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PROBABILISTIC PRODUCTION COST CREDIT EVALUATION OF WIND TURBINE GENERATORS

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Abstract. *This paper proposes an algorithm for probabilistic production cost credit evaluation of wind turbine generators (WTG). Renewable energy resources such as wind, solar, micro hydro, tidal and biomass etc. are becoming increasingly important because of the increased interest in protecting the environment. Wind energy is one of the most successfully used renewable energy sources used to produce electrical energy. The proposed approach was implemented on a power system that includes WTGs. Test results demonstrates the viability of the proposed approach for assessing the wind speed credit from the economics view point.*

Keywords: Probabilistic production cost credit, Wind turbine generator, Wind speed credit

1. **Introduction.** The application of renewable energy in electric power systems is growing rapidly due to its advantages that are minimal pollution, non-depletion and low operating cost. Wind is one of the fastest growing energy sources on a percentage basis. In the past decade, the global wind energy capacity has increased tenfold – from 3.5 [GW] in 1994 to almost 50 [GW] by the end of 2004 [1]. A reason for this is the new policies in many countries that promote reduction of the emission of pollutant gases following the Kyoto Protocol signed in 1997 in Japan. As a result, it is becoming quite important to analyze power systems that include Wind turbine generators (WTG). Recently, serious attention has been given to determining the effect of WTGs on the reliability and economy of power systems when added to the power system [1,2].

The power generated by a WTG depends mainly on large and frequent fluctuations in wind intensity and directions. As a result, unlike conventional generators that can be effectively modeled by a two-state model, WTG should be modeled by a multi-state model.

Giorsetto and Wang used an analytical approach to model wind turbine generators as multi-state units derived from wind speed and wind-turbine power output curves [3,4]. Singh also used an analytical model of the WTG, which was modified to reflect the energy