

Concentrated Photovoltaic Thermal (CPVT) systems : Recent advancements in clean energy applications, thermal management and storage-

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ABSTRACT

Solar spectrum utilization can effectively deliver a significant stake in the next century's energy demand, which lies in tandem with Sustainable Development Goals. Solar energy is a promising, sustainable, and cleaner energy source. The photovoltaic thermal system is a solar spectrum utilization technique that can generate thermal and electrical energy, but the recovered thermal energy can primarily contribute to low-temperature utilizations. This study's motivation lies in the great potential of Concentrated Photovoltaic Thermal systems in providing high-grade thermal energy and increasing the overall system efficiency. This paper collectively reviews advanced thermal management techniques such as using phase change materials and nanofluids to avert overheating of the solar panel. A comprehensive review of Concentrated Photovoltaic Thermal systems like desalination, greenhouse heating which help in attaining Sustainable Development Goals, is also summarized. Heat transfer fluid selection is critical in thermal management, and accordingly, a comparison of various cooling methods is also made. The current article is a novel attempt to deliver a comprehensive review of the recent advancements in thermal management, commercial applications involving clean energy usage, technical challenges involved, economic and environmental impacts of Concentrated Photovoltaic Thermal systems. Multigeneration Concentrated Photovoltaic Thermal systems are environment-friendly, and the carbon dioxide emission per kilowatt-hour is almost half for concentrating systems compared with photovoltaic systems. The locational and environmental dependency of these systems makes them unattractive for some general applications. For better validation of analytical results, more experimental researches are essential in this area.

KEYWORDS

Clean energy; Concentration ratio; CPVT; Heat transfer fluid; Phase change material; Sustainability

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