

REVIEW OF DEVELOPMENT OF SOLAR PHOTOVOLTAIC TECHNOLOGY IN THE WORLD FROM LAST 10 TO 15 YEARS

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Solar photovoltaic technology is one of the renewable technologies, which has a potential to shape a clean, reliable, scalable and affordable electricity system for the future. The concept and uses of electrical power source worldwide are now changing. Global demand for, and dependence on electricity is increasing and as environmental concerns become more pressing, so does the focus on the reduction of greenhouse gas emissions (Energy World, 2015). This is resulting in a move towards a decarbonized electricity system based on a large volume of variable renewable generation, predominantly delivered by wind and solar photovoltaic (PV). The major five leading countries identified are China, Japan, USA, Germany and UK. Solar PV technology is one of the renewable technologies which have a potential to shape a clean, reliable, scalable and affordable electricity system for the future (Tyagi et al., 2013). Considering this fact, all over the world governments are encouraging the development and deployment of solar PV technology. A wide range of PV materials are available worldwide. Globally, there are hundreds of companies involved in the manufacturing of PV modules with varying efficiencies and limitations. Photovoltaic is a fast growing market: The Compound Annual Growth Rate (CAGR) of PV installations was 24% between years 2010 to 2017. Concerning PV module production in 2017, China & Taiwan hold the lead with a share of 70%, followed by Rest of Asia-Pacific & Central Asia (ROAP/CA) with 14.8%. Europe contributed with a share of 3.1% (compared to 4% in 2016); USA/CAN contributed 3.7%. In 2017, Europe's contribution to the total cumulative PV installations amounted to 28% (compared to 33% in 2016). In contrast, installations in China accounted for 32% (compared to 26% in 2016). Si-wafer based PV technology accounted for about 95% of the total production in 2017. The share of multi-crystalline technology is now about 62% of total production. In 2017, the market share of all thin film technologies amounted to about 5% of the total annual production. In 2017, Germany accounted for about 10% (42.4 GWp) of the cumulative PV capacity installed worldwide (415 GWp) with about 1.6 million PV systems installed in Germany. Material usage for silicon cells has been reduced significantly during the last 13 years from around 16 g/Wp to about 4 g/Wp due to increased efficiencies and thinner wafers. The Energy Payback Time of PV systems is dependent on the geographical location: PV systems in Northern Europe need around 2.5 years to balance the input energy, while PV systems in the South equal their energy input after 1.5 years and less, depending on the technology installed. Assuming 20 years life span, this kind of system can produce twenty times the energy needed to produce it. The Energy Payback Time for CPV-Systems in Southern Europe is less than 1 year.

Biography

Utpal Gangopadhyay has received his Master of Science (Physics) degrees from Kalyani University, Nadia, West Bengal, India in 1981. He also has received his PhD degree in Solar Photovoltaic from Kalyani University, India in May 1989. He has around 28 years of research experience in the field of Mono and Multi-crystalline Silicon Solar Cells and Semiconductor related Device like V-Groove MOSEFT, a-Si : H TFT, Silicon/porous silicon related microsensors. He worked as a Research Professor in the School of Electrical and Computer Engineering, Sungkyunkwan University, South Korea in the year 2001-2002 and a Research Scientists in Photon Semiconductor and Energy Limited Company, South Korea in the year 2002-2003 and 2004-2005 respectively. He is presently the Professor of Physics in Meghnad Saha Institute of Technology, Kolkata, India. He has published around 125 papers in various international/national journals and conferences. He has two Indian patents and published one chapter of book and one book under NOVA Publisher Inc, USA. He is also associated as a Principal Investigator of three DST, Govt of India and one MNRE, Govt of Indian project program and as a Supervisor of several PhD program in the field of sensor, nanocomposite and solar photovoltaic.

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