THE PV MARKET IN GREECE

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Abstract: This paper presents an overview of the PV market in Greece, the achievements so far and the prospects in view of the goals set for 2020. Furthermore, the new Greek Government interventions in the electricity market intending to reduce almost to a minimum the burden on the end users and also to ensure the sustainability of the energy market and therefore the economy. One of the measures is the significant reduction of feed in tariffs for new PV plants. Finally, statistical analysis of data from the PV plants, mainly above 1 MWp capacity, installed from 2007 until September 2012 is presented, statistics regarding the location, the origin of the basic system components, the PV module technology used the size of PV modules used etc
Keywords: Greece, PV Market, PV System Statistics

1. INTRODUCTION

Overview of the Greek PV market
The installed PV systems in Greece up to 2006 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 2 presents the installed capacity of PV systems in Greece until 2011 according to 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. For the years 2008 and 2009 an additional installed and connected capacity of 12 and 36.5 MWp was introduced, mostly in grid-connected PV systems, respectively. In the years 2010 and 2011 as the law and incentives have been active for 5 years now, the first serious penetration of grid-connected PV systems is taking place even though the country is going through a deep economic depression and lending funds are not easy to receive, while the lending rate is higher than other European countries. The grid connected new capacity for 2010 was 150 MWp and for 2011 it was 400 MWp. For the year 2012, due to the gradual maturity of the PV market, despite the economic situation and the measures taken in August 2012, reducing tariffs and suspending the authorization process and the granting any new offer for connection of photovoltaic plants, it is expected that the PV installations may exceed the 800 MWp mark. But a question remains about the development of the PV market in Greece in 2013 as most of the mature and running PV projects will be on line. It is hoped and expected that the government will take into account the fact that the targeted installed PV capacity according to the National Renewable Energy Action Plan (NREAP) [1], for the year 2014 was 1.500 MW and for 2020 it is 2.200 MW. Currently (Data of June 2012), the total PV installed capacity for all plants that have signed feed-in contracts are 2.570 MW. Of those 2570 MW, 820 MW are in operation without counting the special PV program for PV systems under 10 kWp on buildings. Therefore, the targeted PV capacity will be soon reached, maybe even at the end of 2012 and thus the government has to update its targets and take appropriate measures so that the PV market sector, where several thousand companies are active and more than 25.000 people are employed, remain engaged in their activities. It has to take into consideration also all benefits and charges of all forms of energy and the initiative to transform the electricity market into a simple, transparent and just operation scheme for all players and the consumers.
Figure 1 presents the historic data for the installed capacity of PV systems in Greece from 2006 and on. For the year 2012, it is a CRES estimate.

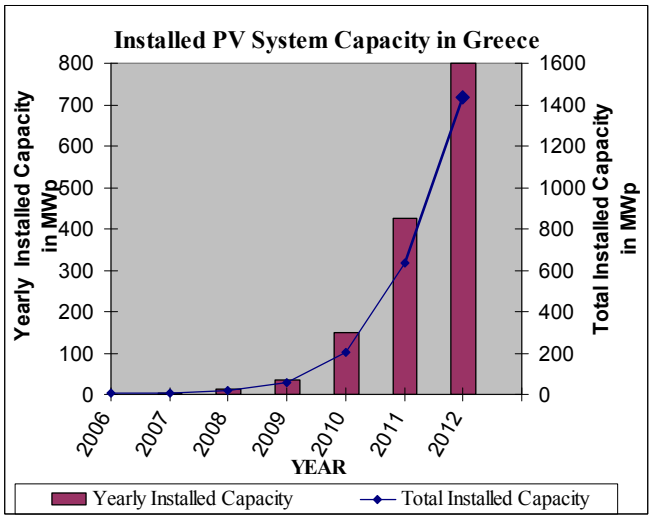

Figure 1: Historic PV market data, yearly and cumulative introduction of PV systems in Greece (CRES estimate for 2012).

On August the 10th 2012, the recently elected Greek Government announced the first interventions in the electricity market, intending to reduce almost to a minimum the burden on the end users and also to ensure the sustainability of the energy market and therefore the economy. Specifically, Ministerial decisions were signed by the Deputy Minister of Environment, Energy and Climate Change, announcing:

1. Suspension of the authorization process and the granting any new offer for connection of photovoltaic plants because the targets for PV capacity set by the Ministerial decision, 19598/01.10.2010 Y.P.E.K.A.", have been surpassed. The photovoltaic systems on roofs under 10KWp (except Peloponnesus which has been identified as an area with congested networks) and PV projects that at the time the suspension decisions were signed were included in the fast track process are exempted.
2. Modification of Decision No. F1/2262/ 31.1.2012 (V'97) related on the feed in tariffs of electricity produced by photovoltaic plants.
The new feed in tariff levels for new "Feed in tariff contracts" are as follows:

Table 1: Feed in tariffs for PV systems other than the special program for PV systems on Buildings under 10 kWp.

	Mainland		Non-Interconnected Electrical Systems (Islands)
	>100 kW	≤100 kW	
2012 August	180,00	225,00	225,00
2013 February	171,90	214,88	214,88
2013 August	164,16	205,21	205,21
2014 February	156,78	195,97	195,97
2014 August	149,72	187,15	187,15
Every year v from the year 2015 and on	1,3 x μΟΤΣv−1	1,4 x μΟΤΣv−1	1,4 x μΟΤΣv−1

μΟΤΣv−1: Average System Marginal Price of the previous year

At the same time, the following Joint Ministerial Decisions were signed:
3. Modification of the "Special Development Program Photovoltaic Systems in buildings and particularly on roofs of buildings". The feed in tariff contract is agreed on a fixed price corresponding to the month and year that the feed in tariff contract was signed, provided that the connection is energized within 6 months from the date the feed in tariff contract was signed. Otherwise, the energizing month and year is considered as the feed in tariff level of the contract.

Table 2: Feed in tariffs for the special program of PV systems on Buildings under 10 kWp.

Month / Year	Feed in tariff in (Euro/MWh)
August 2012	250,00
February 2013	238,75
August 2013	228,01
February 2014	217,75
August 2014	207,95
February 2015	198,59
August 2015	189,65
February 2016	181,12
August 2016	172,97
February 2017	165,18
August 2017	157,75
February 2018	150,65
August 2018	143,87

4. "Determination of the contribution ratio for ERT SA, Article 14 of Law 1730/1987, which constitutes a resource for the Special Account of Article 40 of Law 2773/1999 ".
The share of the ERT fee allocated to enhance the Special Account of article 40 of Law 2773/1999, managed by the Operator of the Electric Energy Market (LAGIE, www.lagie.gr) was set at 25%, this percentage will be redefined every year.
As the government has revealed, in a second phase, in the following months, new measures will be announced after the necessary legislation is introduced. These measures have to do with the completion of the lending process to LAGIE and the efforts being made for the release of the accounts of Energa and Hellas Power, gradually restoring liquidity in the energy market, thus dealing with the difficult issues of today. A new measure that it is allegedly discussed is a special temporary tax on operating PV plants.

2. STATISTICAL ANALYSIS OF PV PLANTS ABOVE 1 MWp INSTALLED CAPACITY

Through Law 3468/2006, Article 8.5, CRES was assigned to perform a technical audit of the PV systems, initially (Law 3468/2006) of capacity higher than 150 kWp, and provide a certificate that the equipment and design satisfy the minimum necessary operational and technical characteristics for safe and efficient operation. In 2010, Law 3851/2010, in an effort to simplify the procedures increased the PV plant capacity that has to receive production, installation and operation licenses above 1 MWp.
Since 2007, until September 2012, CRES checked, visited and issued 94 "certificates" for an equal number of PV plants, for a total capacity of 225.5 MWp. The information collected from the audits was used to produce statistics regarding the location, the origin of the basic system components (PV modules, inverters, etc.), the PV module technology used the size of PV modules used, etc.
In figure 2 the shares and PV capacity values for systems above 1 MWp are presented according to the geographical regions of installation in Greece.

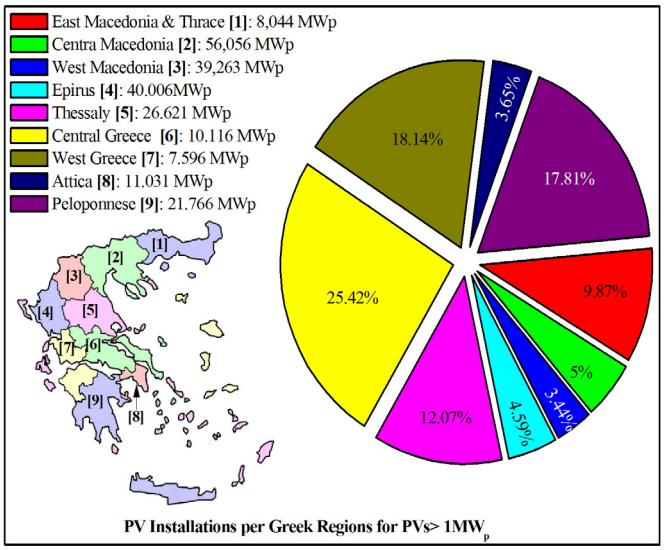

Figure 2: PV system capacity share according to the geographical regions in Greece.

In figures 3 and 4 the PV module shares installed in Greece in the period of 2007 until September 2012, according to their origin and the type of photovoltaic technology, for PV systems with capacity above 1 MWp, are presented. It is noted that majority of PV modules originate from China with second country of origin Germany and third Greece. In the last year, the share of Chinese

modules is further increasing. Regarding the PV module technology, crystalline Silicon covers almost 98% of the installed capacity with 2.2% of the capacity occupied by CdTe.

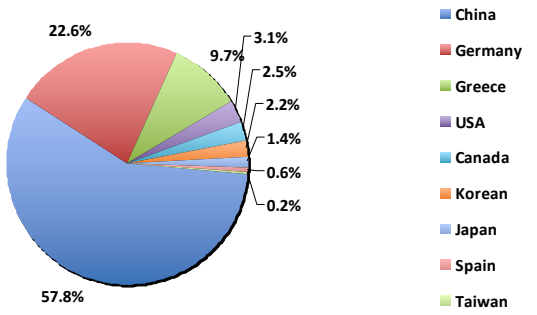

Figure 3: PV module capacity shares installed according to their origin.

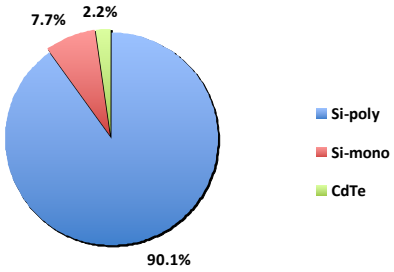

Figure 4: PV module capacity shares installed according to the type of photovoltaic technology.

In figures 5 and 6 the inverter manufacturer capacity share and the share of installed inverter capacity depending on inverter capacity nominal value are presented.

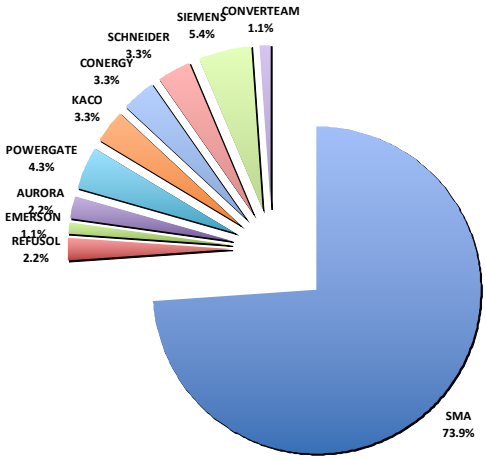

Figure 5: Inverter capacity shares according to inverter manufacturer for PV systems above 1 MWp.

Regarding the origin of the inverters used in the PV systems, it is observed that German manufacturers occupy 85.7% of the installed capacity with SMA being the dominant manufacturer with 72% of the total installed capacity.

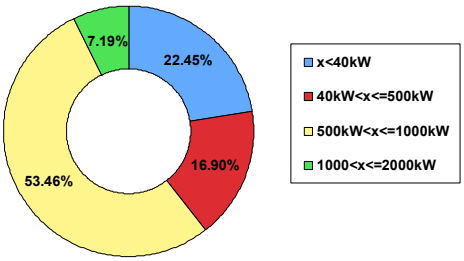

Figure 6: Share of installed inverter capacity depending on inverter nominal value

In the inverter category with nominal capacity value below 40 kW, as presented in figure 6, it was found that 9% of those PV plants that were using small inverters (under 40 kW nominal capacity) those inverters were fitted with transformers. In fact it was observed that after Match 2011 all inverters installed in the category under 40 kW capacity, they were all transformerless.

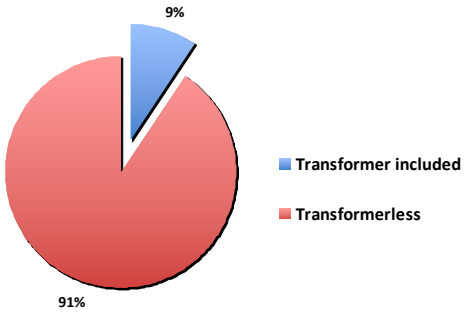

Figure 7: PV plant share with transformerless inverters for inverter sizes less than 40kW.

4. CONCLUSIONS

This paper presented an overview of the PV market in Greece, the achievements so far and the prospects in view of the goals set for 2020. The new Greek Government measures in the electricity market intending to reduce almost to a minimum the burden on the end users and also to ensure the sustainability of the energy market and therefore the economy were presented. Finally, a statistical analysis of data from the PV plants, mainly above 1 MWp capacity, installed from 2007 until September 2012 is presented. The statistics are dealing with the location, the origin of the basic system components, the PV module technology used the size of PV modules used etc. In the PV market segment investigated, it is clear that Chinese manufacturers of PV module are dominant while in the inverter category Germany is leading, with SMA clearly standing out with a very large share.

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REFERENCES

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