

Accelerating the Shift: Current and Emerging Strategies for Sustainable Energy

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ABSTRACT – Energy sustainability has emerged as a critical global priority, demanding a comprehensive transition from fossil fuel dependence to clean, renewable, and efficient energy systems. This paper presents a concise review of the historical, current, and prospective efforts toward achieving long-term energy sustainability. Historically, the global energy landscape was dominated by non-renewable resources such as coal, oil, and natural gas, with minimal consideration for environmental impacts. The oil crises of the 1970s and early environmental movements triggered early research into alternative energy sources, yet progress remained slow due to technological and economic barriers. In recent decades, substantial advancements in solar, wind, and energy storage technologies—coupled with international climate commitments—have accelerated the shift toward low-carbon energy systems. Present efforts emphasize electrification, energy efficiency, smart grid integration, and policy support for decarbonization. Looking forward, emerging trends such as hydrogen energy, advanced battery technologies, and AI-driven energy management hold promise for a more sustainable and resilient global energy infrastructure. The paper also highlights the socio-economic and environmental benefits of sustainable energy transitions, including emission reductions, improved energy security, and equitable energy access. Understanding the evolution of these efforts is essential for shaping future strategies that align technological innovation with environmental and societal goals.