

Mathematical Modeling, its Types, Application and Utility of Solar Energy

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Abstract: *One of the most plentiful, sustainable, and clean renewable energy sources that humanity has access to is solar energy. It is useful in a variety of fields, including as manufacturing, agriculture, environmental management, heating, and energy generation. By efficiently converting solar energy into electrical and thermal power, photovoltaic and solar thermal technologies can lessen reliance on fossil fuels and reduce greenhouse gas emissions. Crop drying procedures, greenhouses, and solar-powered irrigation systems all increase agricultural productivity while advancing sustainability. Similar to this, both domestic and commercial uses—like process heat, space conditioning, and solar water heating—help to lower operating costs and increase energy efficiency. In addition to its technological benefits, solar energy promotes economic growth by stabilizing long-term energy prices, guaranteeing energy security, and generating job opportunities. By lowering carbon emissions and air pollution, it also contributes significantly to environmental conservation. The future utility of solar energy keeps growing because to developments in smart grid integration, hybrid renewable systems, and solar-powered vehicles. All things considered, solar energy is a key component of international initiatives to address climate change and achieve sustainable development.*

Keywords: Solar energy, photovoltaic systems, thermal applications, renewable energy, sustainability, energy security, environmental benefits

