Chapter 8
Empowering Sustainability: The Role of Artificial Intelligence in Renewable Energy

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ABSTRACT

This chapter explores the significant role that artificial intelligence (AI) plays in advancing renewable energy technologies and promoting sustainability. It discusses how AI can address the challenges and complexities associated with renewable energy systems, improve their efficiency, and enable their seamless integration into existing power grids. The chapter also explores various AI applications in renewable energy generation, forecasting, grid optimization, energy management, and demand response. Additionally, it highlights the potential benefits of AI-driven solutions in accelerating the global transition to a sustainable energy future.

INTRODUCTION

Sustainable Development

According to the theory of sustainable development, human civilizations must continue to exist and meet their own needs without jeopardising the ability of subsequent generations to do the same. The original definition of sustainable development was presented in the Brundtland Report, which was published in 1987. The 2030 agenda for sustainable development, which was approved by all United Nations Member States in 2015, offers a united road map for peace and prosperity for people and the

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planet, both now and in the future. At its core are the 17 Sustainable Development Goals, an urgent call to action for both developed and developing countries to work together in a global partnership (Hák et al., 2016).

A framework for attaining sustainable development by 2030 is provided by the Sustainable Development Goals (SDGs) of the United Nations. The 17 objectives and 169 targets of the SDGs are intended to address the sustainability's economic, social, and environmental facets. Among other objectives, the SDGs call for the eradication of poverty, the reduction of inequality, access to education, the promotion of sustainable energy, the preservation of biodiversity, and the advancement of sustainable cities and communities (Henderson & Loreau, 2023).

The ability of future generations to meet their own needs is not compromised when current demands are met through sustainable development. It is a comprehensive and integrated strategy to development that aims to strike a balance between social progress, environmental preservation, and economic prosperity. A future that is economically, socially, and environmentally sustainable and that ensures a good standard of living for all people, both now and in the future, is what sustainable development entails (Nasir et al., 2023).

The foundation of sustainable development is the idea that economic growth must be long-term and shouldn't harm the environment or people's quality of life. This entails conserving resources, cutting back on waste and pollution, and promoting sustainable lifestyles and renewable energy. Assuring that everyone has access to necessities like food, water, healthcare, education, and a safe and secure environment is a key component of social sustainability. Protecting natural resources, lowering pollution and waste, and maintaining biodiversity are all aspects of environmental sustainability (Dincer, 2000).

The pursuit of sustainable development necessitates a comprehensive strategy that entails the cooperation and involvement of all parties, including communities, corporations, governments, and civil society organisations. It entails establishing targets and goals for sustainable development as well as putting those practises and policies into action. Additionally, fostering innovation and technology transfer as well as forming alliances and partnerships are all elements of sustainable development (Fawzy et al., 2020).

In conclusion, sustainable development is an all-encompassing method of growth that aims to strike a balance between social progress, economic expansion, and environmental preservation. It is crucial for building a sustainable future that guarantees a high standard of living for everyone, both now and in the future. All stakeholders must work together and participate in order to achieve sustainable development, and sustainable development-friendly policies and practises must be put into place (Nasir et al., 2023).