

Accepted Manuscript

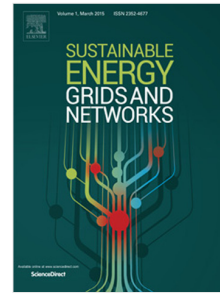
A bi-level robust optimization model to determine retail electricity price in presence of a significant number of invisible solar sites

Hessam Golmohamadi, Reza Keypour

PII: S2352-4677(17)30167-4
DOI: <https://doi.org/10.1016/j.segan.2017.12.008>
Reference: SEGAN 133

To appear in: *Sustainable Energy, Grids and Networks*

Received date: 20 July 2017
Revised date: 4 December 2017
Accepted date: 21 December 2017



Please cite this article as: H. Golmohamadi, R. Keypour, A bi-level robust optimization model to determine retail electricity price in presence of a significant number of invisible solar sites, *Sustainable Energy, Grids and Networks* (2017), <https://doi.org/10.1016/j.segan.2017.12.008>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

A Bi-Level Robust Optimization Model to Determine Retail Electricity Price in Presence of a Significant Number of Invisible Solar Sites

⁽¹⁾Hessam Golmohamadi, ⁽²⁾Reza Keypour

^{(1),(2)}Faculty of Electrical and Computer Engineering, Semnan University, Semnan, Iran

⁽²⁾Corresponding Author: rkeypour@semnan.ac.ir

Abstract: This paper presents a bi-level model for day-ahead electricity pricing and dispatch problems faced by a distributed generation (DG)-owning retailer who plays an intermediary role between the wholesale electricity market and end-use consumers. In this approach, the stochastic programming is addressed in the upper level to study behavior of the retailer in the wholesale electricity market in presence of self-generation facilities, including thermal DGs, wind farms and roof-top photovoltaic (RPV) sites. Regarding increased penetration of RPV sites, a data dimension reduction technique through k -means clustering and principal component analysis (PCA) methods is used to hedge against large-scale output power data of RPV sites. In addition, to forecast day-ahead power output of RPV sites, a similar-day detection (SDD) technique is addressed to investigate the impacts of climate variables, e.g. irradiation, sunshine hours and temperature, on 24-hour-ahead power of RPV sites. In the lower level problem, information gap decision theory (IGDT) is proposed to determine robustness of retail electricity price against uncertain clients' consumption. In this way, robustness and opportuneness functions are discussed to evaluate immunity against failure and windfall reward, respectively. Finally, numerical results based on actual data from PJM market and North Carolina solar sites are presented to demonstrate the usefulness and proficiency of the proposed framework.

Keywords: Retailer, roof-top solar sites, stochastic, robust, electricity price

Nomenclature

Indices

t	Index of time
ω	Index of scenarios
i	Index of thermal self-generation facilities
k	Index of blocks for cost function of thermal self-generation facilities
j	Index of wind distributed generations
m	Index of informative (reduced) RPV sites
n	Index of RPV sites

Constants

N_{ω}	Number of scenarios
N_W	Number of wind self-generation facilities
N_T	Number of time hours
M	Number of informative (reduced) RPV sites
N	Number of all RPV sites
$\pi(\omega)$	Probability of occurrence of scenario ω
N_{DG}	Number of thermal self-generation facilities
N_s	Number of blocks for cost function of thermal self-generation facilities
S^{DG}	Cost of related blocks for thermal self-generation facilities (\$)

Download English Version:

<https://daneshyari.com/en/article/6935456>

Download Persian Version:

<https://daneshyari.com/article/6935456>

[Daneshyari.com](https://daneshyari.com)