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Energy policy to promote photovoltaic generation

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ABSTRACT

Supplying present and future energy demand without adding to climate change is one of the most pressing problems today. Renewable energy is a potentially huge solution, for which governments are creating policies to encourage its harness and use. The dominance of photovoltaic (PV) among renewable energy technologies is owed mostly to its noiselessness, non-toxic emission, and relatively simple operation and maintenance. This study reviews the policies existing and in the making in seven leading countries that actively champion use of PV.

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Abbreviations: AUD, Australian Dollar; BIPV, building integrated PV systems; BMU, Federal Ministry for the Environment, Nature conservation and Nuclear; CAD, Canadian Dollar; CSH, concentrating solar high-temperature heat; CSP, concentrating solar power; DG, distributed generation; DOE, Department Of Energy; FIT, feed-in tariff; FY, Fiscal year; GDP, gross domestic product; GHG, green house gas; GWh, gigawatt-hour; IEA, International Energy Agency; ITC, Investment Tax Credit; JPEA, Japan Photovoltaic Energy Association; kWh, kilowatt-hour; LRET, large scale renewable energy target; MAFF, Ministry of Agriculture, Forestry and Fisheries of Japan; METI, Ministry of Economy Trade and Industry; MEXT, Ministry of Education, Culture, Sports, Science and Technology; MoE, Ministry of the Environment; MPPT, Maximum Power Point Tracking; MWh, megawatt-hour; NSSP, National Solar Schools Program; OPA, Ontario Power Authority; PGEP, photovoltaic generating electric power; PV, photovoltaic; PVPS, photovoltaic power system programme; REC, renewable energy certificate; RES, renewable energy source; RET, renewable energy target; RPS, renewable portfolio standard; REL, renewable energy law; SER, Syndicat des Energies Renouvelables; SETP, solar energy technologies program; SHCP, solar homes and communities plan; SPV, solar photovoltaic; SRES, small-scale renewable energy scheme

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1. Introduction

The ongoing process of climate change and the implications of this threat are one of the most challenging problems facing the world today [1]. The main reason for climate change is the greenhouse gases released from the burning of fossil fuels. Almost 80% of greenhouse gases come from production and consumption of energy. Globally and approximately, 40% of the average total energy consumption relate to buildings [2]. World primary energy demand will have increased almost 60% between 2002 and 2030; this is a 1.7% average annual increase, which further increases greenhouse gases [3]. Promoting electricity generation using renewable energy sources is one of the ways to overcome the global warming phenomena in the future. The energy source is sustainable, clean, and all-natural [4].

Nowadays, most countries are applying energy policy to promote electricity from renewable energy sources [5]. Among them, Germany, Japan, Spain, and the USA have contributed the most to PV market growth [6]. Energy policy is a strategy in which government decides to address the issues of energy development along with the development of the energy industry to sustain its growth; including energy production, distribution and consumption [7]. The main aim is to produce good-quality energy continuously and affordably within the principles of sustainable development [8].

Recent studies in the field of renewable energy sources have tackled diverse aspects of development and from different perspectives (e.g. legal, technical and economic) [4,9–14]. Most of these researches have emphasized on the application of two renewable resources; solar energy and wind. Among various solar energy technologies of sustainable energy sources, photovoltaic (PV) appears to be quite attractive for electricity generation because of its noiseless, non-carbon dioxide emission during operation, scale flexibility and rather simple operation and maintenance [15,16]. The International Energy Agency (IEA) estimates that solar power could provide as much as 11% of global electricity production in 2050 [16].

This paper will discuss various solar policies presently in place. Where most literatures discuss those of a specific country, this paper will look at the PV energy policies of the world and compare the energy policies of 7 countries. The review aims to aid researchers, policy makers, energy producers, and governments in their decisions and legislations [17].

2. Solar energy on the world

The mitigation of global climate change requires policies that encourage the production and use of renewable energy. It is often argued that such policies are best achieved via processes that involve many actors: not just bureaucrats and decision-makers, but also citizens, stakeholders, scientists, and other energy experts. If policy-makers rely only on the advice of one type of actor – e.g., energy producers – the legitimacy of the policy is diminished, and its implementation is hindered [18].

As we all know, there is basically only one source of energy for us, living on the Earth: the sun. The power it irradiates on our planet is estimated to be about 175,000 TW, four orders of magnitude more than the power we use even in our energy intensive times. The energy we have received and continue to receive from the sun is converted in many different ways by the dynamics of our planet and of its atmosphere: the high temperatures below the crust are due to its original activity; the presence of hydrocarbons in the soil, to ancient photosynthesis; winds and waves to the present thermal differences (Fig. 1).

Since 1994, worldwide solar PV market has experienced enormous growth (Fig. 2). According to a general overview of financial incentives in different parts of the world of PV systems among other technologies, incentives for PV systems have decreased over the last 10 years not only in the United States but also in major PV-based adopters such as The Netherlands, Austria, and Germany [19]. In fact, since 1994 the PV global market has increased by factor of 20. By end of 2007, the cumulative installed capacity of solar PV system reached 9200 MW, worldwide. About 6.2 GW of PV capacity were installed in the IEA PVPS countries during 2009 (much the same amount as in the previous year) which brought the cumulative installed capacity to 20.4 GW (Fig. 3). By far, the greatest proportion (74%) was installed in Germany and Italy

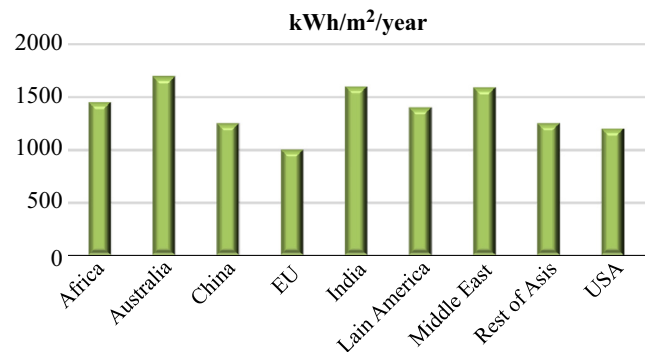


Fig. 1. Highest readings for sun radiation.

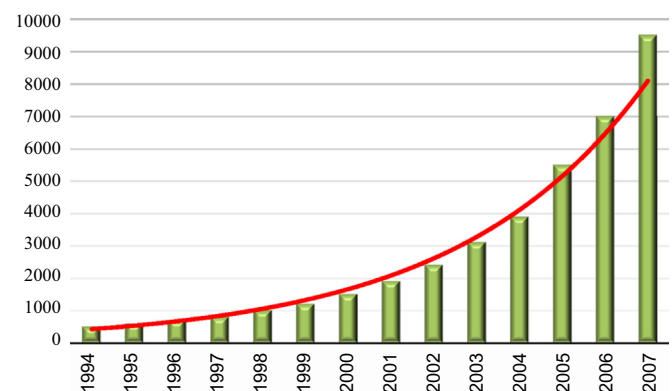


Fig. 2. Global cumulative installed PV capacity MW.

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