

## Accepted Manuscript

Title: A systems approach to quantifying the value of power generation and energy storage technologies in future electricity networks

Author: Clara F. Heuberger Iain Staffell Nilay Shah Niall Mac Dowell



PII: S0098-1354(17)30211-9  
DOI: <http://dx.doi.org/doi:10.1016/j.compchemeng.2017.05.012>  
Reference: CACE 5814

To appear in: *Computers and Chemical Engineering*

Received date: 24-8-2016  
Revised date: 13-5-2017  
Accepted date: 15-5-2017

Please cite this article as: Clara F. Heuberger, Iain Staffell, Nilay Shah, Niall Mac Dowell, A systems approach to quantifying the value of power generation and energy storage technologies in future electricity networks, *Computers and Chemical Engineering* (2017), <http://dx.doi.org/10.1016/j.compchemeng.2017.05.012>

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.

2 A systems approach to quantifying the value of  
power generation and energy storage technologies  
in future electricity networks

4 Clara F. Heuberger<sup>a,b</sup>, Iain Staffell<sup>a</sup>, Nilay Shah<sup>b,c</sup>, Niall Mac Dowell<sup>\*a,b</sup>

<sup>a</sup>*Centre for Environmental Policy,*

<sup>b</sup>*Centre for Process Systems Engineering,*

<sup>c</sup>*Department of Chemical Engineering*

8 *Imperial College London, Exhibition Road, London, SW7 1NA, UK*

*\*Corresponding author*

---

10 **Abstract**

A new approach is required to determine a technology's value to the power systems of the 21<sup>st</sup> century. Conventional cost-based metrics are incapable of accounting for the indirect system costs associated with intermittent electricity generation, in addition to environmental and security constraints. In this work, we formalise a new concept for power generation and storage technology valuation which explicitly accounts for system conditions, integration challenges, and the level of technology penetration. The centrepiece of the System Value (SV) concept is a whole electricity systems model on a national scale, which simultaneously determines the ideal power system design and unit-wise operational strategy. It brings typical Process Systems Engineering thinking into the analysis of power systems. The model formulation is a mixed-integer linear optimisation and can be understood as hybrid between a generation expansion and a unit commitment model. We present an analysis of the future UK electricity system and investigate the SV of

Download English Version:

<https://daneshyari.com/en/article/6595089>

Download Persian Version:

<https://daneshyari.com/article/6595089>

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