

CERTIFICATE

Of

PARTICIPATION

Assam Zorig

has participated in 2nd International Conference on Scientific and Innovative Studies ICSIS 2024 on April
18-19, 2024 in Konya, Turkey

PAPER TITLE

*Maximizing Efficiency of Independent Solar Power Systems via
Particle Swarm Optimization (PSO)*

PRESENTATION TYPE

Oral



All Sciences Academy



Maximizing Efficiency of Independent Solar Power Systems via Particle Swarm Optimization (PSO)

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Abstract – Photovoltaic systems rank among the top renewable energy solutions. A significant disadvantage is their high initial investment. To reduce costs, optimizing the system's size is a viable approach. This paper aims to explore the potential of Particle Swarm Optimization (PSO) in enhancing the efficiency of independent solar power systems. Independent solar power systems are crucial for sustainable energy generation, particularly in remote locations or off-grid settings. The study investigates the application of PSO, a nature-inspired computational technique, to optimize various factors affecting solar power system performance, such as panel orientation, tilt angle, and energy storage management. By employing PSO algorithms, this research seeks to identify the optimal configuration that maximizes energy output while ensuring cost-effectiveness and minimal environmental impact. The results obtained from this study can significantly contribute to the advancement of renewable energy technologies and promote global efforts towards sustainable development and energy security.

Keywords – Power System, Optimal, photovoltaic, renewable energy, PSO.
