Assessment of survival potential of four grid-connected solar photovoltaic power stations in Jiangsu Province, China

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Research Article

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Abstract

The aim of this study is to analyze the feasibility of the construction of 1-MW grid-connected solar photovoltaic (GCSPV) power stations at four locations of Jiangsu province, China. The economic, emission, sensitivity and risk analyses of the proposed systems are all performed using the RETScreen clean energy management software. The GCSPV system in Xuzhou is more economically viable than those in other regions under consideration, while this system in Nanjing is relatively less economically viable. The GCSPV power stations in Xuzhou have the largest annual Greenhouse gases (GHG) emissions reduction due to its largest electricity production from the proposed system. The sensitivity analysis results on NPV show significant variations due to the variations of electricity export rate (EER) and initial costs (ICs) parameters. The NPV of the proposed system increases from 707,589 \$ to 2,046,766 \$ with the increase of the EER, while the NPV of the system decreases with the increase of the ICs at the same of EER. The risk analysis shows the largest influence on the NPV of the project is the change of the EER with positive correlation, while the least impact on the NPV is the debt term with positive correlation.

Full Text

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Figures

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China’s installed renewable energy capacity in 2019.

Figure 2

Installed solar PV capacity of China from 2010 to 2019.

Figure 3

Research framework of the study.

Figure 4

Locations of the study regions in Jiangsu province of China. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

Figure 5

Schematic diagram of GCPV station configuration.

(a)

(b)

Figure 6

The current vs voltage curves of STP 320S-24/Vem PV module at several irradiation (a) and temperature (b) levels.

(a)

(b)

Figure 7

The power vs voltage curves of STP 320S-24/Vem PV module at several irradiation (a) and temperature (b) levels.

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Figure 9

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Figure 13

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