Electricity Network Scenarios for Great Britain in 2050

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eprg0513.pdf (PDF, 311Kb)

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Publication Date

2006-03-14

Publisher

Faculty of Economics

Language

en_GB

Type

Working Paper

Metadata

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Citation

Elders, I., Ault, G., Galloway, S., McDonald, J., Kohler, J., Leach, M., & Lampaditou, E. (2006). Electricity Network Scenarios for Great Britain in 2050. https://doi.org/10.17863/CAM.5054

Abstract

The next fifty years are likely to see great developments in the technologies deployed in electricity systems, with consequent changes in the structure and operation of power networks. This paper, which forms a chapter in the forthcoming book Future Electricity Technologies and Systems, develops and presents six possible future electricity industry scenarios for Great Britain, focussed on the year 2050. The paper draws upon discussions of important technologies presented by expert authors in other chapters of the book to consider the impact of different combinations of key influences on the nature of the power system in 2050. For each scenario there is a discussion of the effects of the key parameters, with a description and pictorial illustration. Summary tables identify the role of the technologies presented in other chapters of the book, and list important figures of interest, such as the capacity and energy production of renewable generation technologies.

Keywords

Classification-JEL: Q42, Q55, Q56, Energy technology, electricity, sustainable development, environment

Identifiers

This record's DOI:
https://doi.org/10.17863/CAM.5054

This record's URL:
http://www.dspace.cam.ac.uk/handle/1810/131649
https://www.repository.cam.ac.uk/handle/1810/131649

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The United Kingdom has a National Grid that covers most of mainland Great Britain and several of the surrounding islands, as well as some connectivity to other countries. In 2019 the electricity sector's grid supply for the United Kingdom came from 43% fossil fuelled power (almost all from natural gas), 48.5% zero-carbon power (including 16.8% nuclear power and 26.5% from wind, solar and hydroelectricity), and 8% imports. Renewable power is showing strong growth, while fossil fuel generator use in Electricity network scenarios for. Great britain in 2050. Ian Elders. 1. Abstract The next fifty years are likely to see great developments in the technologies deployed in electricity systems, with consequent changes in the structure and operation of power networks. An important motivation for this transformation will be the increasing development of renewable sources of energy, placing radically new demands on electricity systems. New technologies will be developed and applied to power systems to meet these needs, and existing technologies will be used in novel ways. Britain’s energy network is 17 per cent cheaper in real terms than at the time of privatisation, reliability has improved by over 30 per cent since 2002 and over £16 billion of investment has been made since 2010. Resilient and smart electricity networks are critical to ensuring energy security, as well as achieving our energy and climate change objectives. The Department of Energy & Climate Change (DECC) is responsible for setting the policy and legislative framework for the networks in Great Britain. Overall aims: ensure the timely, cost-effective and reliable connection of electricity generation to demand. support a low-carbon, secure and affordable national system. Specific objectives for future electricity networks: maintain electricity network reliability. dependent electricity use (peak/off-peak) reducing. needs for storing variable RES electricity. All these measures allow for exploiting greater. potentials for off-shore wind in the North Sea. Scenario 5: Delayed CCS. An internal greenhouse gas emission reduction contribution of around 80% in 2050 is taken as the key constraint for exploring different scenarios. To ensure that decarbonisation efforts are comparable across options and scenarios, the equalisation of cumulative emissions across scenarios is used as an additional constraint, underlining the importance of the climate impacts of cumulative emissions over the whole period until 2050 (and beyond). Using realistic implementation scenarios on just 0.4 Mha of land, Miscanthus and SRC could still contribute more than 5 % of heat and electricity needs in Great Britain. We conclude that Miscanthus and SRC have the potential to form part of a diverse renewable energy portfolio for Great Britain. In addition to climate and energy policy, the contribution of Miscanthus and SRC to heat and electricity will be impacted by the efficiency of combined heat and power (CHP) and alternative energy crops, and the area of land eventually used for dedicated bioenergy crops. Discover the world's resear