

Enhancing Renewable Energy Management in India's Smart Grids Using Multi-Agent Reinforcement Learning

A Thesis Submitted in Fulfillment of the Requirements for the Degree of
Master of Technology



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DECLARATION

I, Ms. Ishita Bahamnia, hereby declare that the thesis entitled “**AI-Powered Energy Efficiency in Smart Grids Using Multi-Agent Systems (MAS), with a Focus on India’s Solar Energy Land scape**” submitted to Maharshi Dayanand University in partial fulfillment of the requirements for the award of the degree of Master of Technology, is a record of original work carried out by me under the supervision of Dr. Yogesh Kumar. This thesis has not been submitted elsewhere for the award of any other degree or diploma. All sources of information and data have been duly acknowledged.

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CERTIFICATE

This is to certify that the project report titled “**AI-Powered Energy Efficiency in Smart Grids Using Multi-Agent Systems (MAS), with a Focus on India’s Solar Energy Landscape**” submitted by **Ishita (Reg No.: 2318381801)**, to the **Maharshi Dayanand University, Rohtak** for the award of the degree **Master of Technology in Artificial Intelligence and Machine Learning Computer Science and Engineering** is a bonafide record of the research work done by her under our supervision. The contents of this thesis, in full or in parts, have not been submitted to any other Institute or University for the award of Masters Degree..

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Abstract

The transition to smart grids is essential for achieving sustainable energy solutions in modern urban settings. This thesis proposes the development of a Multi-Agent System (MAS) to optimize energy distribution and consumption within smart grids, focusing on energy efficiency and the integration of renewable energy sources.

By employing reinforcement learning and optimization techniques, the proposed system autonomously manages and balances energy generation, storage, and consumption. The simulation results demonstrate that this approach enhances grid stability, reduces energy losses, and maximizes the utilization of renewables, thus contributing to the development of smart cities with efficient and sustainable power management.

Keywords: Energy Efficiency, Smart Grid, Multi-Agent Systems, Reinforcement Learning, Solar Energy, India

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for particle in swarm:

update_velocity()

update_position()

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