

THE CURRENT STATE OF THE PV MARKET, NEW RES LAW IN GREECE

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Abstract: This paper presents in short the recently introduced RES Law (3851/2010) for the simplification and promotion of RES in Greece, the current state of the PV market, the achievements so far and the prospects in view of the new RES Law. Several industrial PV manufacturing efforts are in place in Greece producing PV wafers, cells and modules. The most noted efforts and the PV production capacity will be presented.

Keywords: PV Market, Funding and Incentives, Manufacturing and Processing.

1. INTRODUCTION

A new Hellenic Law, 3851/2010 for the simplification and promotion of the introduction of RES to the energy mix of Greece was passed by the parliament in June 2010 (OG A/85/4th June 2010).

It is an amendment of the Laws 3468/2006 and 3734/2009, "Generation of Electricity using Renewable Energy Sources and High-Efficiency Cogeneration of Electricity and Heat and Miscellaneous Provisions", (Official Gazette A' 129/27.06.2006), in order to simplify and remove obstacles for the introduction of RES in Greece. The most important elements of Law 3851/2010 are [1]:

- An ambitious national target for RES (namely 20% on final energy consumption, 2% above the mandatory level of 18% set by Directive 2009/28/EC) is specified, to be achieved through the combination of measures for energy efficiency as well as for the enhanced penetration of RES technologies in electricity production, heat supply and transport.
- It further sets specific targets for RES electricity share (40%), RES heating and cooling share (20%), and RES transport share (10%) in order to achieve the national target of 20% contribution of the energy produced from RES to the gross final energy consumption.
- Simplification of licensing procedures and designation of shorter issuing deadlines.
- The electricity generation license from renewables or high efficiency cogeneration, i.e. the first main license in the related licensing process and a prerequisite for the environmental terms of approval of the project in question, will henceforth be granted by the Regulatory Authority for Energy (RAE) instead of by the Minister. RAE issues the electricity generation license based on technical and economic criteria only, without requiring a preliminary environmental impact assessment of the project.
- Unification of the previously separate requirements of preliminary environmental impact assessment and evaluation and final environmental terms

approval into a single process, reducing the time as well as expenses for issuing the relevant license by the competent authority. Environmental terms approvals remain a prerequisite for the installation license as well as the final grid connection requirements in the form of an offer.

- Rationalisation of feed-in-tariffs with a view to providing better economic incentives.
- Half of the renewable energy special levy retained by the HTS Operator from the gross revenues from electricity sales of renewable energy installations (with the exception of photovoltaics), i.e., 3% before VAT, is redirected from the current local authorities in the area of which the RES projects are installed, to the individual citizens of the local communities concerned and the Greek Fund for NATURA 2000 areas.

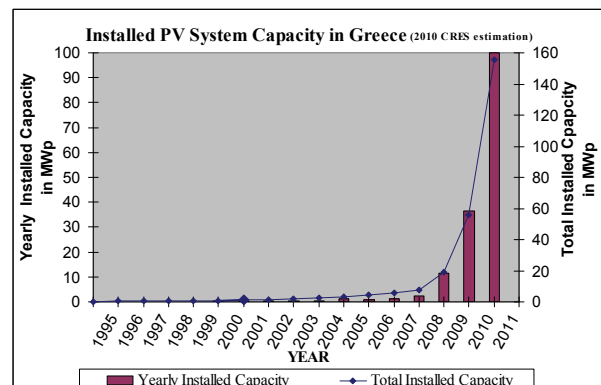


Figure 1: Projected market driven yearly and cumulative introduction of PV systems in Greece.

In the beginning of July 2010, the National Renewable Energy Action Plan (NREAP), in the scope of the directive 2009/28/EC, was presented. In chapter 5 "Assessments", in Tables 10 a and b, the estimated total contribution expected from each renewable energy technology to meet the binding 2020 targets are presented. Regarding the solar energy contribution in electricity consumption, the estimated capacity for 2020 is 2200 MWp for Photovoltaic Systems and 250 MW for Concentrated Solar Power.

The Hellenic Association of Photovoltaic Companies (HELAPCO, www.helapco.gr) in a public announcement reacting to the National renewable Action plan for 2020, considers the document without vision or any important development outlook for Photovoltaic systems and other RES. The proposed action plan is in most cases a simple extrapolation of the current growth trend and it does not depart from the stereotypes that have led to the failure of the current energy planning in our country.

The low target proposed for photovoltaics (2.200 MWp in 2020), is clearly well behind the potential of the country and the already manifested investment interest. We note that RAE (the Regulatory Energy Authority) has received in the previous years a large number of PV system applications amounting to 3.700 MWp, of which, it is estimated, that around 2.000-2.500 MWp can be implemented.

On the basis of even the previous legislation, these projects must be implemented not later than 2013, otherwise their licenses are void. If in the previous numbers the new applications of this year are added, coming from the new categories added by the new law, such as the PV systems by farmers, from PPC (Public Power Corporation), industrial zones applications, the industrial-commercial roof sector and the residential roof sector, it is clear that the proposed cap will be already covered in the next three years. And then HELAPCO is noting, what will happen, the market will freeze. Hundreds of companies will shut down and what will happen to the PV panel production industry in Greece, where 0.5 billion € were invested in recent years. The PV industry was subsidized by the Greek government on the basis of a green development future. What about the building sector? Will we eventually ban the installation of PV in buildings because no more PV capacity margin is allowed?

The argument for the limited capacity of photovoltaic systems is usually exhausted in the cost issues in relation to other technologies. The dynamics of the PV market is fortunately such that significant and rapid decrease in prices is expected, something that all analysts worldwide agree on. This alone should lead to a greater share of photovoltaics in the energy mix. As a matter of fact, around 2015, capital costs for wind and photovoltaics is expected to be similar, and so will be the feed-in tariff for produced solar and wind kilowatt-hours. At the same time, the PV will achieve the so-called grid parity, that means, the output of solar PV kWh will cost the same as conventional energy is sold to the consumers. In addition, photovoltaic systems have a very high social acceptance and they also help to develop a more decentralized and thus more stable electrical system and have a greater flexibility to combine storage systems in the future for grid support.

In order to achieve the objectives of the country, the PV systems should cover at least 12% of electricity consumed in 2020. Since the estimate in the proposed action plan for energy demand in 2020 is 68,1 TWh, then this translates to 8,17 TWh of PV electricity or about 6000 MWp of photovoltaics. This goal will produce, among other things, thousands of new jobs in a time period when the economy is in crisis and the unemployment is increasing.

2. OVERVIEW OF THE GREEK PV MARKET

In the past year, a RES law modification was issued by the Ministry of Development (Law 3734/2009) in order to organize the procedure for evaluation of the large number of outstanding applications for PV systems, to provide a 20 year contract for electricity sale to the grid operator and thus a secure environment for investments, a new table for feed-in tariffs that start decreasing for new PV installations after August 2010. It abolished the initially proposed distribution of PV capacity in the different regions and the timeframe of PV capacity introduction. All the outstanding PV applications was planned to be evaluated within the year 2009. A special program for PV systems on buildings, not bound by the existing feed-in tariffs and procedures, was announced and was established in the summer of 2009. The feed-in tariff for PV systems on buildings was set at 0,55 Euro/kWh and an electricity purchase contract is signed with PPC for 25 years. An annual regression of 5% is foreseen for new installations as of 2012.

The installed PV systems in Greece up to a few years ago were mainly privately owned autonomous systems in remote locations where there is no grid. The grid connected market, besides a few demonstration projects, was relatively small until 2006.

Although there was a legal framework for the RES market since 1994 the lack of a significant support scheme running over a long time, the involvement of many public services in order to receive a large number of licenses and the lack of concrete regulations for the market players have hampered the larger introduction of PV systems. The annual installed capacity of Photovoltaic systems in Greece before the new law, excluding demonstration programs and research projects, did not exceed 200 to 300 kWp. Figure 1 presents the installed capacity of PV systems in Greece until 2010 according to the estimates of CRES. In the year 2007, the installed PV system capacity was raised by 2.3 MWp, half of it coming from grid-connected PV systems due to the law 3468/2006.

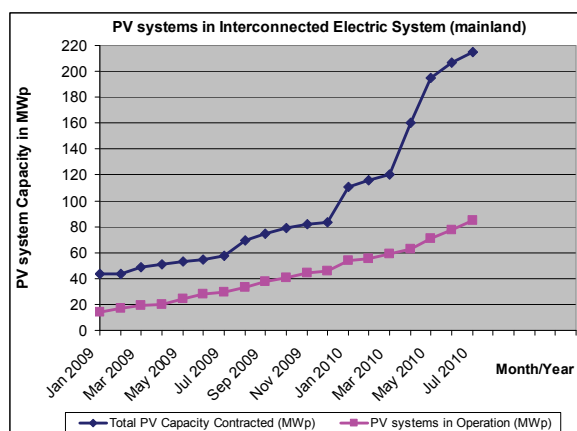


Figure 2: Monthly evolution of grid-connected PV systems in the Interconnected Electric System (mainland).

For the year 2008, an additional installed and connected capacity of about 12 MWp was introduced, mostly in grid-connected PV systems. In the year of 2009 36.5

MWp were installed, mainly grid connected. For the year 2010, due to the new law support and simplifications introduced, the gradual maturity of the PV market and the economic situation, it is expected that the PV installations may reach between 100 and 120 MWp.

In figure 2, the monthly evolution of the PV capacity of PV system owners that have signed a power purchase agreement and the actual operating PV systems in the Interconnected Electric System (mainland) are presented. It is noted that in the last 6 months, the operating PV system introduction rate is increasingly lagging the contracted PV capacity and therefore in the following months, an acceleration is expected in the operating PV systems. The average annual PV energy production for 2009, in the interconnected electric system, was about 1450 kWh/kWp.

Another PV segment was launched in June 2009, it was the PV systems on buildings under 10 kWp, with a feed-in tariff of 0.55 Euro/kWh, a 25 year contract and a simplified and straight forward administrative procedure that should not take more than a month to complete. The response of the market was enthusiastic as it is seen in figure 3. The number of applications has reached until June 2010 the number of 766, while the banks just started to advertise attractive loan rates for the whole PV system cost and therefore the interest is going to intensify.

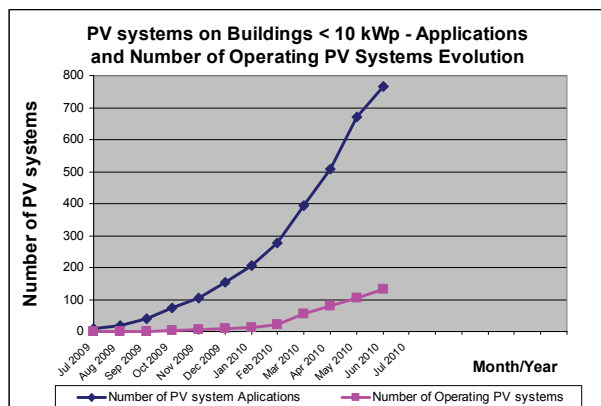


Figure 3: Number of applications and number of operating PV systems in buildings under 10 kWp.

It is also noted that in there is a large mismatch between applications and installations but this gap is expected to close as the procedure and initial problems are ironed out this market segment is expected to accelerate in installations as well. In order to promote good practices in designing, installing and safety issues, in June 2009 the Ministry of Development now called Ministry of Environment, Energy and Climatic Change (www.ypeka.gr) requested from CRES to prepare a "Guide for the installation of PV systems in buildings" (www.cres.gr/pvcatalog). The guide was prepared by CRES and it was put in consultation with interested parties, such as, PPC (the largest electric utility and Distribution System Operator in Greece), the Hellenic Association of PV system companies (www.helapco.gr) and NTUA. Already more than 450 companies, engineers and technicians have subscribed to CRES's PV installers database, accepting the technical practices in the published PV installation guide. These companies and

technicians represent a total workforce of 2800 people of which 1660 are involved directly with Photovoltaic systems.

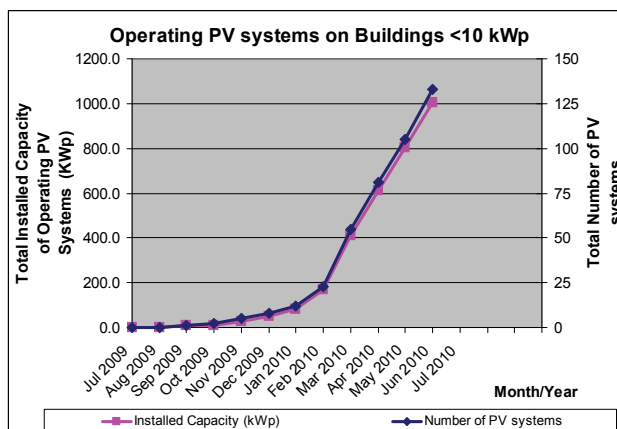


Figure 4: Operating PV systems in buildings under 10 kWp.

In figure 4, the operating power capacity and number of PV systems under 10 kWp in buildings is presented. The average PV system size is 7.55 kWp.

2.1 Non-interconnected Insular Regions

RAE announced in the summer of 2007 a call for application submissions for PV systems, in the non-interconnected islands. It was scheduled as follows: for Crete the call was open from 2nd of July to 31st of August 2007 and for all other islands from 1st of August to 28th of September 2007. The maximum allowed power capacity per PV system is 150kWp but finally it was reduced to 80 kWp in order to allow more participants in the program.

In May 2009, RAE announced the results of the evaluation of the 1638 applications for the island of Crete. Out of those applications 1216 applications were evaluated positively and are proposed to receive the exemption from energy production licence from the Ministry of Development. The installation of the PV system is not possible before an environmental permit is received and a permit for the local office of planning for the works that will follow on the property. This last permit has to do with the allowed uses of the land and a minimum surface area for the property. For this reason, an environmental study for the impact of the PV system is prepared and approvals and opinions from all relevant authorities are collected. After the positive expression of all the authorities an environmental permit for the PV system is issued by the region environmental office. At this time the progress in the installations of PV systems in the non-interconnected islands is slow as the procedure is time consuming and complex. In 2009 the new PV installations in the non-interconnected islands were 1.15 MWp, of which 0.8 MWp of new PV installations in the island of Crete.

3. GREEK PV PRODUCTION CAPACITY

In anticipation of the support schemes for PV systems in Greece several efforts were initiated to establish PV

module production in Greece, the most noted efforts are presented below:

- Solar Cells Hellas SA is in production in Greece since the end of 2008. It completed a total investment of about 120M Euro for the construction of an integrated PV production factory in the Industrial Area of Patras in Greece. The products will be polycrystalline silicon wafers, solar cells and PV modules. The first phase of investment concerned a 20 MWp/year polycrystalline Silicon wafer line and a 30 MWp/year solar cell line. In the second phase, it installed an additional line of 20 MWp/year of Silicon wafers and a line for PV module assembly of 30 MWp/year.
- Stibetherm S.A. is based in the Industrial zone of Stavrochori, in Kilkis. It started recently the assembly of multi-crystalline Si modules with an annual production capacity of 15 MWp.
- The Exel Solar group also located in the Industrial zone of Stavrochori, in Kilkis, has started assembly of multi-crystalline Si modules during the year 2009, The annual production capacity is planned to reach 70 MWp in the following year.
- Energy Solutions S.A., began its activity in the beginnings 2005 as a subsidiary company of the group of companies VIOHALCO. "Energy Solutions", started assembling c-Si PV modules in Feb. 2005, with 1 MWp/year capacity in the city of Pernik, near Sofia of Bulgaria. The production capacity was increased to 10 MWp/year in 2007.
- Heliodomi S.A., a joint venture between Themeliodomi and EPV (USA) started in 2001 with the construction of a manufacturing plant in Kilkis, Northern Greece, for annual production was set at 5 MWp of a-Si modules. The investment is currently on hold as Themeliodomi is in financial difficulty.

Two newer investments in photovoltaic manufacturing have been initiated in the passed 2 years in Peloponnisos with a total value of 245 Million Euro.

- The first investment concerns a production unit of thin film photovoltaic modules (Micromorph = a-Si/ μ -Si) in the industrial zone of Tripoli, by the company named "Heliosphera" The annual production capacity is 60 MWp. The total budget reached the amount of 185 Million Euro. The project was supported by the Greek investment law. Production begun at the end of 2009.
- In the industrial zone of Patras, the Kopelouzos energy group has set up two separate companies. The first company named "Pirition S.A.", with an investment of 40 Million Euro, producing polycrystalline Silicon wafers and the second company named "Silcio S.A.," producing polycrystalline Silicon solar cells, with a capacity of 31 MWp per year, and a budget of 20 Million Euro. A line for PV module assembly of annual capacity of 18 MWp is also in operation.

4. CONCLUSIONS

With regards to the introduction of Photovoltaic systems in Greece, although the introduction and preferential treatment of large PV systems built up the PV power

capacity faster, as Greece is trailing in RES electricity production implementation, it is hoped that the newly introduced program for PV systems on buildings, commercial and industrial roofs, farmers and in industrial zones will have a serious impact on installed PV capacity. The building sector is considered as a key sector as it constitutes the "natural environment" for photovoltaic systems that can be coupled with storage and energy management and other ancillary services. The photovoltaic technology is suitable for building applications, making it the main component for a decentralized RES development model. In countries with developed photovoltaic markets, such as Germany, the small PV systems in buildings (<10 kWp) constitute 40% of the annual market, while globally the building sector has a share of the order of 90%. It is noted that the program "PV systems on buildings", put into effect in Greece this summer, does not support building integrated photovoltaic systems. In Law 3734/2009, it was announced that the PV system in buildings program will support PV systems on roofs and facades according to the existing building code. It is obvious, that the building code did not permit the integration of PV systems on buildings (BIPV), this is a disappointment as the integration gives added value to the PV system and promotes the involvement of architects in the integration of PV systems, thus introducing BIPV in the mainstream of building design. In any case, action should be taken to modify the building code in Greece in order to allow PV integration in buildings. This will also bring benefits in the employment and the economy of the country.

Finally, the national renewable energy action plan should and it will in the future consider the added benefits of the solar PV technology and in the next reassessment of the national action plan a balance will be reached. Furthermore, it seems that there is a lack of information on the local impact of the RES technologies and the global advantages they offer. A more profound and balanced examination should take place.

REFERENCES

- [1]. NATIONAL RENEWABLE ENERGY ACTION PLAN, in the scope of Directive 2009/28/EC, July 2010, Ministry of Environment, Energy and Climatic Change.