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Editorial Open Access

Solar Radiation Modelling: The Latest Version and Capabilities of MRM

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Editorial

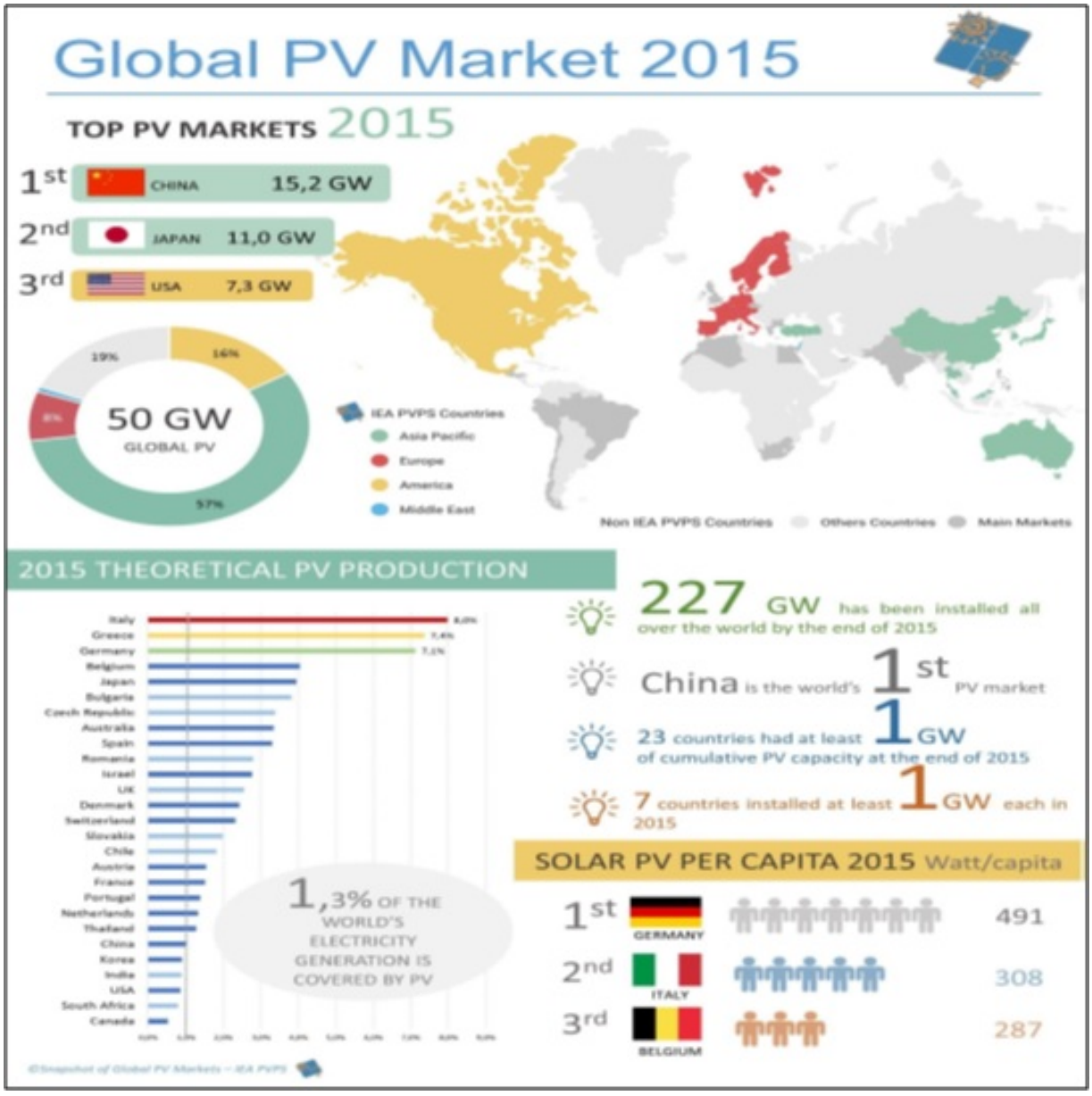

Figure 1: Global PV market at the end of 2015 [1].

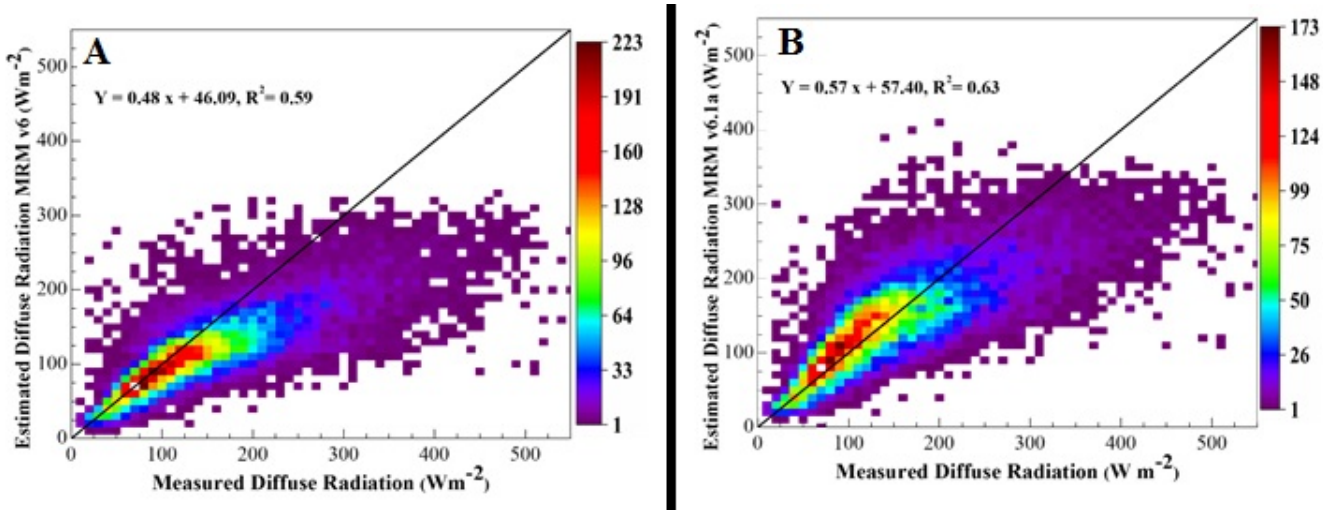

Figure 2: Comparison between measured and MRM-estimated mean hourly diffuse-radiation values at Athens in the period 2001-2005; A. MRM v6; B. MRM v6.1 [5].

Solar power systems have been at the forefront of the global energy market for at least 10 years. In the meantime, the world has realised that the only environmentally-friendly option for power generation is the implementation of Renewable Energy Sources. In this context, the solar power systems have shown remarkable market penetration. 2015 has been a record year in installed units of photovoltaic (PV) systems worldwide [1]. Figure 1 gives a clear picture of the shares.

Prior to PV installations, it is obvious that accurate solar radiation measurements are needed. In recent years, solar radiation modelling utilising existing climatic parameters, such as sunshine duration or cloud cover, relative humidity, air temperature, etc., has shown remarkable progress. It is generally accepted that the use of models for solar radiation prediction, instead of using scattered ground-based measurements, is essential during solar energy systems design, because in most cases the low density and the limited number of solar radiation measuring stations cannot describe the required variability of the climatic parameters involved [2].

Several solar radiation models have appeared globally since the 1970's in order to generate solar radiation on horizontal plane, mostly under clear-sky conditions [3]. Among those developed over the past 40 years there exists a broadband model, which has been developed in Greece in the late 80's by the Atmospheric Research Team (ART) at the National Observatory of Athens; the code estimates solar radiation on horizontal surface and is called "Meteorological Radiation Model" or briefly MRM. Its latest form is version 6 [4]. Nevertheless, MRM has undergone further improvement by ART and the new MRM v6.1 estimates the diffuse radiation component more accurately as it uses sunshine duration measurements as in the previous versions or, alternatively, cloud products from MERRA [5]. The latter constitutes an innovative feature in v6.1.

The main advantage of MRM against other broadband models is its simplicity in the input data needed (i.e., air temperature, relative humidity, barometric pressure and sunshine duration or cloud products as an alternative in MRM v6.1) at the location of the application. MRM can be applied worldwide. Its previous versions have been tested by various researchers [3,6] and credits have been given for its accuracy. Figure 2 shows the improvement in MRM v6.1 as regards diffuse radiation in comparison to MRM v6.

MRM is provided free of charge in executable form to any interested user after relevant request to Dr. Harry Kambezidis.

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