

The book chapter written by me highlights photovoltaics as a major contributor to the future global energy needs. After analyzing the energy needs of today (140 PWh primary energy resulting in ~90 PWh secondary energy) and using a realistic energy efficiency increase by a factor of 3, the future energy needs for ~10 billion people are estimated (secondary energy ~150 PWh). Emphasis is given to the fact that unlike the situation of today where energy is unfairly distributed across the globe we should have for all future people a similar energy offering. By considering no other than renewable technologies there is no need to discuss primary energy any longer. It is shown that by only considering sustainable offerings from all renewable technologies more than 20 times of the needed future annual secondary energy is available. The portfolio of the most important renewable technologies (solar radiation (photovoltaics, heat and centralized electricity production), wind and all other technologies (including biomass, hydro, geothermal, ocean etc.)) has an astonishing split of 90% solar, 9% wind and only 1% for all others. Taking into account local conditions and optimization strategies a pragmatic split is made: 60% solar (with 3 contributions of similar size: decentralized photovoltaics, solar heat for heating, cooling and medium process heat as well as centralized electricity production by CSP (concentrated solar power) and CPV (concentrated photovoltaics)), 20 % wind and 20% all other renewable sources. The challenges by integrating such high shares of variable energy sources (like PV and wind) are described and solutions discussed. The competitiveness of photovoltaics compared to traditional sources like fossil and nuclear is demonstrated by using Price-Experience-Curves including cost efficient electricity storage. It is shown that the integration of variable renewable energy sources with a high share of a countries annual electricity needs is economically feasible by choosing the right portfolio of complementing renewable technologies and various levels of storage. In summary photovoltaics (and also the other renewable technologies) will serve the future energy needs more cost efficiently, environmentally friendly and with a much higher degree of security of supply for everyone compared to the current technologies.