

Optimize Configuration For Mismatched PV System

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Abstract—Power generation efficiency of Photovoltaic(PV) system are significantly affected by partial shading and solar cell damage. This efficiency loss caused by turning on bypass diode of PV panels, which we called mismatch loss. By using some reconfiguration technology to reconfigure electrical series or parallel connection can reduce the mismatch loss and maximize power generation. Recently, an efficient reconfiguration method is proposed. This method applies precise power simulations based on a list of configuration candidates. However, some of the configuration candidates are not be able to realized and this method does not show any systematic way to identify such feasibility. Thus, in this paper we propose a very fast algorithm to check feasibility and reduce wiring complexity.

I. INTRODUCTION

With fossil depleting and the pollution of the environment becomes more serious. Green and renewable energy have become necessary for a sustainable society and environment. Photovoltaic(PV) receive significant attention since it has unlimited energy and can be easily scaled up. However, due to the nature of photovoltaic cell structure, PV arrays are sensitive to partial shading and PV cell fault or aging. That means when PV cells or modules experience different irradiance or do not uniformly generate power, the PV array is mismatched and unable to efficiently generate power. Additionally, when PV array under mismatch condition it will accelerate aging and heating for PV cells. That will cause a short circuit of PV array for further damaging. In order to prevent damaging or PV array and maximize power generation, based on previous studies we propose an algorithm that can reconfigure PV array with low computational expense and high feasibility.

In this paper, we use un-uniform irradiance distribution to represent the mismatch condition that PV array experienced. By reconfigure electrical connection of mismatched PV array can increase power generation efficiency.

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An excellent style manual for science writers is [7].

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TABLE I
TABLE TYPE STYLES

Table Head	Table Column Head		
	Table column subhead	Subhead	Subhead
copy	More table copy ^a		

^aSample of a Table footnote.



Fig. 1. Example of a figure caption.

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ACKNOWLEDGMENT

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REFERENCES

Please number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use “Ref. [3]” or “reference [3]” except at the beginning of a sentence: “Reference [3] was the first ...”

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REFERENCES

- [1] G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” *Phil. Trans. Roy. Soc. London*, vol. A247, pp. 529–551, April 1955.
- [2] J. Clerk Maxwell, *A Treatise on Electricity and Magnetism*, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.
- [3] I. S. Jacobs and C. P. Bean, “Fine particles, thin films and exchange anisotropy,” in *Magnetism*, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.
- [4] K. Elissa, “Title of paper if known,” unpublished.
- [5] R. Nicole, “Title of paper with only first word capitalized,” *J. Name Stand. Abbrev.*, in press.
- [6] Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, “Electron spectroscopy studies on magneto-optical media and plastic substrate interface,” *IEEE Transl. J. Magn. Japan*, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetism Japan, p. 301, 1982].
- [7] M. Young, *The Technical Writer’s Handbook*. Mill Valley, CA: University Science, 1989.

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