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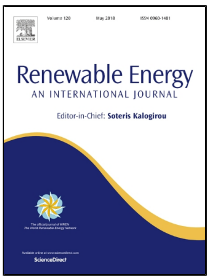

Optimization of Wind Turbine Placement in a Wind Farm using a New Pseudo-Random Number Generation Method

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PII:	S0960-1481(18)30226-X
DOI:	10.1016/j.renene.2018.02.082
Reference:	RENE 9813
To appear in:	*Renewable Energy*
Received Date:	21 April 2017
Revised Date:	31 December 2017
Accepted Date:	17 February 2018

Please cite this article as: Saïd Zergane, Arezki Smaili, Christian Masson, Optimization of Wind Turbine Placement in a Wind Farm using a New Pseudo-Random Number Generation Method, *Renewable Energy* (2018), doi: 10.1016/j.renene.2018.02.082

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Optimization of Wind Turbine Placement in a Wind Farm using a New Pseudo-Random Number Generation Method

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Abstract

In this paper, with the goal of maximizing the power production of a wind farm and reducing the wake effect resulting from front-end turbines, we present a new optimization method based on the generation of pseudo-random numbers as a mathematical approach; we have used this method along with the Jensen linear wake model in order to study optimal wind turbine positioning in a farm of given dimensions. For this purpose, a computer program has been developed to carry out numerical simulations based on the maximum total power produced. Using a typical wind turbine for uniform and unidirectional wind speed, the simulation results that we have obtained are presented and discussed. Compared to previous works based on genetic algorithms and viral basis methods, this optimization has yielded recorded enhancements of up to 6.5% on resulting wind farm power. Furthermore, we have found that an optimum number of wind turbines can be properly determined for any given wind farm.

Keywords: Wind farm; Wind turbine wake; Random number generation; Optimization; Numerical simulation.

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