Using hydropower to complement wind energy: a hybrid system to provide firm power

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Received 7 November 2003; accepted 22 February 2004

Abstract

This paper presents a theoretical study of how wind power can be complemented by hydropower. A conceptual framework is provided for a hybrid power station that produces constant power output without the intermittent fluctuations inherent when using wind power. Two hypothetical facilities are considered as case studies. One of them is a hydropower plant located on the “Presidente Benito Juarez” dam in Jalapa del Marques, Oaxaca, Mexico. The other hypothetical facility is a wind farm located near “La Venta”, an area in Juchitan, Oaxaca, Mexico. The wind–hydro–power system is a combined wind and hydro power plant in a region that is rich in both resources. The model shows that the hybrid plant could provide close to 20 MW of firm power to the electrical distribution system. On a techno-economic basis, we obtain the levelized production cost of the hybrid system. Taking into account two different discount rates of 7% and 10%, figures for levelized production cost are developed.

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Keywords: Wind–hydro power system; Hybrid power plant; Wind power; Levelized production cost