

EXISTING SITUATION AND PROPOSAL TO THE GREEK GOVERNMENT FOR THE DEVELOPMENT OF A PHOTOVOLTAIC MARKET IN GREECE

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ABSTRACT: The existing regulatory, legislation and support schemes environment, for the development of a PV market in Greece is reviewed in this paper. The bureaucratic administrative barriers restricting the total market to only 3.4MW as of the end of 2004 are listed and the experiences encountered on the effectiveness and applicability of the existing measures is reported. The initiative of IENE to recommend to the Greek government a particular strategy with vision, targets and measures for the sustainable market development of PVs in the country, both in the islands and the mainland, is analysed. The adaptation of a feed-in tariff policy for the energy produced by PVs should be based on macro-economic criteria and together with simplified licensing procedures will open the household sector market and create favourable conditions for increased PV penetration as well as industrial development.

Keywords: PV Market – 1; Strategy – 2; National Programme – 3

1 PRESENT NATIONAL POLICY FOR PV

The data presented in this section are based on a recent work conducted within an on-going project, [1].

1.1 Market Background and Industrial Activities

In Greece, activities on PV applications started in 1980 by the Public Power Corporation (PPC) within EC RTD projects for the electrification of island communities and remote areas. As a result, the utility gaining considerable experience on the operation of PV power supply systems for the electrification of remote areas using local energy resources. These applications had a strong social content and assisted in the development of the local communities in terms of tourism business and local economy.

Other important PV applications in Greece include sea navigation lighthouses, telecommunication systems, experimental PV systems installed and operated by research institutions and universities, a number of stand-alone PV systems for the electrification of the Monasteries, summer houses etc. Some large PV plants have been developed within National Programmes, such as the Operational Energy Programme (OEP, 1997–2000) and the Operational Programme for Competitiveness (OPC, 2001 to date) and the Development Law. These programmes provided subsidies of 40% to 55% of the budget depending on the system size and the location of the application. As of the end of 2004, the total installed capacity in Greece is estimated 3.4MW, of which approximately 1.35MWp are grid-connected systems.

Concerning industrial activities, a Greek investment was realised in Bulgaria in 2004 by Energy Solutions SA.

Production of c-Si PV modules started in February 2005 and a capacity of 1MW is expected to be produced by the end of 2005. Production in 2006 is expected to be tripled with target markets those in the Balkan and Mediterranean regions. Since 2001, an a-Si production line is under development by Heliodom SA in northern Greece and production is expected to start in 2006. In addition, there are 3 inverter manufacturers and 3 batteries manufacturers. It is estimated that as of the end of 2004, the total employment capacity of the PV sector in Greece was 70 people, including manufacturers, installers and scientists involved in RTD activities.

1.1 Regulatory Framework

A specific regulatory framework for RES was introduced by Act No 2773 of 1999. With this law, the Regulatory Authority for Energy (RAE) was established and the deregulation of the electrical energy market was initiated. The so-called, “Code for the Management of the System and Transactions of Electrical Energy”, is a document recently published by RAE to regulate the framework of the energy sector in Greece. The code is valid for RE applications grid connected in the Medium Voltage or High Voltage of the utility and thus, its applicability for PV is restricted to only large capacity plants. Key aspects of the existing regulatory framework are:

- RAE provides the Energy Production Licence for a potential investment. PV systems below 20kWp capacity are excluded from the licensing procedure.
- RAE determines the feed-in tariffs from RE power stations. So far, no special measures for PV are included. Feed-in tariffs are directly correlated to the development of electricity price levels.

- The tariff system is uniform for all RES but distinguishes between Self Producers (SP) and Independent Power Producers (IPP), voltage level connection and grid type, see Table 1 below.
- SPs consume the generated electricity in their own premises and obtain 70% of the domestic low voltage tariff on islands for the surplus generated energy. In the mainland, this tariff accounts for 70% of the respective end-consumer price.
- IPPs feed the entire electricity generation into the grid and receive 90% of the domestic low voltage tariff on islands and 90% of commercial medium voltage tariff on the mainland.

The feed-in tariff prices for RES as of November 2004 are summarised in Table 1.

Table 1: present tariffs for energy producers by RES

Island System		Interconnected System		
		Low Voltage	Medium Voltage	High Voltage
SP	€6.356c/kWh	€6.356c/kWh	€5.142c/kWh	<u>Peak Load</u> €3.357c/kWh
				<u>Medium Load</u> €2.326c/kWh
				<u>Low Load</u> €1.726c/kWh
IPP	€8.172c/kWh	€6.611c/kWh		
		€1.69705/kW (power, monthly)		

1.2 Legislation

Act No 2244 was introduced in October 1994 and refers to, "Regulation of issues related with the production of electrical power from RES and conventional fuel and other provisions". This law established the legislative environment for the development of RES in Greece, providing access to the grid for IPPs and SPs. The law is uniform for all RES and no specific measures are envisaged for PV applications. With Act No 2244, the utility is obliged to buy all energy produced by IPPs, while retaining the exclusive right to supply third parties with electricity. Other provisions of Act No 2244/94 are summarised as follows:

- The maximum allowable capacity for IPPs is 50MW.
- Grid-connection contracts with IPPs and SPs are guaranteed for 10 years. An extension is possible thereafter.
- The penetration of intermittent RES in island grids is limited to 30% of peak load of previous year.
- Penalties for low cos ϕ and reactive power apply.
- The cost for the extension of the grid or any reinforcements of the power lines are born by the RES developers.

The most relevant regulation for the promotion of BIPV is due to a Common Ministerial Decision between the Ministry of Development and the Ministry of Environment of November 2004, which characterises PV

systems up to 500kWp as "low annoyance level" installations. According to this decision, it is allowed to install PV power supply systems in traditional settlements, historical parts of towns and cities and preservable buildings, after approval of the apposite authority concerning their integration in the environment.

Initially, feed-in tariffs of energy generation were paid by the utility. Effective from April 2003 and based on Act No 2773 of 1999 for market deregulation, PPC charges its customers €60c/MWh as a fee for RES. The money gathered is rendered to the Transmission System Operator (TSO), and they are then used to compensate RES energy producers with contracts. It is estimated that some €20M are collected annually.

Act No 2364 of 1995 included a National tax deduction scheme for RE systems, but was discontinued in 2003. Finally, Act No 8295 of 1995 clarified the administrative processes and tackled the issues related to the installation and operation licenses for electricity producing plants.

1.3 Programmes and Support Schemes

The Operational Programme for Competitiveness (OPC) is the major tool for obtaining a subsidy for an energy investment, including PVs. OPC is open for the period 2000 to 2006. In the latest call, PV subsidies varied between 40% and 50%, depending on the geographical location of the application. Applications for the incorporation of a project in the OPC Programme are evaluated from the Central Evaluation Committee (CEC). The evaluation of a proposal contains 3 main parts:

Audit of typical requirements: eligibility conditions refer to the acceptability of the legal status of the investor, the required licences obtained at the proposal submission phase and the budget thresholds.

Financial status of the potential investor: justification of the availability of the budget for the proposed activity is required; indicators include economical profitability, lending ability, liquidity and relative capital assets. For projects related to electricity production, the Energy Production Licence by RAE is a prerequisite and is a strong asset of a proposal in the evaluation process.

Techno-economical evaluation and viability audit: the criteria used for marking a proposal are: primary energy saving, environmental & social consequences, credibility and certification of the technology, credibility and maturity of the investment, internal rate of return and specific energy consumption.

After an evaluation process, a list of successful proposals to be subsidised is carried out by CEC and the final approval is decided by MoD within 20 days.

1.4 Administration

The administrative procedures for obtaining an authorisation for a PV plant are summarised below:

- RAE provides the Energy Production Licence for a potential investment.
- Another 40 public authorities on the national, regional or local level are involved in the permission and approval procedures. These include: environmental consequences assessment,

Archaeological and Forests Departments, Town Planning Authority, Civil Aviation Department, General Army Forces, National Telecommunications Organisation, Hellenic Organisation for Tourism, Prefecture Council, approval of the environmental consequences, approval for the installation, negotiations with PPC or TSO, CRES approval, installation, building, civil works licences, Fire Department, contracts with PPC for grid connection, energy sales and operation licences.

- Although a PV system up to 20kW capacity is exempted from the Energy Production Licence, PPC requires complete technical characteristics of the system components, electrical drawing of the grid connection and a certificate of the town planning authority stating that the system can be connected to the grid. After approval of the application and during the installation phase, PPC requires extra protection devices attached to the automatic switch i.e., voltage threshold, frequency threshold, voltage skew distribution and high amperage relays and a reverse current cut-out device.

1.5 Experiences Encountered

During the years of its validity, Act No 2244 proved to be insufficient and a number of modifications and amendments were introduced aiming to resolve important technical and processing issues. In the last decade, some 13 Laws, Common Ministerial Decisions, Circular Decisions, etc. were put in place. The present regulatory and legislation environment is extremely confusing and bureaucratic, practically restraining the sustainable development of RES in the country.

For PV technology in particular, no special measures were introduced by Act No 2244. PV technology was treated on a common basis with other RES. On the other hand, provisions for the introduction of small PV systems in the household sector were not envisaged. Specifically, the purposeless processes for licensing, the irrational environmental conditions required, the lack of reasonable feed-in tariff and the problems encountered for the grid connection are the main constraining factors limiting the PV applications in Greece to the present low capacity.

Procedures for permits and subsidies: presently, the authorities' ability for granting operating permits and subsidies is not adequate for a sustainable RES development in the Greek energy market. Procedures should be simplified, aiming to minimise granting time and relevant costs, thus allowing energy investors to have a long-term perspective planning of their business.

Economic framework: kWh prices for RES are lower than those of most European countries and public subsidies and incentives offered by the Greek government help to somehow offset these low rates. A more attractive and clear economic framework should be in effect. The present structure of OPC practically excludes PV applications in the domestic sector. There are no incentives for the realisation of PVs in private households and the minimum amount per project of €44k is prohibitive for the budget of a typical household.

Programme monitoring and evaluation: systematic evaluation is needed, even in intermediate stages of the

Programme. The experiences encountered from previous activities should be assessed and the evaluation should be available to the public for comments.

2 PROPOSITION FOR A NEW INITIATIVE

The Institute of Energy for South-Eastern Europe (IENE), took the initiative in summer 2004 to elaborate a proposal to the government including legislative and regulatory measures aiming in accelerating the development of RES in Greece, starting from solar energy. For PV technology, a group from stakeholders and experts was formed with members from the research community, the Greek industry, EPIA, the association of PV companies and experts in the field. The PV working group formulated a list of new propositions and IENE published the relevant document in December 2004, [2].

Meanwhile, Greek governmental authorities recently completed a draft of a new decreative framework aiming at establishing new instruments, procedures and means for an effective energy policy, promoting electricity production from RES and high efficiency CHP plants. This document, with integration of some of the IENE recommendations, was released by the Ministry of Development for comments. It is expected that special measures including a generous feed-in tariff policy for PV technology will be announced in 2005.

2.1 Strategy, Targets and Timetable

A strategic decision to comply with both the target of the Kyoto protocol and the EU Directive 2001/77 has been made by the Greek government through Act No 3017 of 2002. It is expected that the share of RES in the electricity sector will be 20.1% by 2010 and 29.0% by 2020 of the total consumption. However, specific targets for the participation of PV technology in the share of RES have not been defined.

The recommendations of the IENE working group indicates that PV systems should be considered as integrated power supply elements, to assist the grid with high penetration levels reaching 15% in islands. A list of short and medium term quantitative targets for PV technology evolution and applications in Greece are summarised in the following Table 2.

Table 2: recommended national targets for PV applications

Targets for 2010 and 2020	Islands	Mainland Grid
<u>2010</u>		
Installed Capacity	120MWp	80MWp
Electricity Production	180GWh	115GWh
Penetration from PV	3%	0.2%
Cost Reduction	50%	50%
<u>2020</u>		
Penetration from PV	15%	3% – 5%
Cost Reduction	>50%	>50%

In view of the upcoming new electricity grids and the role of DG and DER topologies, such an integration approach would contribute significantly to the quality and the

security of energy supply as well as, the improvement of voltage regulation, grid stability and grid security.

2.2 Measures Envisaged

The measures that are suggested to be adopted by the government are both legislative and regulatory. These include,

Removal of administrative barriers

- The Energy Production Licence, now issued by MoD after the recommendation of RAE, should be discontinued for RES plants of less than 50MW capacity in the mainland grid and less than 10MW in the island grid, provided that a study for the integration is submitted and approved by the DSO in the latter case.
- Abolish all articles and relevant to PV technology matters and measures from Laws, Common Ministerial Decisions and Circular Decisions of the last decade, except of Act 2244 of 1994.
- Inclusion of PV systems in the existing legislation for solar thermal applications. This concerns installations in the built environment and licenses for the installation and operation of PV systems should be discontinued.
- Licensing from a local Prefecture or a District Authority should be required for large systems, only for matters related to forestry usage or adjacency with archaeological sites or other monuments.
- Contracts with the utility should be increased from 10 years today to 20 years and VAT for RES should be decreased from 19% today to 9%.

Adaptation of a feed-in tariff policy for PVs

A new tariff policy is suggested for energy fed into the grid from PV systems. No distinction between self-producers and independent power producers should be put in place, i.e. the proposed tariffs should be valid for the energy production in the output of the inverter. The recommended feed-in tariffs presented in Table 3 below include macroeconomic criteria and parameters related with the real value of energy production as well as, the solar resource potential and the particularities of the grid in Greece.

Table 3: suggested feed-in tariff policy for PV applications (for the total energy produced)

	PV Plant Capacity, [kWp]	Islands, [€/kWh]	Mainland Grid, [€/kWh]
Low Voltage	< 5	0.48	0.45
	5 – 20	0.45	0.40
	20 – 100	0.42	0.36
Medium Voltage	100 – 1000	0.38	0.30
	> 1000	0.30	0.25

In addition, it is suggested that for utility customers in LV connection, the produced energy is deducted from the consumption figure in the monthly electricity bill.

Simplification of procedures for grid connection

The enactment of the Distribution System Operator

(DSO) is considered as a first priority matter. The DSO will be an authority independent from PPC and will be responsible for arranging grid access and connection issues. Grid connection of PV systems installed in the household sector should be straightforward after approval of an application duly submitted in a standard form by a certified responsible electrician.

2.3 Monitoring and Evaluation

Systematic registration of all RES installations should be officially kept by a registered governmental authority. For operational systems, data processing, analysis and statistics should additionally be undertaken in order to assess the performance of systems. Should a national PV Programme put in place, an efficient assessment process with specific indicators is also required, to be done in intermediate stages. In this way, better usage of national resources will be guaranteed and the necessary amendments will be carried out reaching the Programme's targets in an optimum way.

2.4 Supporting Measures

A number of supporting measures were recommended by the IENE working group. These include: elaboration of technical guidelines for the connection of PV systems to the grid and application of regulations and standards, training of electricians, development of BIPV demonstration projects in public buildings, educational activities and campaigns in universities, technical schools etc. Additionally, a targeted programme for the collaboration of the industry with research institutions for novel RTD activities related to PV technology is envisaged.

3 CONCLUSIONS

The existing legislation and regulatory framework for the development of RES in Greece was presented in this paper. Experiences encountered from previous subsidy Programmes were reported and the suggestions to the Greek government of the PV working group of IENE were presented. The potential for the development of a sustainable PV market in Greece is very high and the conditions favour the development of PV technology and applications. Special measures distinguishing the PV household sector from the general energy market from RES are needed together with the introduction of a generous feed-in tariff policy. The new Law, now under discussion, is not yet mature. It should introduce a new vision and a clear long-term strategic approach for the development and functioning of the RES market, based on simplified procedures and a well designed feed-in tariff tool, with technically and financially viable applications that will produce multiple economical and social benefits.

REFERENCES

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