75% of the shared capital of the joint venture, the project will not be eligible.

5.11.5 The Technology Performance Financing

The Technology Performance Financing pilot project was launched in March 1991 by DG Enterprise/D of the European Commission and involved nine major European commercial banks. Its objectives were to:

- Increase the involvement of commercial banks in technology financing by encouraging them to experiment with Technology Performance Financing as a new product in their portfolio;
- Enable the participating banks to share experience and good practices in financing technology projects;
- Help innovative SMEs, in particular NTBFs, to make their first reference sales;
- Promote the adoption of new technologies by SMEs.

The participating commercial banks agreed to test the extension of the technique of Third Party Financing, used widely in the energy sector, to other sectors and technologies. The Technology Performance Financing technique allows the financing of a new technology based on its performance. The European Commission provided a partial guarantee to cover the technology risk of the financier, as well as a contribution to the set-up costs of the system. The financing of technology projects originated from the participating bank's own resources.

Although the TPF pilot project and the Community support to the participating commercial banks ended in 1997, most of the participating banks continue to finance technology projects and have proven to be open to such opportunities. The intermediary Operator for Greece was the Agricultural Bank of Greece.

5.11.6 I-TEC

The I-TEC pilot project is an initiative to encourage early stage investments in technologically innovative SMEs. It was launched in July 1997. I-TEC is supported by the European Commission under its INNOVATION/SMEs Programme, and implemented in collaboration with the European Investment Fund.

I-TEC aspires to help build, within Venture Capital operators, a lasting capability to appraise

and manage those early stage projects, in technologically innovative SMEs, which, in spite of their economic viability and inherent quality, would otherwise not be taken into account.

Innovative SMEs can access a network of 28 capable Venture Capital investors, interested in business projects with a high degree of innovation in technology, product, service or process and which exhibit a potential for high growth and new job creation. The Venture Capital operators who are taking part in the I-TEC pilot project have agreed to devote at least 25% of their funds to early stage investment in technologically innovative SMEs over the next three years.

The I-TEC contribution per selected Venture Capital operator is as follows: The European Commission can contribute up to 50% of the costs related to initial appraisal and hands-on management. The total I-TEC contribution per Venture Capital fund will not exceed 5% of the investments effectively made, with a maximum of 500,000 Euro. The I-TEC contribution will be made available only after actual investments have been made.

5.12 Risk Capital in Greece [3]

There is recognition of a risk capital gap in Greece. The Hellenic Organisation of SMEs EOMMEX suggests that new establishments in all sectors looking for financing in the 150,000 to 600,000 (GDR 50-150 million) range are particularly affected. On the other hand the proportion of SMEs willing to use external risk capital is put at less than 1 percent. This would still amount to 170-200 firms annually if firms with less than 10 employees were excluded completely.

To relieve the pressure on the commercial banking system, the supply of risk capital in Greece has been promoted through government action, with EU support, in sponsoring the setting up of four regional mutual guarantee companies, together with a counter-guarantee fund. The government is also intending to launch up to six venture capital companies to join the three private-sector investors who include a bank subsidiary and a private fund management company. The venture capital sector in Greece is newly developing. In early 2001, a project to create a New Technology Venture Fund was announced by the Ministry of National Economy. Raising awareness of venture funding and its appropriate uses among the SME population is considered a high priority. There were 45 investments in 1999 amounting to 71 million, and first half 2000 figures suggest a healthy increase. Nearly all investment was in start-up and expansion stages.

The level of subsidy announced in the mutual guarantee and public venture system suggest that there may be a significant lack of transparency and competitiveness within the Greek SME finance market. Loan guarantee schemes may run into difficulties in such situations. In these circumstances, it does not seem appropriate to consider an equity guarantee scheme, which *a fortiori* needs to be positioned within a well functioning market.

CHAPTER 6

NEW FINANCIAL MODELS FOR RE INVESTMENTS

6.1 Introduction

Financing the investments of renewable energy systems remains a major concern. It will improve as costs fall and RET become more competitive because many investors are willing and anxious to enter the energy sector. They are helped by new financial instruments that use private-sector banks to create green investment funds with lower interest rates in commercially viable technologies. Third-party financing has the potential to be an important instrument but energy service companies (ESCOs) have had problems raising capital, given the risk perceived for the projects.

Different types of financing measures have been developed and applied throughout the EU in the past. These range from traditional subsidy schemes to reduce the initial investment costs (grants), through tax relief and exemptions to more innovative schemes such as Third Party Financing and Energy Performance Contracting.

It is the time for the RE industry to consider project financing, rather than conventional financing. The principle behind the project as opposed to conventional lending is that the banks take the project risk and rely on the success of the venture they are financing to repay the borrowings.

The renewable energy industry, including independent producers, argues that for the most part they do not have the same advantageous terms to borrow from the financial markets, as utilities do. This can be helped by funds as described in the present chapter, but they can also be helped by getting the utilities to invest.

Financing also improves if companies can be assured a long-term market for their production, for example, through improvements in the policy framework to ensure fair access to grids and to set the structure for pricing.

6.2 The ESCO Concept - Third Party Financing [16]

An Energy Service Company (ESCO) is a company engaged in developing, installing, and financing comprehensive, performance-based projects, typically 7 to 15 years in duration, centred around energy production or/and improving the energy efficiency of facilities owned or operated by customers.

ESCOs are project developers responsible for an unusually wide spectrum of tasks: they identify, design, and finance the project; install and maintain all or most of the equipment involved; measure and monitor the project's energy performance; and assume the risk that the project will save or produce the amount of energy guaranteed. Like most developers, ESCOs distinguish working capital from project financing.

The fundamental feature common to all ESCO projects is the requirement that the customer does not make any cash payments except from realised savings or purchase of energy. In order to meet this requirement, the ESCO assumes all performance risks associated with developing, financing, implementing, and operating the project. This means that the ESCO:

a) Provides all working capital to develop the project;
b) Provides or arranges construction financing, including interest during construction;
c) Provides or arranges long-term financing so that the annual repayment obligation is less than the project's annual realised savings;
d) Absorbs financial loss if the project's ongoing debt-service and operating costs exceed realised savings.

Regardless of how a project is structured and financed, the ESCO typically receives the following forms of compensation:

- Progress payments during the construction phase for its costs to develop, design, purchase, and install the efficiency measures, plus a mark-up for marketing, general and administrative costs, and profit (referred to as the implementation price).
- Savings payments after construction for its ongoing monitoring, maintenance, and management costs, plus a charge for the performance risk assumed.

Another important aspect of the ESCO is the flexibility to package its services in a variety of ways such as:

- *Full Service Package.* The company is responsible for the whole life cycle of the energy investment project including financing (design, plans, materials, labour, commissioning, performance measurement and monitoring).
- *No Financing and No Equipment Maintenance.* The utility secures the financing and maintains the equipment while the ESCO provides the remaining services. In this scheme ESCO can act as an investment consultant to the utility taking advantage of special agreements with banks (e.g. green fund option).
- *Standard engineering and/or consulting services.*
- Projects are *performance contracting (EPC),* when the ESCO's compensation and often the projects' financing are meaningfully tied to the amount of energy actually saved. Projects are said to be *comprehensive* when the ESCO seeks to achieve energy savings from the widest possible array of cost-effective measures in a given facility. ESCOs are therefore distinguished from specialised purveyors of single-measure installations offering no performance guarantees and usually disregarding the potential for savings unrelated to the equipment in which they specialise.

The main financial instrument of an ESCO is *Third Party Financing (TPF).* The repayment of investments is conditional upon and proportional to the return. The model is based on a contract whereby the private company or public institution enlists the services of the ESCO, which assumes responsibility for all phases of investments designed to increase energy efficiency. Depending on the nature of the project, the total cost is reimbursed in two ways: a) in proportion to the energy savings achieved for an energy efficiency project b) by selling the energy to the utility subject to an energy contract.

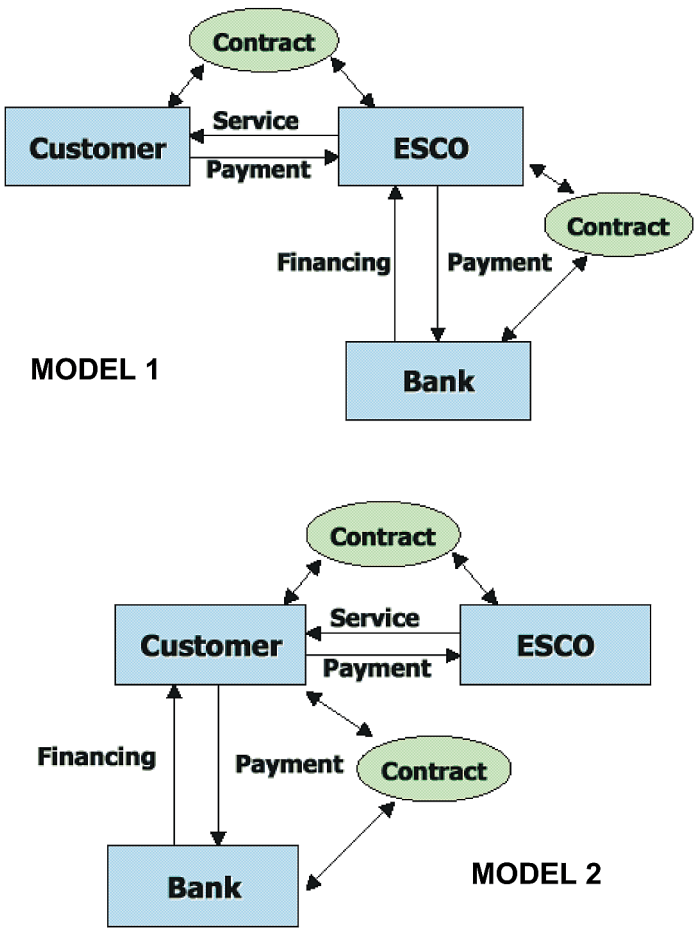

Figure 6.1
Financing Models structured around Third Party Financing Concept[6]

Finding finance for the project is essential part of the ESCO business. Two basic financing models are commonly employed, as shown in Figure 6.1. Model 1 is typical for a *"shared savings"* EPC, under which the customer has no obligation to repay the Implementation cost but instead commits to pay a percentage of the realised savings over a specified period of time. Model 2 is typical for a *"guaranteed savings"* EPC, under which the customer assumes the obligation to repay the Implementation cost to a third-party financier (commercial bank or leasing company). The ESCO guarantees to the customer that the project's realised savings will equal the payments made by the customer over the term of financing.

6.3 Energy Performance Contracting

An ESCO carries out a contracting method - called "*energy savings performance contracting*",

which allows public or private sector companies to undergo energy conservation / production projects without having to pay capital expenditure monies.

Under this contracting method, companies contract with an ESCO that pays all up-front project-related costs, which include installing, operating, and maintaining energy-efficient systems. The company pays back the ESCO over a period of time, usually 10 to 15 years. The immediate cost savings with a lower energy expense usually cover payback costs, including interest.

In the framework described above, financing is arranged so that the energy savings or energy production covers the cost of ESCO services and the cost of the energy equipment. The repayment options are negotiable and include the following: a *"shared savings"* agreement in which the ESCO will take a fixed percentage of the energy savings for a predetermined length of time; a *"fast payout"* agreement in which the company receives all the energy savings until either the end of a specified time period, or the cost of the project is paid off; *"energy purchase"* agreement in which the utility pays a flat fee each month for the energy needs covered in the contract; *"chauffage"* where the customer pays the ESCO a fee equivalent to energy bills prior to the project, less a discount of 5 to 10 percent, with the ESCO paying the energy bills over the life of the agreement.

6.3.1 Guaranteed Savings [16]

In a project structured around guaranteed savings, the customer makes periodic debt service payments (typically fixed amounts) to amortise the implementation price paid to the ESCO for developing, designing, and installing the efficiency measures.

In these projects, the customer assumes the obligation to repay the implementation price to a third-party financier. Usually introduced by the ESCO, this third party is very often a commercial bank or leasing company. If the customer finances the project itself, of course, the customer "repays" itself by saving energy costs. Where performance-based Demand Side Management funds are provided by the customer's utility company, repayment is typically made to the ESCO, which commonly finances some or all of the project.

The ESCO guarantees to the customer that the project's realised savings will equal the payments made (or financing costs absorbed) by the customer over the term of financing. These payments may also include operating and maintenance costs charged by the ESCO for ongoing service. If the savings realised fall short of the payments made by the customer, the ESCO pays the customer the difference.

If, however, actual savings exceed the payments, the customer usually must agree to share with the ESCO the savings in excess of the amount guaranteed (which equals the amount of payments owed by the customer). The size of this share and the method of calculating it vary widely, depending on the degree of risk assumed and the extent of services provided by the ESCO.

It is important to note that in the typical guaranteed savings project, the ESCO has no contractual relationship with the bank or leasing company likely to be financing the project. The ESCO's guarantee runs only to the benefit of the customer. In legal terms, this guarantee is not a *guarantee of payment* for the bank's benefit; rather, it is a *guarantee of performance* for the customer's benefit alone - a promise that the efficiency project as designed and installed will pay for itself over the life of the loan assumed to finance it. The customer's remedy for a

breach of that promise is the ESCO's payment of any shortfall caused by a failure of the project to perform as guaranteed.

This is why ESCOs and customers who use the guaranteed savings structure stipulate a specific level of minimum savings guaranteed for each project, generally tied to the project's debt-service requirements and any other incremental operating costs incurred by the customer as a result of the project. As a consequence, the bank or leasing company approaches the project (in fact, the customer) as it would a commercial loan to that customer, confining its risk analysis to the customer's general credit standing. The customer, in turn, must have confidence in the ESCO's ability to deliver and guarantee a project that will pay for itself. The customer will also scrutinize the ESCO's ability to make good on its guarantee, in the event that the project does not perform as designed, and to that extent, the customer generally examines the ESCO's credit standing. However, the principal issues between ESCO and customer remain those that directly concern the project—its design, its cost, and its ability to deliver the requisite energy savings.

The primary impediment of the guaranteed savings structure to the ESCO is that it requires the customer to incur a liability and rely solely on the ESCO savings guarantee for repayment of the liability. This can make it very difficult to sell guaranteed savings projects to some customers.

6.3.2 The Guaranteed Solar Results (GSR) Concept [12]

A very promising area for the development of the "guaranteed savings" contracts in Greece is the case of solar-thermal applications. Greece with 2,961,000 m^2 solar collectors is the European Union's second market in solar collectors after Germany. The Greek domestic market is presently (2000) 180,000 m^2 per year and 95% of the installed solar thermal systems in Greece consist of glazed collectors used in individual or public water heating applications.

The concept of Guaranteed Solar Results (GSR) applied to hot water production, means that a solar system is expected to supply a minimum quantity of energy each year for a given hot water consumption. If the energy supplied is less than the energy guaranteed, the technical pool that has signed the contract should compensate their client. The compensation is established in relationship to the difference between the guaranteed energy supply and the amount that was really used for heating water during the period of the contract. The GSR contract offers four essential advantages:

- No financial risks – The client or energy user is guaranteed a certain annual energy supply. Consequently, the investment payback time is also guaranteed.
- Easy bank loans – The absence of financial risk makes it easier to borrow the money needed for the investment.
- No breakdown worries – The working order of the system is permanently monitored in order to signal any anomaly in the working order. In the case of a system failure, repairs are carried out quickly by the technical pool in order to avoid compensating the client.
- Preferential funding – Subventions for collective solar installations are generally linked to guaranteed performance.

The Guaranteed Solar Results concept takes on a different form in Greece in order to guarantee solar results. The concept devised is that of *"Third Party Financing"*. The innovative aspect of this concept is that besides the user and the manufacturer of the solar system, a third party is introduced which, in practice, is an *"Energy Service Company"*. The role of the ESCO is to:

finance the solar system; supply the technical expertise; monitor the working order and results of the solar system; ensure system maintenance.

The user pays the ESCO an amount that is directly related to the amount of energy supplied by the solar system. Once the financial investment of the Energy Service Company has been returned, the user becomes the sole owner of the installation.

In this way, the energy user can exploit a solar system without an initial investment or risk and the energy service company has the incentive to maintain the equipment until the return on the capital investment (with interest) is achieved.

6.3.3 Shared Savings [16]

Under a *shared savings* structure, the customer has no obligation to repay the Implementation Price through a debt or lease payment but instead commits to pay a percentage of the realised savings over a specified period of time. Here, the ESCO finances the project's Implementation Price, usually by borrowing the money from one or more third parties and collateralising the loan with the anticipated savings payments from the customer. The customer assumes no financial obligation other than to pay the ESCO a share of the savings that the project realises. Thus the ESCO not only assumes project performance risk but also assumes customer credit risk by borrowing the money for project financing itself.

In exchange for the ESCO providing project financing and for the ESCO's assumption of performance and credit risk, the customer agrees for a fixed term to pay the ESCO the value of a set percentage of those savings, which varies widely depending on several factors: (1) the length of the project; (2) the customer's creditworthiness; (3) the degree of technical risk involved (i.e., the certainty that savings will accrue as projected); (4) the relative expense of maintaining project equipment and monitoring energy savings; and (5) the value of utility incentives to be contributed by the customer's utility. The portion of savings paid to the ESCO that is attributed to debt service is always higher for shared savings than for guaranteed savings projects, reflecting the ESCO's significantly greater risk and expense. The ESCO uses its payments from the customer to repay debt associated with the project, conduct equipment maintenance, measure and monitor savings, and earn a return. As with guaranteed savings projects, the ESCO measures energy savings throughout the term of the project agreement, typically 10 years or more.

The method used to share savings varies from project to project. The parties may share *gross savings*—savings without regard to ongoing costs—or *net savings,* the pool of which would be divided only after accounting for certain costs of implementation. A subcategory of the shared savings structure is *pay-from-savings.* In this structure, the customer again assumes the obligation to repay debt used to finance the project, but the financing agreement is structured somewhat differently.

Unlike a typical guaranteed savings project, the customer is not obliged to repay the loan over a fixed term. Instead, the obligation is amortised as savings accrue and remains out-standing until enough savings accrue to fully repay it. The customer pays down its obligation in variable amounts that change each payment period, calculated as a percentage of actual savings as they occur. Accordingly, the term of the project agreement varies also, expiring only when the project loan is fully paid. Interest rates applied to pay-from-savings projects are high, in the range of rates for unsecured bank loans. Project agreements tend to be shorter (usually seven years or less), and the savings share on which payments are based is comparatively high.

6.4 Financing the RE Sector: Financial Market

The RE sector has in theory access to most generally available financing mechanisms from commercial banks and the investment sector - in an ideal world this might be sufficient. However, the sector has particular need for innovation in accessing finance geared to its needs. The sector also has a particular demand for certain types of finance, which may be less frequently available or present special problems. The sector is supported by a number of specialist institutions providing finance and a number of specialist funds and investment vehicles have been set up.

The financial market is the most significant source of external finance to RE companies, and can exert considerable influence on them:

- Influence management through lending arrangements.
- Supporting companies with information. Financial institutions are a major source of information for companies, and there is potential for financial institutions to act as a conduit of information.
- Specialist "Green Energy" Financial Services. There is scope for banks to develop financial products, which contribute to the environment, e.g. energy efficiency loans, or leasing of RE technology.
- Specialist support for RE Companies. RE sector can face difficulty-getting recognition from the financial markets, because they are new, the risks are unknown, the technology unfamiliar and the markets uncertain. By actively trying to understand the sector and the issues it faces, financial institutions can at least try to reduce some of the obstacles these emerging businesses face, although one cannot expect them to forgo normal financial judgement.

6.4.1 Bank Sector

Credit Risk Assessment

The basic risk assessment conducted by most banks focuses largely on risks presented by current and future direct liability. However, the environment creates other risks in lending activities - for instance, suppliers who fail to take account of the environmental pressures from customers could lose key business. As well as purely financial risks, by becoming involved in controversial projects banks can expose themselves to a negative reputation. A key lever here is likely to be providing information on RET developments and business implications to the financial community.

An excellent example of an innovative RE project financing is the TRIODOS Bank[xxiv] *"non resource finance"* dedicated to small-scale wind power development. This mechanism lacks of resource to any traditional security for the finance provider in the event of project failure. A systematic four-pronged approach to credit risk management is applied:

1. Thoroughly evaluating the risk through a process of due diligence;
2. Controlling the risk through fixed cost and, ideally, turn-key construction contracts and long-term power purchase contracts;

xxiv. http://www.triodos.co.uk/ & http://www.windfund.co.uk

3. Creating an element of security through debentures over assets and undertakings, first charges over site leaseholds and issued share capital, and a debt service;
4. Maintaining the commitment of the project owners to the project's success through a minimum equity stake of at least 20% of the total project cost.

Develop "Green" Business Products

As well as "green" consumer products, banks could develop products for the business community (both large and small) that would offer environmental benefits and could present business opportunities. A noteworthy example is the RE lending initiative by National Westminster Bank, available for lending to environmental projects by businesses. The loans are cheaper than normal, which is partly justified by the profitability improvement that they are intended to bring, and are targeted at the medium sized business market.

Right Issues & Bond Issues

Once listed environmental sector companies can access the whole range of financing options such as rights issues (the issuing of new shares) and the raising of bonds. Again, companies will be vulnerable to the overall perception and understanding of the sector. For example Waste Recycling Group in the U.K. sought money from shareholders to expand its activities.

Investment & Financial Advisory Boutiques

Several small financial boutiques have emerged in recent years that aim to help RE sector companies access finance, both from publicly known sources and from private sources such as high net worth individuals. Typical examples include venture capital / investment advisory work; project finance for renewable energy companies; traditional environmental sector analysis and investment advice and corporate strategy and finance. Such companies can provide a valuable function by combining a detailed knowledge of the sector together with practical financing expertise, and helping RE sector companies address some of the obstacles faced. Typical examples are: Delphi International /VTZ (venture capital/investment advisory work); Impax Capital (project finance for RES), Ecofin (traditional environmental sector analysis and investment advice) etc.

Ecological - Ethical Banks

A number of ecological or ethical banks exist in the EU and Switzerland. These banks are typically very small (although growing) and they focus on providing lending for "good" projects, which results in a major interest in small projects and business in the environmental sector, where they can be a significant force. They have also been behind the formation of a number of the environmental funds. Typical examples are Triodos Bank of the Netherlands, Belgium and U.K. and the Ecology Building Society in the U.K.

RE & Environmental Sector Funds

Dedicated RE and/or environmental sector funds fall into two categories: Those investing largely or solely in listed investments and those investing in unlisted ventures or projects. Listed funds were the first to be launched and have been the most prominent.

Buying listed RE company shares on the market does not channel any new money into the RE services sector. The money goes into shares, which have already been placed on to the market. Funds can contribute to RE investment by investing in companies at the initial public offering (IPO) stage, or subscribing to rights issues, investing in venture capital or by investing in specific projects. Otherwise, buying these equities supports the market valuation of such companies, thereby encouraging more companies to be bought to the market and highlighting investor interest in the sector.

More recently, the attention has shifted to unlisted funds. These funds focus on providing new money to projects and ventures within the environmental sector. They can make a positive contribution to sustainable development, by channelling funds to key areas. The most prominent example is the "green" fund launched in the Netherlands. These funds have focused on providing debt for environmental projects, and have been made especially attractive with the provision of tax concessions to investors. The other area where there is current activity is in the emerging markets where development banks are keen on developing targeted investment vehicles with a sustainable development emphasis.

As well as providing capital, such funds can help overcome some of the obstacles encountered by emerging RE industries, by building up industry knowledge and providing financial expertise.

6.4.2 The Investment Sector

Most investors who seek to invest in "green" companies do so through some form of collective investment fund. Just as there is a range of different types of "green" companies, there is a range of environmental funds. Over the past 30 years, these funds have grown increasingly sophisticated, having evolved from simple "green" filters avoiding the worst offenders, to more sophisticated approaches aiming to link environmental performance to financial performance. The key types of funds are the following two:

"Ethical" Managed Funds

Ethical funds avoid investing in companies who are involved in certain activities. As many funds have their roots in religious communities, their guidelines reflect Christian ethics: avoiding tobacco, alcohol, armaments, gambling and repressive regimes. Environmental concerns have recently been included, usually by using the environmental impact definition, and excluding the worst offenders.

While many of the funds claim a positive focus, seeking out "good" investments, it is not clear how many of them have effectively implemented this side of their investment policy.

"Green" Managed Funds

As understanding of environmental issues grew, it became apparent that a more sophisticated approach was needed. A new generation of funds emerged, which typically gave environmental issues a much higher priority (although they normally retained some form of ethical screening). The funds developed a sophisticated understanding of the impact of environmental issues on business, and then analysed the environmental performance of companies in detail before making a decision as to whether to invest. In addition, the analysis aimed to identify links to financial performance. The funds have tended to seek out suitable positive

investments in the environmental sector, particularly among the "green" pioneers and particularly in this area the detailed knowledge of environmental issues was able to add value to the financial analysis.

Another new type of "green" fund is the Environmental Values Fund, which focuses on the concept of eco-efficiency. The fund's ability to invest in all sectors has attracted considerable institutional interest (conversely, it makes it less appealing to individual investors).

6.5 Energy Taxation

The European Commission has adopted a proposal for a Council Directive restructuring the Community framework for the taxation of energy products (COM (97) 30, OJ C139, 6.5.1997), which widens the scope of the existing minimum tax rates to cover all forms of energy. The proposals are aimed at eliminating distortions within the EU single market caused by differences in the taxation systems between Member States, and are intended to shift general taxation away from taxing employment and towards a system based on environmental criteria.

The EU's Council of Ministers has been debating for some years the Commission's 1997 proposal for a Community framework, including minimum tax levels, for the taxation of all competing sources of energy. The proposal was aimed at improving the functioning of the Internal Market and ensuring greater respect for the environment, while at the same time combating unemployment by allowing Member States to compensate increased revenues from energy taxation by lower taxation of labour.

Discussions on the proposal have been taking place since in the Council. The Spanish Presidency in the first half of 2002 drew up guidelines providing a clear direction for further work on the basis of the Commission's proposal (for further details see the Progress report on energy taxation (document 10195/02) attached to the conclusions of the Seville European Council.

On November 5th 2002, the Council discussed some outstanding elements of the draft Directive. On the basis of a Presidency text, the Council focused its debate on the possibility of setting national levels below the new minimum levels of taxation, the arrangements for the use of diesel oil, the duration of transitional periods for electricity and other energy products than diesel oil and the link between the exemptions and tax reductions laid down in the Directive and state aid rules. The Council stated that work be continued on these outstanding issues with a view to achieving an agreement on the Directive in a forthcoming session of the Council.

6.6 Tradable Green Certificates [15]

Under *direct price support schemes*, generators of electricity from renewable energy sources receive, directly or indirectly, on the basis of State regulation, financial support in the form of a subsidy per kWh supplied and sold. At present there are essentially two categories of direct price support mechanisms within the EU: quota-based systems, and fixed-price systems.

Quota-based systems are based on setting the price through competition between RES-E generators for available support following a decision by the Member State in question on the desired level of RES-E. Two different mechanisms presently operate: the green certificate and tendering schemes.

The main objective of a system of tradable green certificates is to stimulate the penetration of green electricity into the energy market. In a green certification system, certification serves two purposes. It functions as an accounting system to verify whether demand has been met or, when there is no demand, to measure the amount of electricity produced from RES.

In a system of green certificates, producers of renewable electricity receive a certificate for each pre-defined unit of electricity produced. Such a certificate represents the "societal value" of the production of electricity from RES. By issuing green certificates two different markets are created for producers of renewable electricity: the market of physical amounts, on which they have to compete like any other energy producer, and the market of green certificates. Demand for green certificates can originate for several sources:

- ⇨ Voluntary demand of consumers e.g. by green pricing.
- ⇨ Imposed by the government on consumers or other market actors in the energy supply chain via an obligation to generate, transmit, deliver or buy a certain amount of green certificates.
- ⇨ The government itself can act as a buyer of green certificates e.g. by securing a minimum price or by a tendering procedure.

In practice green certificates market development might occur as a combination of the above-mentioned sources. However, demand as a result of an obligation should be in most cases a good starting point.

Six different functions can be identified in the implementation of a green certificates system: a) Issuing certificates, b) Verification of the issuing process, c) Registration of certificates and trade, d) Exchange market, e) Accounting of the certificates, f) Withdrawing of certificates from circulation. Apart from these institutional functions, there are many other issues that have to be addressed in order to make a system of tradable green certificates work properly. The most important of them are: the definition of renewables used, b) the time aspects of the obligation, c) the penalty for not reaching the target and the parties that should be obligated.

6.7 The Clean Development Mechanism (CDM) Approach [17]

Although CDM may be considered as a policy driver rather than a financial instrument, its rational application as a methodological procedure for the appraisal of energy investment projects (e.g. from FIS) may favour the development of RE systems.

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (FCCC), ratified by the EU (Council Decision 2002/358/EC, OJ L130, 15.5.2002), established a Clean Development Mechanism (CDM) to assist developed, Annex I countries in meeting their binding greenhouse gas (GHG) emissions reduction commitments by financing emission-reduction projects in less developed, non-Annex I countries. This mechanism poses many challenges, among them: 1) ensuring the additionality of CDM projects; 2) promoting sustainable development in host countries; and 3) monitoring and verifying claimed emission reductions.

CDM projects must involve activities that reduce GHG emission relative to emissions that would have happened otherwise. Such reductions must be additional to any that might have occurred anyway because of changes at the project's chosen site or within the economy at large. This additionality requirement will need to be translated into workable methodologies

for crediting CDM projects that are acceptable to the many parties with a stake in the process. Specifically, such methodologies will need to be:

- ⇨ *credible* – to ensure that environmental objectives are satisfied,
- ⇨ *transparent* – to ensure that assumptions are explicit and well-vetted, and
- ⇨ *practical* – to ensure that undue transaction costs are not incurred.

A CDM project generates emission credits that grant the investing partner the transferable right to emit an amount of greenhouse gases equal to the project's claimed reductions. These claimed reductions are equal to the estimate of emissions that would occur in the absence of the certified project activity – established by applying a baseline methodology - minus the emissions of the project itself. If systematic bias or error in application of the baseline methodology leads to claimed emissions reductions in excess of those that are truly additional, then the CDM project will lead to an increase in total global emissions.

The application of a baseline methodology can also err in the opposite direction, leading to inadequate crediting for emissions reductions and to a lowered economic incentive for CDM activities. Therefore, it is important that methodologies for establishing baselines be credible in order to assert, with sufficient confidence, that the CDM will produce credits that correspond to emission reductions achieved (e.g. the challenge of minimising "free-riders," creditable low emission activities initiated even in the absence of a CDM program).

In the ongoing discussion of baseline methodologies, two general types of approaches have attracted the most attention: project-specific approaches and benchmark approaches. These two general types of approaches can be distinguished in terms of the degree of standardisation they imply: project-specific approaches are less standardised, and benchmark approaches are more standardised. The CDM is still in an early stage of development, with many key policy questions related to modalities and governance still largely unanswered. Among them, one of the more challenging questions is how baselines will be established. Baselines will provide the metric against which the tradable output of CDM projects, i.e., carbon credits, will be measured.

CHAPTER 7

CASE STUDIES

7.1 Introduction

Despite the generous grants and subsidies provided to RES investment projects by all earlier versions of the National Development Law (e.g. Laws 1262/82 and 1892/90), private investment activity in renewables was minimal in Greece before 1995, mainly due to the lack of a favourable legal framework regulating the various aspects of RES development and exploitation in the country (role of public and private entities, jurisdictions and responsibilities, permitting procedures, buy-back tariffs for RES-produced electricity, etc.). Such legislation was finally enacted in 1994-95 (Law 2244/94 and Ministerial Decision 8295/95). This legislation created a coherent and quite liberal framework, which, in conjunction with the National Development Law and the O.P.E. / Measure 3.2 (CSF II) financing mechanism, induced serious RES investment activity in Greece. Hundreds of permit applications for establishing commercial-scale RES projects, primarily in wind, small hydro and biomass energy, have been submitted to the Ministry of Development in the last few years, taking advantage of the favourable legal and financial framework for RES investments.

After the activation of the Operational Programme for Energy (O.P.E.), Measure 3.2, in mid-1997, most investors interested in establishing RES projects opted for this particular financing instrument, rather than for the National Development Law, because of O.P.E.'s several advantages over the latter (grant and subsidy) scheme. The specific advantages of Measure 3.2 included:

- Higher-than-40% capital subsidies for most types of RES applications (National Development Law : 40% capital subsidy for all types of RES applications);
- Lower own-capital requirement (20% of total investment cost for Measure 3.2 projects vs. 40% for the projects funded by National Development Law);
- More relaxed installation permit requirement (unlike the National Development Law, the installation permit for Measure 3.2 approved projects was required only at the time of signing of the capital grant contract, concluded between the State and the investor).

Private investments of 745,375 mill. Euro were approved by the Minister of Development beginning of June 2002 in energy saving and RES in the frame of the first proclamation of Measure 2.1 of the Operational Programme «Competitiveness» (EPAN), CSF III, 2000-2006,

that corresponds to 26% of the total budget of actions of the Energy Sector and Natural Resources. The approvals concern 201 investment proposals.

With the Ministerial Decision 110 proposals were included in the program that concerns Initial investments, that is to say investments eligible for regional aid of total budget of 613,382 mill. Euro. The remaining 91 proposals, that were approved and concern environmental or joint investments, that is to say proposals, that come under the Community framework of investments for the protection of environment, with a total budget of 131,933 mill. Euro, will be included with a newer decision of the Minister within June.

The rate of subsidy of Initial investments will range from 30% up to 50% (depending on the technology), accordingly with the Energy Investments Guide (July 2001), while for environmental investments the rate of subsidy will result with the calculation, according to the Supplement of the Guide for Energy Investments. It should it is marked that in the frame of first proclamation of the Operational Programme «Competitiveness» 390 proposals had been submitted of a total budget of 1.538,767 mill. Euro.

7.2 Case Study I - Guaranteed Solar Results (GSR)

7.2.1 ACHAIA CLAUSS Winery, Patras, Greece [12]

Achaia Clauss is a well-known wine producer and exporter. The factory of Achaia Clauss is situated in Patras, Greece. Its yearly production is approximately 70,000 bottles. A solar system is installed since 1993 on the roof of the bottling factory under a TPF contract. The aim of the solar installation was to reduce the diesel fuel consumption of the steam boiler, by using the solar thermal energy to pre-heat the water entering the boiler. The water exiting the boiler is used in the industry's bottling process as a cleaning medium.

The bottling factory works only day-shifts and rarely over the weekend. The required temperature of the hot water used on the factory floor is 45-60ºC. The main components of the solar system are :

- a solar field of 140 solar panels (140 x 2.2 = 308m^2) facing southwards with a 450 tilt;
- two horizontal storage tanks, 3m3 each;
- a differential valve controller which regulates the closed-loop pump;
- a re-circulation branch which pumps water from the solar storage tanks to the steam boiler.

In the case of the Achaia Clauss winery, the manufacturer and main contractor of the solar system, SOLE S.A, is also the Energy Service Company (ESCO). CRES provided a subsidy amounting to 50% of the total cost of the system and is also responsible for telemonitoring. The remaining 50% of the cost was provided by SOLE S.A. The user only paid for the labour required installing the system on the factory roof. The energy user (Achaia Clauss), following the measurements made by a third party (CRES), paid the Energy Service Company (SOLE S.A) for the energy supplied according to the following tariffs:

- 0.043 ECU/kWh during the first three years (1993-1996)
- 0.040 ECU/kWh for the next three years (1996-1999). This price was approximately equal to 70% of the diesel fuel used by the conventional burner (0.54 ECU/litre).

- After the investment was returned, with interest, the Achaia Clauss winery became the owner of the system. In order to insure both sides, two additional terms were included in the TPF contract:
- The solar kWh price was adapted according to the monthly mean fuel price in order to keep the ratio 70% constant.
- Achaia Clauss claimed that the minimum hot water demand of the factory was 50 m3 of hot water at a mean temperature of 55ºC. This hot water demand was a basic parameter in the sizing of the solar system. If the factory consumed less energy, then the system operated at a low efficiency. Therefore, in this case, the price of the energy supplied was adjusted accordingly at a higher price, as shown by the linear relationship
- During the return on investment period the installation costs of the equipment as well as the cost of maintenance work was charged to the energy user.
- The provision of spare parts was charged to the Energy Service Company.

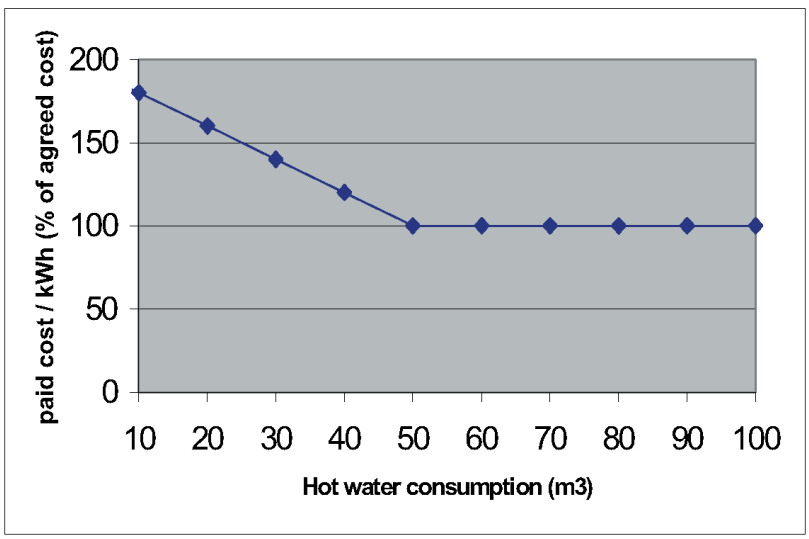

Figure 7.1
Funding mechanism for the Achaia Clauss Winery

7.2.2 Case study - Sarantis cosmetics, Oinofita, Greece [12]

Sarantis Ltd. is a cosmetics manufacturer who has installed a solar thermal system at his plant in Oinofita, Greece. In the summer the solar thermal system is used to cool the storage warehouse of the factory where the stock of manufactured cosmetics is kept and in the winter also pre-heats the water used to heat the office spaces.

The solar installation consists of: flat - plate collectors (2700 m^2), 3 conventional air-cooled chillers (200 RT) for auxiliary cooling, 2 cooling towers (500 RT) and 2 adsorption chillers (200 RT). The solar collectors consist of 2700 m^2 flat-plate collectors facing southwards at a tilt angle of 30º, with selective absorptivity of high performance, manufactured in Greece. The absorptive surface used is the most recent TiNOx technology, whereby a titanium oxide layer is deposited on the copper tubing of the collector with the *"vapour deposition method".*

SOLE S.A. was the main contractor of the installation. The construction of the solar cooling system was partly funded by the European Commission, the Hellenic Government and the user, according to the following arrangement (Table 7.2):

Table 7.2
Funding scheme for the SARANTIS solar cooling project

	%	Sum (ECU)
SARANTIS	50	760,000
EUROPEAN COMMISSION	37.5	570,000
HELLENIC GOVERNMENT	12.5	190,000

CRES was responsible for the follow up of the investment and for the monitoring of the solar thermal system. A GSR contract was drawn up to guarantee the performance of the solar system. Figure 7.2 shows the funding mechanism of the GSR contract.

According to a feasibility study carried out, the amount of solar energy that the installed solar system should guarantee the user was fixed (point E on Figure 7.2). The public subsidy given to the main contractor of the installation (SOLE S.A) by the European Commission and the Hellenic Government would depend on the amount of energy supplied to the user as follows:

- If the energy supplied to the user was between 80 –100 % of the system guaranteed performance, then the contractor received 100% of the public subsidy (see line DE, Figure 7.2).
- If the energy supplied to the user was between 60-80 % of the guaranteed system performance, then the contractor received 80-100% of the public subsidy, as derived from the linear relationship shown in Figure 7.2, line DC.
- If the energy supplied to the user was less than 60% of the guaranteed system performance, then the contractor received only 80% of the public subsidy, as well as losing his letter of credit (10% of funding) see line CBA, Figure 7.2.

We note that the GSR mechanism displayed in Figure 7.2 is currently in operation for over 40 large solar projects in Greece.

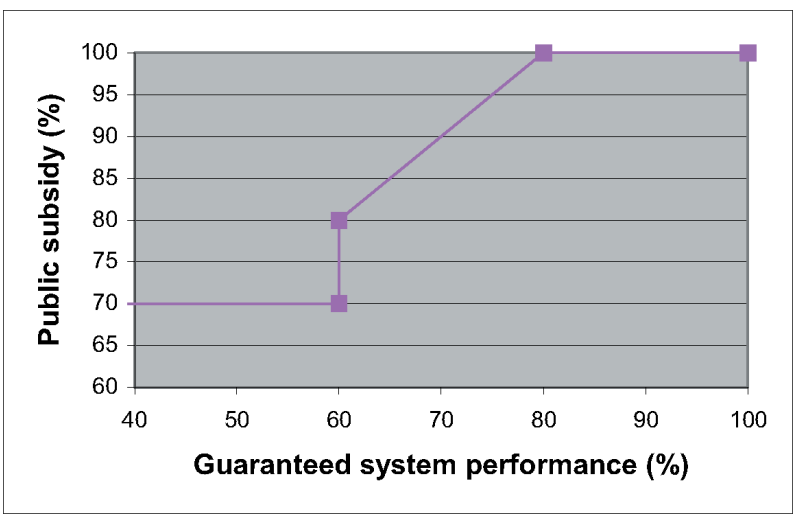

Figure 7.2
Public subsidy as a variable of the system performance

7.3 Case Study II - Bankable Wind Energy Investment

The case study concerns a 10,2 MW wind power project development by "ROKAS Wind S.A." in Crete island (Xirolimni- Sitia, Crete). The wind farm consisted of 17 MK IV type wind turbines (600 kW each), manufactured by Bonus Energy A/S (Denmark). The construction of the Wind Park started March 1997 and by March 1998 it has been connected to the electricity grid of the island of Crete.

Table 7.3
Financing Scheme for ROKAS 10,2 MW Wind Farm in Xirolimni, Crete

Financial Analysis (in ECU)		
1	**Investment**	
	Initial Approved Investment Cost	11 323 529
	Investor Proposal	13 294 118
	Final Investment Cost for subsidy	13 514 706
2	**Capital Stucture**	
	Own Capital	5 441 176
	Subsidy (Law 1892/90)	5 405 882
	Loan (long-term)	2 676 470
		13 523 528
3	**Long-term Loan**	
	Amount	2 676 470
	Currency	Euro
	Duration	9 years
	Interest rate	~ 8%
	Bank	BNP (through EIB)
4	**National Added Value**	~51%
5	**Energy Sales**	
	Predicted energy sales per year (Investment Proposal)	37 500 000 kWh
	Actual production	39 000 000 kWh
6	**Profits**	
	Predicted Profits per year (Investment Proposal)	2 308 823
	Actual profits	2 647 059
7	**Payback Period**	
	Predicted Payback Period for own capital	~ 5 years
	Predicted Payback Period for Own Capital + Loan	~ 8 years
8	**Internal Rate of Return**	**~ 15%**

The project site is located 13 km southeast of the city of Sitia, with 460 m average altitude from sea-level and occupies a total of 22 he of rangeland. According to the preliminary measurements on the wind potential, the area is exhibiting excellent wind characteristics with a yearly average wind velocity of 8,5 m / s (north-west direction). The average annual electricity production per wind turbine is 2 200 000 kWh and the average availability is between 99% and 99,5%. The Wind Park was connected to the local electricity substation of the Municipality of Sitia, which is located 13 km away from the park. The connection was established through a double transport line of Public Power Corporation and was financed by ROKAS company.

“Rokas Wind S.A.” structured the investment financing mechanism in a mixed base e.g. 40 % own capital; 40% as public subsidy according to the National Development Law 1892 / 90; the remaining 20% has been provided in terms of a long-term loan in Euro by BNP through the European Investment Bank. Thus, the project exploited in full the financial opportunities arisen both in the national level (fiscal measures) and EU level (low interest loan from EIB).

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

Financing the installation of renewable energy technologies remains a major concern. The Government should try to ensure that environmental externalities are fully included in the operating costs of energy companies, both private and public. All external costs or benefits borne by state-owned energy companies should be made explicit for all market participants through regulation or market-based policy instruments such as taxation of pollutant emissions of fuels. Ensuring that energy costs include the costs of reducing emissions of sulphur dioxide and particulate matter, or even CO_2, will tend to encourage the use of cleaner liquid or gaseous fuels and will aid the Government's efforts to speed the introduction of RE into the energy mix. To help the market there are also several types of innovative marketing and financing schemes to promote the increased penetration of renewable energy technologies.

Renewable energy technologies tend to have higher capital costs and longer payback periods than conventional energy technologies, although overall rates of return may be higher. Capital markets traditionally favour projects with lower payback periods, which tie up capital for a shorter period and are seen as lower risk. At the same time, conventional fuel prices do not reflect their full cost, due to the failure to include the additional external costs associated with these fuels. Current fuel prices do not reflect the true social cost, while renewable energies have a market price above their social cost.

A further obstacle is the relative unfamiliarity the Greek capital markets and investors have with renewable technologies, which in part is due to the fact that they are often innovative and may have yet to be proved commercially. This lack of knowledge translates into increased uncertainty and places a higher risk premium on these investments for the capital markets.

An important factor in RE investments cost reduction, especially for wind electricity, is the scaling up of the technologies involved and the consequent reduction in unit construction, connection and operating costs. The capacity of newer, commercial type, wind turbines installed can be as high as 1.5 MW, compared to 300 kW a decade ago. For wind energy systems, the development of variable-speed turbines is also important. In addition, the com-

petitive bidding procedures initiated by some countries, whereby developers of similar renewable energies compete on cost grounds amongst themselves, have helped, in certain cases, to push costs down for renewable electricity generation.

While the economic conditions all over EU in the eighties militated against ESCO (dramatic fall in energy prices, capital budgeting rules restricting third party financing etc.), five major elements of this period may in fact be responsible for the current comeback of ESCO. These five elements are:

1. Environmental degradation.
2. Limits to growth in the energy supply industry.
3. The quest for economic efficiency in the public sector.
4. The deregulation and globalisation of energy market.
5. Development of e-energy services.

The ESCO business is very sensitive to the prevailing market conditions regarding financial settlements (regular payments) and financial credibility of the public sector. In this regard the most important legislative actions for establishing a favourable environment for the development of the Greek ESCO industry is: a) legal provision regarding the Third Party Financing concept, b) compliance with the new Directive that mandates financial settlement between supplier and purchaser within 30 days.

Effective promotion of renewable electricity will be facilitated if it is examined in the context of the whole electricity market. Market reforms in the electricity sector are influencing the policies used to promote renewable electricity. These new policies increasingly contain an element of intra-renewables competition. Possible means of using market mechanisms to promote renewable electricity include:

- Ensuring that independent power producers and non-utilities have fair access to the electricity grid;
- Allowing distributed generators to feed into and take from the grid;
- Creating supply-side incentives, such as favourable buy-back rates, to make renewable electricity generation economically attractive for potential generators;
- Creating a market for renewable electricity by requiring a certain proportion of total electricity to come from renewable sources;
- Making demand-side incentives such as “green pricing” as widespread as possible.

A barrier can also take the form of a regulated or limited price increase, such as in Greece. In this situation the electricity provider is not allowed to reflect its supply costs in its tariffs, although the cost of supplying electricity to consumers not connected to the mainland electricity grid is higher. The price charged for electricity in islands or other remote locations may therefore be lower than its cost, with the supplier’s loss being recouped via cross-subsidisation from electricity users in more densely populated areas.

Increased availability of finance at lower interest rates is indispensable in lowering the cost of capital-intensive technologies as RE. This can be achieved where financiers are willing to lend at lower interest rates to technologies they perceive as more developed and less risky, or through larger companies self-financing renewable electricity projects rather than borrowing. Clearly, financial institutions cannot be expected to send market signals on environmental matters unless they recognise it as being in their own interest, and thus realistically and practically this goal may be difficult to achieve. However, as Europe’s financial markets generally operate on an efficient basis, changes need only be fairly marginal to have materially significant impacts.

The general RE policies that Greece has already introduced to promote renewable energy may be finely tuned to overcome:

- Market barriers, such as lack of information;
- Market distortions, especially the non-monetisation of the positive environmental benefits of renewable energy;
- Technical barriers, lack of market for and experience with a technology type; grid saturation problems, etc.;
- Cost barriers.

Table 8.1
Generic Barriers to RE & Energy Efficiency Investments and Measures to Overcome them

GENERIC BARRIERS	MEASURES
Lack of information.	Information centres and services; Appliance labelling, consumer information.
Lack of managerial expertise.	Training programmes (integrated resource planning; analysis of non-traditional projects).
Price distortions.	Instituting supportive legal, regulatory and policy changes.
Regulatory biases.	Standards.
High transaction costs.	Market development; Demand-side management programmes; Energy Service Companies.
Lack of access to credit.	Innovative financing mechanisms.
High user discount rates.	Energy Service Companies.
BARRIERS TO NEW FINANCING MECHANISMS	**MEASURES**
High profits from traditional financing products & services (non-saturated market).	Acceleration of the administrative and legislative procedures for energy market deregulation.
High adaptation costs for entering the Euro zone.	Market development & reform
Lack/Quality of information.	Develop standards for disclosure of RE and/or environmental information targeted at financial market.
Lack of motivation	Awards for innovation in RE & environmental projects finance. Publicity.

Fiscal incentives have been the most widely used measures to promote renewable investments in Greece. It is these measures that have been most successful in promoting renewable energy supply - irrespective of whether this has been done in a market-based manner or not. This is because large proportions of those who buy RET equipment are private firms or individuals susceptible to economic arguments (i.e. independent renewable electricity producers are in the business of electricity generation to make a profit).

REFERENCES

1. **Centre for Renewable Energy Sources (2002),** *Greece Renewable Energy Sources Statistics,* Final Report for IEA-Eurostat.

2. **Vassilakos N., Karapanagiotis N.K. (2002),** *Greece*, in "Handbook of Renewable Energies in the European Union. Case studies of all Member States" Reiche D., (ed). Reter Lang GmbH, Frankfurt am Main, 123-139.

3. **Bannock Consulting (2001),** *Innovative Instruments for raising equity for SMEs in Europe*. Study contract ETD/00/503116 prepared for EU DG Enterprise.

4. **DELPHI INTERNATIONAL Ltd. (1997),** *The Role of Financial Institutions in Achieving Sustainable Development,* in association with ECOLOGIC Gmbh. For the European Commission.

5. **ECN, Energie Noord West (1999),** *Green Certificates; Empowering the Market?!,* ECN-ENW-99.

6. **ESMAP (1999),** *Energy Service Companies Practitioners Workshop,* Workshop Summary.

7. **European Commission (1998),** *DRI: Europe in 2001 Economic Analysis and Forecasts,* Final Report.

8. **European Commission (1998),** *European Energy to 2020.*

9. **European Commission (2000),** *Proposal for a Directive of the European Parliament and the Council on the Promotion of Electricity from Renewable Energy Sources in the Internal Electricity Market,* CEC, 11-5-2000.

10. **EUROSOLAR e.V. (1999),** *Financing Renewable Energies. Window for New Opportunities. Irm Pontenagel ed., Eurosolar – Verlag.*

11. **IEA (1999),** *Renewable Energy Policy in IEA Countries,* Vol. II Country Reports (http://iea.org.pub.htm)

12. **Karagiorgas M., Botzios T. (1999),** *GSR Experience in Industrial Applications of Solar Thermal Systems in Greece,* CRES paper for Solar Hot Water with Guaranteed results.

13. **Ministry for Environment, Physical Planning & Public Works (1995),** *Climate Change : The Greek Action Plan.*

14. **OECD (1999),** *Performance Contracting,* PUMA/PAC (99) 2.

15. **Oeko-Institut, SPRU (1999),** *The Implications of Tradable Green Certificates for the Deployment of Renewable Electricity,* ECN-C-99-072.

16. **The World Bank (1999),** *The Energy Service Industry,* Energy Sector Unit. Occasional Paper No. 12.

17. **U.S. EPA (1999),** *Evaluation of Benchmarking as an Approach for Establishing Clean Development Mechanism Baselines,* Contract No. 68-W6-0055 Analysis of Issues Associated with Joint Implementation.

18. **D. Agoris, K. Tigas, G. Giannakidis, F. Siakkis, S. Vassos, N. Vassilakos, V. Kilias, M. Damassiotis**, *An analysis of the Greek Energy System in view of the Kyoto commitments*, Energy Policy, (under publication).

19. **K. Tigas, V. Kilias, J. Kabouris, J. Vlahos, P. Nikolopoulos,** *Development of a Geographical Information System for the assesment of the economic potential of RES for electricity generation,* Operational Programme for Energy-Measure 3.4.3., CRES final report 2002.

Εκδοτική Παραγωγή: ΕΠΤΑΛΟΦΟΣ ΑΒΕΕ – Αρδηττού 12-16 Μετς 116 36 Αθήνα
Τηλ.: 210.921.7513 – Fax: 210.923.7033 – www.eptalofos.com.gr – e-mail: info@eptalofos.com.gr

Centre for Renewable Energy Sources (CRES)
19th km Marathonos Ave., GR- 190 09 Pikermi, Attica, Greece
Tel: +30 210 660.3300, Fax: +30 210 660.3301-2, http://www.cres.gr