PV SUPPORT AND PROMOTION MECHANISMS IN GREECE

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ABSTRACT: The objective of this work was to compile and analyse information about the various support and promotion mechanisms for photovoltaics in the sectors of Research & Development, Industrialisation, Demonstration & Dissemination in Greece. For that matter, the promotional tools developed and implemented in Greece, by national, regional and local authorities were examined. This work was partly performed during the course of realization of two THERMIE B projects. Comments and recommendations are presented for a better interconnection and synchronisation of the individual measures. Although there is not a specific programme for support and promotion of PVs in Greece, there is a number of legislative measures and programmes supporting Renewable Energy Sources, where actions and support measures for Photovoltaic systems are included.
Keywords : Funding and Incentives - 1: National Programme - 2: R&D and Demonstration Programmes - 3

1. INTRODUCTION

The main vehicle for support and promotion mechanism is the Second Framework Support Programme for Greece (1994-1999), managed by the Ministry of National Economy, and financed by national and E.U. funds. A scheme of the existing laws and programmes are presented in Table I.

TABLE I: National management scheme for RES funds appropriation

Ministry of National Economy Manages the Second Framework Support Programme for		
E.U. Funds		National Funds
CONTRIBUTING FUNDS TO MINISTRIES		
Ministry of Development		Ministry of Interior
Operational Programme for Energy Measures 3.2 and 2.3 for RES		Regional Operational Programmes
Operational Programme for Industry (RES)		
Operational Programme for Research & Technology (PABE,PENED, PEPER,YPER, Research Network,...)		
Investment Subsidies (including RES) New Law (2601/98)		
INCENTIVES		
National Tax Deduction Scheme for Renewables and Natural Gas, Law 2364/95, article 7, paragraph 17		

The existing measures for support and promotion that follow, are divided into two categories :

- Legislative
- Programmes.

2. SUPPORT AND PROMOTION MEASURES

2.1. Legislative

2.1.1. New National Development Law 2601/98 replacing the Laws 1892/90 and 2234/94

The main investment subsidy scheme up to now, for SMEs and other businesses in Greece, has been the National Development and Modernization Law (1892/90 and 2234/94) that subsidized, besides other things, investments in the renewable energy field. There was a special framework within the aforementioned Laws, that rendered RES investments attractive, without imposing a lower limit to the invested total budget (in contrast to the Operational Programme for Energy). The capital subsidy varied with the geographical region of application, ranging between 40 and 55% of the total budget of the project. Applications (accompanied by a techno-economic study) for subsidy were submitted to the Ministry of National Economy and were evaluated twice a year (December and June). With the new Development Law 2601/98, effective as of April 15th 1998, the goal is to attract private investments in Greece, through which the government is striving to boost the regional development, create new employment opportunities, increase the competitiveness of the businesses, contribute to the protection of the environment and the rational use of energy. The new Law is more adaptable to changing needs than the one it is replacing. This is due, in part, to the possibility to shift parts of the country to a higher subsidy regime. Therefore, providing higher subsidies to investments realized in regions of the country that face higher unemployment or reduction of the active population. This decision is made by a Ministerial decree every two years.

In the new Law, there is no special framework for the implementation of RES as in the old one. RES is usually one of the possible supported activities of each category of investing enterprises. One such category of enterprises, whose investments are subsidized, is the one regarding companies that produce energy in the form of hot water, steam or solid fuel from biomass, companies co-generating electricity and heat, or electricity producing companies from solar energy, wind, hydro-electric, geothermal, biomass, as well as companies that produce

biomass from plants with the intention to use it as fuel for the production of energy. For this category, and also for processing and manufacturing companies such as, agricultural, fishing, metallurgical, tourism businesses, enterprises of local governments and cooperatives that invest in equipment for the production of electricity from RES or co-generation of electricity and heat, the subsidy is the same across all the country. It covers 40% of the investment, as well as 40% of the interest paid for loans taken for the investment, for a period longer than 4 years, and the coverage of 40% of the installments for the payment of equipment bought by leasing. Alternatively, each one of the above mentioned companies may choose instead, to deduct 100% of the investment from its profits, as well as receive a subsidy for 40% of the interest paid for loans taken for the investment for a period longer than 4 years.

The new law also imposes a lower total investment budget limit, that is set at 10 million Dra (29 kECU) in cases of investments related to RES.

The subsidy for RES investments is uniform across the country, matching the highest subsidy offered within the new law. This is a clear message from the Greek government, about the role and the importance it gives to the development of RES applications, which by their nature are distributed and become a tool for regional development and new job opportunities. In 1996, a stand-alone PV/Hybrid installation was subsidized by the Laws 1892/90, 2234/94. The system was installed in Elounda Island, Crete, to electrify a group of 12 bungalows. The total subsidy received by the hotel owner, including extra benefits, was 43% of the total project cost.

2.1.2. Law 2244/94, Electricity Production from RES

The Law for Electricity production from Renewable Energy Sources was introduced in 1994. In April of 1995 a Ministerial Decree (8295/19.4.1995) was announced, clarifying the administrative processes and tackling the issues related to the installation and operation licenses for electricity producing plants. In the same decree, a sample contract between the Public Power Corporation and the electricity producers was presented, where the details regarding the buying-back rate and the grid connection terms are included.

Two categories of electricity producers are defined:

1. Autoproducers (**AP**), those who generate electricity to cover for their own consumption and sell only their surplus energy, if any, to the PPC.

2. Independent power Producers (**IP**), those who sell all their production to PPC.

The law has removed any previous restrictions for the independent production of electricity from RES, bringing the maximum allowable capacity of a power plant to 50MW for IPs. PPC is obliged to buy all energy produced by IPs under a 10 year contract, while retaining the exclusive right to supply third parties with electricity. The law also defines explicitly the essential components of the payback tariff system, to be followed for the power producers, correlating it with PPC's KWh selling price. The new payback tariffs, valid since August 1st 1997 are presented in Table II.

Recommendation: The payback tariff of the low voltage connections should be in parity (net metering) with the selling price in all grids for APs and IPs. APs should also receive a subsidy for power capacity, at least for medium and high voltage systems. A more favorable tariff regime should also be provided for medium and high voltage connections for the promotion of such systems.

TABLE II: Payback Tariffs of RES electricity producers.

			APs Energy payback 70% of KWH selling price, in Drachma	**IPs** Energy payback 90% of KWH selling price, in Drachma
Autonomous Island Grids	Energy (all Voltages)		18.08	23.25
Main land system	Low Voltage 220/380 V	Energy	18.08	---
	Med. Voltage (6.6, 15, 20, 22 KV)	Energy	14.62	18.79
		Cap-acity	---	483 X σ (50%of selling tariff)
	High Voltage (150KV)	Peak zone	9.55	12.28
		Med zone	6.62	8.51
		Low zone	4.91	6.31
		Capa-city (peak zone)	---	1096 X σ (50%of selling tariff)

Note 1: σ assumes the following values.
0.5 for wind and solar units
0.7 for small hydro units
0.9 for geothermal and biomass units
Note 2: The capacity credit is calculated on the basis of the peak measured power output between two successive measurement periods.

2.1.3. Law 2364/95 article 7, paragraph 17 (National Tax Deduction Scheme for Renewables and Natural Gas)

At present, the only available incentive offered to individuals, to install photovoltaic systems, permits the deduction of 75% of the purchase and installation cost of RES systems from the taxpayer's annual taxable income. For companies and other legal entities the above mentioned percentage or 100% may be amortized from their profits over a time period, usually 5 years.

This measure is important only when the individual is taxed in the higher tax brackets of 30 to 45%. For those tax brackets, there is a PV system cost reduction of 22 to 34%, respectively. Although this measure is welcome, it does not provide a serious incentive as it is dependent on the taxable income bracket and therefore the compensation is not significant for lower and middle

income taxpayers in Greece. In any case, the associated PV system cost reduction with respect to equivalent programmes that promote RE System introduction, is generally considered low.

Recommendation: The tax reduction scheme could and should become more effective and balanced with respect to the less wealthy citizens. For that matter, it is proposed to apply the same percentage of reduction (40 to 60%) for all citizens, which will be subtracted from one year's payable taxes. The percentage (40-60%) proposed should be implemented in a flexible way, so that the Ministry of National Economy would be able to change it with simple measures, as the cost of PV systems is being reduced in time, as well as applying it in a complementary way with respect to similar pan-European programmes. This tax reduction scheme could be partly, or completely financed by the eco-tariff already applied to the gasoline in Greece (5 Drachma per liter).

If such a measure for PV systems is established in the Greek market for individuals, installing 1 MWp per year, and considering an average PV system cost of 2 Million Dra per KWp installed, such an action would impose a state tax reduction of 1.2 to 0.8 Billion Dra per year.

Comparing this amount with over 5 Billion Dra collected annually from the gasoline eco-tariff, it is safe to say that it could be a viable and worthy effort. Such measures are needed for the development of the Greek PV system market, permitting feasible investments in related fields by the SMEs.

TABLE III: Comparison of PV system cost reduction by Law 2364/95 and recommendation.

	Taxable Income reduction in %	**PV system cost reduction in %**	**Proposed PV system cost reduction in %**
Individuals	75	up to 34	40 to 60
Companies	75 to 100 (amortized usually over 5 years)	up to 40	no change

2.2. Programmes

2.2.1. Operational Programme for Energy

The Operational Programme for Energy (OPE) was established in 1996. It provides co-financing to investments in Greece in the area of renewables and rational use of energy. Three quarters of the subsidies provided come from the 2nd framework Support Programme for Regional Development, and the rest from the Greek state. The Programme runs for 4 years (1996-1999). The total budget allocated to renewables is 50 Billion Dra (or 165 MECU). A part of the programme's budget, of the order of 10 Billion Drachma, has been put aside to fund RES applications in the Public sector.

The investments supported are classified in the following categories:

A- Energy Saving (Measure 2.2)

B- Renewable Energy Sources (Measure 3.2)

A minimum total budget limit of 20 million Dra exists, for proposals made for Photovoltaic systems. The photovoltaic systems are financed by 55% of their total cost, while the rest of the amount is covered by private funds.

During the first call for proposals (which expired on March 3rd 1997) there were 8 proposals concerning Photovoltaic systems, adding up to a total amount of 10.16 billion drachma.

Amongst these, three PV projects were selected for financing, for a total budget of 4.762 billion drachma :

- a 5 MWp central system for Crete (4.7 B. Dra),
- a PV system for a tourist business in the island of Paros (32.5 M. Dra) and
- a PV system mounted on a industrial building (30 M. Dra).

The second call for proposals of the OPE, expired on October 31st 1997. This time, besides measures 2.2 and 3.2, the first call for proposals was announced for measure 2.3, regarding technical support to Small and Medium Enterprises in the field of RES and energy saving and substitution.

The investments supported by measure 2.3, are classified in the following categories:

A - Energy Saving

B- Substitution of Energy by LPG and NG

C- Renewable Energy Sources

In Table IV, the proposals concerning photovoltaic systems, of the second OPE call, are presented. The selection process has not finished yet.

TABLE IV : Photovoltaic proposals submitted in the second OPE call.

2nd OPE Call	**Number of proposals**	**Total Budget in kECU**	**Total Programme budget in %**
Measure 3.2	8	2270	0.3
Measure 2.3	10	885	2.85

2.2.2. OPRT (Operational Programme for Research and Technology)

The Greek state supports research activities through the Operational Programme for Research and Technology and Sub-programme 2, which mainly finances actions related to the "Promotion of the Research & Technology Activities in the field of the Environment and environmentally sensible Technologies" (Sub-programme 1, measure 1.1) and "Industrial research, technology transfer and innovation" (Sub-programme 2).

Sub-programme 1, Measure 1.1 supports actions in 7 thematic areas, namely :

1. Pollution and anti-pollution technology.
2. Natural disasters.

3. Renewable Energy Technologies and rational use of energy including solar technologies (solar thermal, active or passive systems and photovoltaics).
4. Protection of quality of living conditions.
5. Water resources.
6. Renewable energy in the treatment of water effluents.
7. Anti-seismic constructions.

The goal of Sub-programme 2, is to encourage industrial research, technology transfer and innovation, both from inside the country (e.g. Universities, research centers) and from abroad. An important part of the programme is to develop the ability to supply consulting and technological services to enterprises, through technology research and development agencies, company incubators, scientific and technology parks, technology transfer parks, quality control and certification labs, and other related entities, such as : ELOT, OBI, EOMMEX or ELKEPA.

Sub-programme 2 is implemented through a number of activities, such as Industrial Research Development Programme (PAVE), Scholarships of Oriented Research (YPER), Co-financing Programme (SYN) or Liaison Offices.

2.2.3. Regional Operational Programmes

Greece is divided into 52 counties, which in turn are grouped into 13 administrative regions. Therefore, there are thirteen regional programmes, one for each region. The basic categories of these programmes are the following:

1.**Infrastructures**: Road networks, Railway network, Telecommunications, Energy, Natural Gas.

2.**Living conditions**: Urban development, Health, Environment.

3.**Competitiveness**: Industry and services, Research and Development, Tourism, Culture, Agriculture, Fisheries.

4.**Human resources**: Education and continuous training, modernization of Public Services.

Most RES applications are usually financed in part or completely, by categories 2 and 3 of the above programme list. Depending on the region's needs and priorities set, actions are being formulated and launched.

In Table V, a list of the major PV installations in Greece, without being exhaustive, is presented, along with the chronological evolution of the type of systems installed, such as autonomous, grid connected systems, etc. Only recently, the first few grid connected applications have been introduced in the main-land grid of Greece.

3. CONCLUSIONS

With respect to photovoltaics, the framework of electricity purchase of PPC from auto and independent producers has not been tested in practice so far. It is considered that the photovoltaic market in Greece is in its infancy. The PV system installers are less than 40 in Greece according to our sources, while there are less than ten SMEs, active in the field of power electronics, manufacturing stand alone inverters, charge controllers, battery chargers, etc. At this time, the first network of installers is being established by the country distributor of a major PV module manufacturer. Based on the information we get from the market and the installers, the general perception suggests, that Greek PV consultants and installers would benefit from educational seminars in the areas of : system sizing, selection of appropriate PV equipment and the installation procedure according to norms.

Table V : Major PV systems installed in Greece

Owner	Location/Description	Year
PPC*	Agia Roumeli, 50 kWp	1983
>>	Kythnos, 100 kWp	1983
>>	Antikythira, 27.6 kW	1987
>>	Gavdos, 20.8 kW	1987
>>	Arki, 27.5 kW	1988
>>	24 Small islands in the Aegean sea, 53 kWp, (80 PV systems)	1990-1993
OTE**	Antikythira 25 kWp	1987
ETBA, Deve-lopment bank	Menetes, Karpathos Water pumping, 10 kWp	1986
Navigation Signalling Serv.	Lighthouses and beacons, 380 systems 30 kWp in total	1980-to present
CRES	Pikermi, 1-axis tracker, 4.3 kWp	1990
Monastery of Simonos Petra	Agion Oros, 45 kWp, Hybrid	1994
Center of Agri. Research. in Crete	Prasse Community, Chania, Refrigeration for Livestock prod.	1995
Technology Inst. of Patras	Evrymanthos, Achaia, Refri-geration unit of Livestock prod.	1995
OTE**	19 relay stations, Agion Oros, 12.5 kWp	1995
N.A.	Donoussa, Cyclades, 18 kWp	1995
Hotel owner	Autonomous, 12 bungalows and tavern, 6.5 kWp	1996
Ministry of Education	5th High School of Nikea, Grid-connected, 4.5 kWp	1997
BP of Greece	Gas station, Grid-connected, 4.6 kWp	1997
PPC*	PV system grid connected in the island of Sifnos, 60 kWp	1998 to be installed
Private properties	PV installations 20-1,500 Wp (in total more than 200 kWp)	1980 - to present

* PPC: Public Power Corporation,
** OTE: Hellenic Telecommunications Organisation
N.A.: Not Available

The size of the Greek PV market, without taking into account national and EU funded projects, is approximately 50 kWp per year, of which the largest segment is held by the privately owned autonomous systems, the Hellenic Navy as a user of PVs in the Sea Navigation Signaling Service, and finally the telecommunications sector. The grid connected market, besides a few demonstration efforts, is still not existent. Nevertheless, potentially there is room for such systems,

if the appropriate support measures or programmes are put into place.

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