IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 4, Issue 1, July 2024
Impact Factor: 7.53

Sustainability and Energy Management: Trends and Technologies for a Greener Industrial Future

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Abstract: *The industrial sector has recently been at the forefront of discussions over sustainable energy management and the increasing demand for power on a worldwide scale. This paper analyzes a wide class of sustainable energy technologies and industrial energy management techniques that enable low-carbon operations and energy efficiency. In addition to working with advancements in energy storage technologies and energy-efficient manufacturing processes, it investigates the incorporation of green hydrogen, sustainable wind, solar, biomass, and other renewable energy sources. Optimization, predictive maintenance, and real-time energy monitoring are some of the digital technologies studied in this context. Digital information processing through Big Data analytics, AI, and the Internet of Things (IoT) are all part of these technologies. The circular economy methods, such as smart grids, combined heat and power (CHP) systems, Waste to Energy (WtE) technologies, etc., are also reviewed in the paper. Furthermore, thermos socks are supportive in that it needs global regulatory reach, such as ISO 50001, corporate and sustainability reporting support energy transition goals. This work synthesizes recent developments and best practices to provide valuable insights about the emerging field of sustainable industrial energy management, carrying a dedicated potential to advance an industrial community to a future in which the industrial sector is more sustainable, efficient, and robust.*

Keywords: Sustainability, Energy Management Systems, Green Technologies, Renewable Energy, Smart Grids, Energy Efficiency, Waste to Energy (WtE), combined heat and power (CHP), Internet of Things (IoT), artificial intelligence (AI).