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COMPARATIVE ECONOMIC EVALUATION OF FLOATING PHOTOVOLTAIC AND CONVENTIONAL PUMPING SYSTEMS USING LIFE CYCLE COST ANALYSIS: A CASE STUDY OF COIMBATORE

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Abstract

Solar energy plays a vital role in the transition towards the quest to realize a future of net zero emissions. Nonetheless, there are some problems because of increasing land prices and population density, especially on land use regulations to install solar farms. In response to this, floating photovoltaics (FPV) can be used, in which solar photovoltaics (SPV) are installed on water bodies. FPV is increasingly being adopted across the world and has turned out to be a viable alternative. Within the irrigation sector, FPV pumping systems (FPVPS) have experienced massive use over the last few years as opposed to conventional electric or diesel-powered pumps. This study presents a comparative life cycle cost (LCC) evaluation of FPVPS and conventional irrigation pumping technologies, including grid-connected electricity and diesel-operated systems. This paper assesses the economic viability of FPVPS based on LCC analysis in terms of economic feasibility, given the 25 year system lifetime with a discounted rate of 10 %, and the economic conditions of the region. An annualized life cycle cost (ALCC) comparative analysis shows that FPVPS have the lowest costs with about INR 22,000 and INR 57,000 of 1 Horse Power (HP) and 3 HP system respectively against grid-connected electricity operated pumping systems (INR 38,000 and INR 72,000) and diesel-operated pumping systems (INR 52,000 and INR 146,000), thereby demonstrating the superior economic feasibility of FPVPS over conventional pumping systems. Although FPV systems are expensive to install, their servicing and renewal costs are relatively lower than those of other pumping systems.

Key words: annualized life cycle cost, diesel operated pumping system, electricity operated pumping system, floating PV system, life cycle cost

Received: January, 2026; Revised final: April, 2026; Accepted: May, 2026

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