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Study on the arrangement optimization method of renewable energy facilities using the smoothing effect of a wide-area interconnection

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When solar and wind power generation facilities are installed in a wide area and interconnected at a suitable rate, the potential power fluctuations can be considerably smoothed. Moreover, when the total power output is smoothed by the interconnection of renewable energy facilities over a wide area, the cost to stabilize the supply of electricity can decrease significantly. However, to achieve this goal, it is necessary to identify the type and rated capacity of the renewable energy facilities. Therefore, the objective of this study is to develop a computer algorithm that identifies the most economically advantageous power source for the case when solar and wind power generation facilities are interconnected in a wide area. In the proposed genetic algorithm (GA) program, many power sources with nonlinear characteristics and variables can be managed. Also, the kind and capacity of renewable energy generators are expressed using a chromosome model. In this way, the most efficient and economical system can be identified by applying the model in a random computer search. A case study was developed to test the proposed algorithm where solar and wind generation facilities are installed in seven areas in Hokkaido, Japan. Using this algorithm, the system planning requirements for the interconnection of these renewable energy facilities over a wide area were optimized. On the basis of these results, the kind and capacity of renewable energy considered to be the most economically advantageous to the region were identified and evaluated.

Biography

Masaki Okada received the Master of Business Administration degree from Otaru University of Commerce in Hokkaido, Japan, in 2006. He is currently a Doctoral Course Student at the Kitami Institute of Technology, Japan.

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