

Evaluation of the wind pumped hydropower storage integrated flood mitigation system

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ABSTRACT

As Wind Pumped Hydropower Storage (WPHS) need high cost to construct, it is important to study their impacts on economic and environmental aspects. Thus, this research aims to evaluate their economic and environmental performances. First, Hybrid Optimization Model for Electric Renewable (HOMER) was used to simulate power generation system with and without the flood reservoir. Next, the total amount of emitted air pollutant was used to evaluate the environmental impacts. It was found the wind-diesel with reservoir storage system (A-III) will have much lower NPC than other systems that do not include reservoir for flood mitigation when the cost of flood losses are included in the total Net Present Cost (NPC). The NPC for system A-III was RM 1.52 million and for diesel standalone system (A-I) is RM 10.8 million when the cost of flood losses are included in the total NPC. Between both energy systems, the amount of pollutants emitted by the A-III system was only 408 kg-CO₂/year which is much less than the A-I system which is 99,754 kg of carbon dioxide per year. To conclude, the WPHS integrated with flood mitigation system seems promising in the aspects of economic and environment.

KEYWORDS:

Carbon dioxide; Costs; Environmental management; Flood damage; Hydroelectric power; Pollution