Renewable and Sustainable Energy Reviews 39 (2014) 655–666

Contents lists available at ScienceDirect

Renewable and Sustainable Energy Reviews

journal homepage: www.elsevier.com/locate/rser

Future for offshore wind energy in the United Kingdom: The way forward

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ARTICLE INFO

Article history:
Received 23 December 2013
Received in revised form
23 May 2014
Accepted 9 July 2014
Available online 5 August 2014

Keywords:
Wind sector
Offshore wind
Renewable energy
European Union
United Kingdom

ABSTRACT

The majority of our energy demand is satisfied by the combustion of fossil fuels, such as coal, oil and gas. This has resulted in our fossil fuel resources being vastly reduced and has increased the carbon dioxide content in the atmosphere which is causing global warming. The 2020 European Union (EU) targets have been set out to promote the use of renewable technologies and reduce the electricity demand. From the reviewed literature, it was acknowledged that most of these renewable forms of energy sources were initially capital intensive to construct but once constructed they had low operating costs, paying themselves of over their lifecycle. In this study, primary research was undertaken by means of a case study and structured interviews. The case study formed a background to the UK's current and planned offshore wind installations. The results of the interviews were analysed using the NVIVO qualitative software analysis package. This identified themes within the data which allowed them to be analysed and evaluated. The primary data results concluded that the EU targets were challenging but achievable and that the UK government was very supportive in pushing for these targets.

Contents

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http://dx.doi.org/10.1016/j.rser.2014.07.105
1364-0321/

1. Introduction

The contribution of offshore wind power to the United Kingdom's (UK) future energy balance is an important area worthy of investigation for a number of reasons. First and foremost, the world has become more industrialised over the years, which has lead to increasing pressure being put on the planet's energy resource of fossil fuels [1,2]. This has resulted in our fossil fuel resources being vastly reduced and has increased the carbon content in the atmosphere. Over the years there have been various frameworks, strategies and legally binding agreements released in relation to combating climate change and achieving security of energy resources i.e. the Kyoto Protocol [3,4]. Today, the UK is still facing the same issues as before with regards to energy security, demand and the environmental damage as a result of increased green house gas emissions [5,6]. Government policies have for a long time recognised the need for a heavy contribution from renewable technologies to generate clean carbon free electricity and to improve energy security.

The European Union [7] set its targets in the *Climate Change and Energy Strategy* for 2020. These included a 20 per cent reduction in greenhouse gases and energy consumption by 2020 against the levels in 1990. The EU has also highlighted the need to increase electricity generated by renewable energy by 20 per cent by 2020 against the levels in 1990 [8]. Wind power has been around since time began and has been used throughout history for various processes. According to the *European Wind Energy Association* [9] the wind energy market has recently been one of the fastest developing renewable energy markets and, over the past decade, moved off shore. Various researchers, such as Freris and Infield [10] suggested that over the next ten years, wind power will contribute the most to electricity production out of all the renewable sources of energy. This has prompted the question, *how will offshore wind power contribute to the United Kingdom's energy balance?*

With the world's fossil fuel energy resources depleting, future prosperity is looking dim at the minute for the United Kingdom. Oil and gas reserves are slowly dwindling away and are no longer sufficient enough to sustain the ever increasing energy demand. Although the North Sea still holds a considerable quantity of both oil and gas it will continue to fall as the economy grows [5,6]. To date, the UK has relied quite significantly on imports of fossil fuels for our energy production. This increasing dependence is no longer practical, as relationships have become more unsteady. The fight for supplies has recently escalated due to them being concentrated in less prosperous areas of the world. This has allowed corrupt systems to be used to try secure sources of fossil fuels which should never have happened and most definitely cannot continue [5,6]. The concentration of greenhouse gases in the atmosphere, due to the exploitation of these fossil fuels has caused major environmental concerns and the fears of global warming and climate change.

The Department of Energy and Climate Change set out in the Energy White Paper of May 2007 [11], two long-term energy challenges which UK will be facing, which are: tackling climate change by reducing carbon dioxide emissions both within the UK and abroad; and ensuring secure, clean and affordable energy as we become increasingly dependent on imported fuel [11]. This has forced the need to start investing time and money into alternative forms of energy. The high energy prices, climate change and energy security have encouraged governments across the world to seriously tackle this concern [12,13]. This is giving various companies a great opportunity to capitalise on this very lucrative renewable energy market. The increased ventures in this particular field combined with the increased use of renewable energy sources has moved what once was thought of as an alternative energy source, into an increasingly competitive energy source.

As the technological advances in wind, wave, water, solar and geothermal increase so too does the power output of these technologies. Although renewable energy is sometimes criticised for being intermittent this increase in technology and power output is vastly seeing their popularity grow. The surprising turn of events over the past years resulting in the emergence of these options to the traditional reliance of energy supplies from fossil fuels, highlights the significance of other alternative sources of energy supply. This paper therefore focused on how offshore wind power will contribute to maintaining the United Kingdom's energy balance and how it will fit into alternative energy plans that boost electricity generation from carbon neutral technologies. The paper also provides insights on global demand for energy, energy security, conventional energy resources and renewable energy resources. The second part of this paper examined global demand for energy, energy security, conventional energy resources and renewable energy resources.

2. Global demand for energy

Today the vast majority of energy supply needs are met through the burning of fossil fuels such as coal/peat, oil and gas, which fuel our modes of transport, power our industries and light our homes [14–16]. The reliance on fossil fuels has not changed much since 1973 and this can been seen clearly in Fig. 1, which show fossil fuels in 2008 contributing a large 86 per cent to our global energy supply with a mere 13.4 per cent coming from other forms such as combustible renewable, waste and hydro [17].

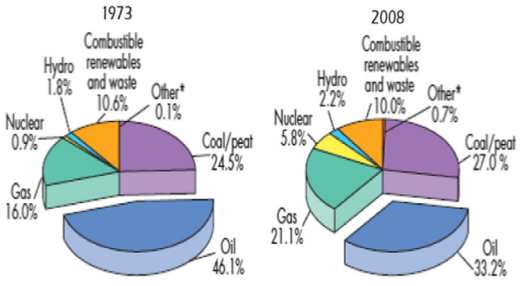

Fig. 1. Global total primary energy supply between 1973 and 2008.
Source: (17, Key world energy statistics, p. 6).