

# Accepted Manuscript

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PII: S0360-5442(18)31397-5

DOI: [10.1016/j.energy.2018.07.100](https://doi.org/10.1016/j.energy.2018.07.100)

Reference: EGY 13365

To appear in: *Energy*

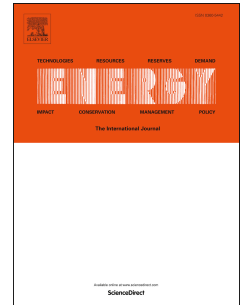
Received Date: 31 October 2017

Revised Date: 9 July 2018

Accepted Date: 15 July 2018

Please cite this article as: Djørup S, Thellufsen JZ, Sorknæs P, The electricity market in a renewable energy system, *Energy* (2018), doi: 10.1016/j.energy.2018.07.100.

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# The Electricity Market in a Renewable Energy System

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## Abstract

The transition to a 100% renewable energy system based on variable renewable energy raises technical but also institutional questions. The smart energy system concept integrates variable renewable energy by addressing the technical challenges through the integration of different energy sectors, but integration of variable renewable energy also entails a change in the cost structures, especially related to electricity. The effect of this change in cost structures on market prices is investigated. This is done through simulation of a 100% renewable energy system that utilises a large degree of cross-sector integration but maintaining the current electricity market structure. The paper uses a 100% renewable energy system scenario for a 2050 Danish energy system. This is reflected in the use of wind energy as the primary renewable energy source. It is concluded that the current electricity market structure is not able to financially sustain the amounts of wind power necessary for the transition to a 100% renewable energy system. Since earlier research shows that neither electricity production costs nor the total system costs is higher for the renewable path than the fossil-based alternatives, the conclusion in this paper points towards a need for reshaping the institutional structure of electricity trade.

**Keywords:** Smart energy systems, electricity market, wind power, renewable energy

## Abbreviations

SES: Smart Energy System

CHP: Combined heat and power

CHP2: Decentralised combined heat and power plants

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