This paper analyzes the impact of production forecast errors on the expansion planning of a power system and investigates the influence of market design to facilitate the integration of renewable generation. For this purpose, we propose a programming modeling framework to determine the generation and transmission expansion plan that minimizes system-wide investment and operating costs, while ensuring a given share of renewable generation in the electricity supply. Unlike existing ones, this framework includes both a day-ahead and a balancing market so as to capture the impact of both production forecasts and the associated prediction errors. Within this framework, we consider two paradigmatic market designs that essentially differ in whether the day-ahead generation schedule and the subsequent balancing re-dispatch are co-optimized or not. The main features and results of the model set-ups are discussed using an illustrative four-node example and a more realistic 24-node case study.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Centre for IT-Intelligent Energy Systems in Cities, University of Copenhagen
Contributors: Pineda, S., Morales González, J. M., Boomsma, T. K.
Pages: 1113-1122
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: European Journal of Operational Research
Volume: 248
Issue number: 3
ISSN (Print): 0377-2217
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 4.08 SJR 2.437 SNIP 2.375
Web of Science (2017): Impact factor 3.428
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.83 SJR 2.489 SNIP 2.433
Web of Science (2016): Impact factor 3.297
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.59 SJR 2.225 SNIP 2.364
Web of Science (2015): Impact factor 2.679
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 3.21 SJR 2.143 SNIP 2.444
Web of Science (2014): Impact factor 2.358
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.25 SJR 2.238 SNIP 2.691
Web of Science (2013): Impact factor 1.843
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 3.01 SJR 2.328 SNIP 2.567
Web of Science (2012): Impact factor 2.038
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 3.02 SJR 2.352 SNIP 2.422