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Leveraging Blockchain and Distributed Ledger Technologies (DLTs) for Transparent and Efficient Sustainable Energy Management

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Abstract

The global race to Net Zero has accelerated the shift toward sustainable energy systems that reduce humanity's impact on natural ecosystems. Renewable energy sources such as solar, wind, hydropower, natural gas, and waste-to-energy solutions offer environmentally friendly alternatives to fossil fuels. However, large-scale investment in these systems requires significant initial capital, public awareness, and rigorous environmental impact assessments to balance economic feasibility with sustainability objectives.

Emerging technologies like Blockchain and Distributed Ledger Technology (DLT) present innovative solutions for enhancing transparency, efficiency, and risk management in energy systems. By providing real-time visibility into energy production, distribution, and consumption, Blockchain can help track and mitigate potential risks to society and the environment. Additionally, smart contracts and decentralized energy trading can optimize energy use, ensuring it is allocated efficiently where and when it is needed most. Despite existing challenges, integrating Blockchain and DLT into sustainable energy infrastructure has the potential to drive greater accountability, resilience, and trust in the transition toward a low-carbon economy.

Keywords: Sustainable energy management; blockchain; distributed ledger; net zero; renewable energy