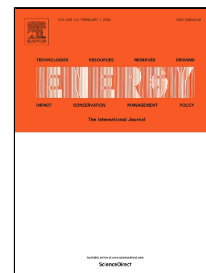


Accepted Manuscript

Renewable Heating Strategies and their Consequences for Storage and Grid Infrastructures Comparing a Smart Grid to a Smart Energy Systems Approach

Henrik Lund



PII: S0360-5442(18)30408-0
DOI: 10.1016/j.energy.2018.03.010
Reference: EGY 12468
To appear in: *Energy*
Received Date: 13 December 2017
Revised Date: 21 February 2018
Accepted Date: 02 March 2018

Please cite this article as: Henrik Lund, Renewable Heating Strategies and their Consequences for Storage and Grid Infrastructures Comparing a Smart Grid to a Smart Energy Systems Approach, *Energy* (2018), doi: 10.1016/j.energy.2018.03.010

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.

Renewable Heating Strategies and their Consequences for Storage and Grid Infrastructures

Comparing a Smart Grid to a Smart Energy Systems Approach

Henrik Lund ^{1a}

^a Department of Planning, Aalborg University, Rendsburggade 14, 9000 Aalborg, Denmark

HIGHLIGHTS:

- Comparing different strategies to transform the heating sector to 100% renewables.
- Comparing a Smart Energy Systems to a Smart Grid approach.
- Focus is on the consequences for storage and grid infrastructures.
- Smart grids may require significant expansion of grid and storage infrastructures.
- Smart energy systems can succeed within existing grid and storage infrastructures.

Abstract:

This paper compares different strategies to transform the heating sector into a future 100% renewable energy solution. It focuses on the consequences for infrastructures in terms of grids and storage across the electricity, gas and heating sectors. The hypothesis is that these consequences are rarely taken into proper consideration, even though the costs are significant and differ substantially between the alternative pathways. While the smart grid scenarios are based on electricity as an energy carrier, the “smart energy systems” approach is based on a cross-sectoral use of all grids. Using Denmark as a case, this paper shows how the current gas and district heating grids each have twice the capacity of the electricity distribution grid. Moreover, the existing gas and thermal storage capacities are substantially higher and the additional future capacities are more affordable than within the electricity sector. The conclusion is that the “smart grid” pathway requires a 2-4 times expansion of the electricity grid and significant investments in electricity storage capacities, while the “smart energy systems” pathway can be implemented with relatively few investments in affordable minor expansions of existing grids and storage capacities.

1. Introduction

The thermal sector currently accounts for 50% of Europe’s final energy consumption [1]. This makes heating and cooling Europe’s biggest energy sector and it is expected to remain so for the foreseeable future [1]. At the same time, the potential for improvement is substantial. It has been calculated that waste heat from Europe’s industry and electricity production exceeds the heat demand of all buildings in Europe [2]. Consequently, this is a key-sector to address in order to meet the goals of Europe expressed in the energy union. Furthermore, the thermal sector has a unique potential for decreasing fossil fuel consumption and CO₂ emissions in Europe (and elsewhere), while simultaneously decreasing costs and creating jobs [2].

¹ Corresponding Author: Lund@plan.aau.dk and +45 9940 8309

Download English Version:

<https://daneshyari.com/en/article/8071815>

Download Persian Version:

<https://daneshyari.com/article/8071815>

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