

1.2 BROAD CHARACTER: INDUSTRY

1.2.2 CHARACTER TYPE: ENERGY INDUSTRY

REGIONAL PERSPECTIVE: EAST ANGLIA

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The region contains wind farms, the nuclear power complex at Sizewell and is an important area for the gas and oil industry. It is notable for the relative absence of hydrocarbon fields or installations, however a large cluster of such features is located immediately to the north, off the North Norfolk coast. Four abandoned or removed wellheads are present in the north of the region, in the south, 26 km from Lowestoft, the remaining three extending in a line north eastwards.

A single gas supply pipeline runs through the area from Bacton in Norfolk to Zeebrugge in Belgium, crossing a number of telecommunications cables. Bacton is one of the UK's major hubs for gas imports consisting of five gas terminals taking gas from the southern North Sea to Belgium and the Netherlands. Submarine powerlines and supply pipes are also located in Lowestoft and Gorleston harbours, at the head of the Orwell and in the River Alde.



Sizewell Power Station

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The region contains Sizewell power station. The active Sizewell B reactor has a net electrical output of 1188 MW which is enough to supply over 2 million homes (roughly the equivalent of the daily domestic needs of Suffolk and Norfolk) and supplies 3% of the UK's entire electricity needs (<http://www.british-energy.com>). Two intake pipes connect the power station to trestle platforms in the marine zone c 100m inshore, the generators on which pump gallons of cooling water to the main turbines.



Pumping platforms off Sizewell Beach

The region has been the focus of a number of wind farm developments as a result of its strong prevailing winds. Working arrays include Round 1 developments Scroby Sands, just off Great Yarmouth, and Gunfleet Sands 7 km off Clacton on Sea (with an extension as part of Round 2). These comprise 30 and 48 turbines respectively, producing 60 MW and 108 MW of power (41,000 and 85,000 homes). Round 2 saw the addition of the Greater Gabbard and London Array farms which are currently under construction. These will



Gunfleet Sands windfarm from Clacton

contain up to 140 and 341 turbines and are expected to produce 172 MW and 1000 MW of electricity (125,000 and 750,000 homes). Round 3 will produce a larger licensed area again in the north of the area close to Scroby Sands, expected to produce up to 7.2 GW of electricity.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

There have always been easily available ways to create energy in the East Anglian region, beginning with peat extraction in the Middle Ages. Peat was used in enormous quantity for domestic fuel and within the salt industry and possibly the cloth industry (see Processing industry). Large scale peat extraction continued from the 12th through to the 16th centuries, although widespread flooding had caused many turbaries to close by the 14th century. The scale of the industry is illustrated by the Broads – created by peat extraction.

The North Sea has become a crucial source of oil and gas since the 1960s. Gas was first discovered in British waters in 1965 in the West Sole gas field off the north east coast. The discovery of oil at the Argyle and Forties fields followed in the 1970s. By the mid 1980s there were over 100 installations in the North Sea and Britain had become a net exporter (<http://www.abdn.ac.uk/oillives/about/nsoghist.shtml>). Although the oil and gas fields did not extend far south of the north Norfolk coast, Great Yarmouth and Lowestoft were the centre of operations for the industry in the southern North Sea, providing significant employment. Many trawlers were adapted to work as service ships for the oil rigs following the decline of the fishing industry (http://www.townmanagement.co.uk/lowestoft_history.php). The Shell Southern Operations base was located on the north shore of Lowestoft Harbour until 2003. The hydrocarbon industry has been in decline since the start of the millennium and more than half of the North Sea oil reserves have been extracted, according to official sources in both Norway and the UK (http://en.wikipedia.org/wiki/North_Sea_oil). However, Great Yarmouth and Lowestoft continue to act as a base for a smaller industry which supports and decommissions local rigs.

The use of nuclear power to provide energy was born out of the post war production of plutonium for nuclear weapons (<http://webarchive.nationalarchives.gov.uk/+http://www.berr.gov.uk/files/file28276.pdf>) and the first reactor was opened at Calder Hall in Cumbria in 1956. This followed the publication of the White Paper 'A Programme of Nuclear Power' which outlined the need for this power and how its use would be implemented.

As part of this programme Sizewell A was built in the early 1960s and became fully operational in 1966. It was one of eleven Magnox power stations built in the UK and produced an electrical power output of 420 MW - enough to serve the energy needs of a third of East Anglia. The station started the 100 year-long decommissioning process in 2007 after its shutdown at the end of 2006, at a budgeted cost of £1.2 billion. Sizewell B, with its distinctive white dome, is the only large pressurised water reactor in the UK. It was constructed between 1988 and 1995 as part of a third nuclear power programme instigated in the 1970s, and produces approximately 3% of the UK's electricity.

Wind power is the fastest growing form of global renewable electricity generation and has become increasingly important in the region in recent years, following the UN Framework Convention for Climate Change agreed in Rio in 1992 and the subsequent Kyoto protocol of 1997. This proposed a global cut of 5.2% greenhouse gas emissions by 2008-2012, specifically committing the UK government to reducing greenhouse gas emissions to 12.5% below 1990 levels by 2008-2012. In 2009 The Department of Energy and Climate published The UK Renewable Energy Strategy which commits to sourcing 15% of its energy from renewable sources by 2020 – an increase in the share of renewables by almost a factor of seven from about 2.25% in 2008, in scarcely more than a decade (<http://www.decc.gov.uk/TheUKRenewableEnergyStrategyExecutiveSummary.pdf>)

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Scroby Sands Windfarm

This is facilitated by the fact that Britain has the best offshore wind resource in Europe and the offshore zone of East Anglia is well placed to take advantage of this. Sites were selected on the basis of their relationships to shipping lanes, recreational activity and known archaeology. The turbines themselves have an impact on the seabed which is extended by cables connecting the windfarm to the shore, buried at c 0.3-5 m below the seabed by ploughing, trenching or jetting. Additional infrastructure to connect to the National Grid will also need to be added in the coastal zone, however the presence of existing energy installations such as Sizewell may make their placement easier.

VALUES AND PERCEPTIONS

The North Sea as a whole has always been important to the energy industry, most notably for its natural oil and gas resources which have been heavily exploited since the 1960s. More recently nuclear power and renewable energy sources have become viewed as more important as a result of increasing concerns about CO₂ emissions from energy generation using fossil fuels. The North Sea and in particular the East Anglian coast has remained crucial to these newer energy industries as outlined above.

Sizewell has been a controversial addition to the coastline and a subject of various and contrasting opinions. The power station dominates the coastline in this area for miles in each direction, as do the power lines that emanate from it (Countryside Agency 1999, 60). **The development of offshore wind farms can be seen as a less obtrusive alternative to terrestrial arrays, but mostly public opinion objects to their impact on coastal views, with turbines extending up to 100 m above sea level.** Stakeholder groups and societies also express differing viewpoints.



The impact of Sizewell on the landscape, as viewed from Dunwich Heath

Wildlife groups have expressed concerns about birds hitting the turbine blades whereas The Suffolk Preservation Society have shown support for offshore development of this sort. The London Array is expected to produce enough electricity to supply around a quarter of Greater London.

RESEARCH, AMENITY AND EDUCATION

Hydrocarbon resources have played a large role in the north of the East Anglian region and their research and education value is high. A recent project undertaken by The British Library National Life Story Collection and the University of Aberdeen entitled 'Lives in the Oil Industry' recorded first hand oral accounts of working in the oil and gas industry. Lowestoft and Great Yarmouth were one of the main centres considered in the project.

The advent of renewable energy has also been crucial. The development and maintenance of the offshore energy industry creates a large amount of data relating to the seabed, most notably geophysical data. This is an invaluable resource for the offshore historic environment, providing information on past landscape surfaces as well as shipwrecks and other intrusive features. It is useful for archaeologists to work alongside wind farm developers at the stage at which geophysics is undertaken to enable avoidance and mitigation of damaging effects on the historic environment from development proposals..

In addition renewable energy developments are often accompanied by educational facilities to inform the general public about the benefits of this type of installation and any additional data produced. Scroby Sands was one of the first operational UK wind farms and was supplemented by a visitor centre on the esplanade at Great Yarmouth. This has attracted over 35000 visitors each year and contains interactive activities and displays aimed at both children and adults.



Scroby Sands windfarm from Hemsby Beach

CONDITION AND FORCES FOR CHANGE

As outlined above, one of the greatest forces for change in the energy industry is the opinion that greenhouse gas emissions should be reduced in order to reverse environmental decline. This is compounded by the fact that hydrocarbon sources are a finite resource and replacement energy sources are essential.

As such, existing oil and gas fields continue to be exploited, although the industry is in rapid decline. In contrast large wind farms are being developed off the East Anglian coast with each round of leasing undertaken by the Crown Estate. Round 3 will see the development of Zone 5 - covering approximately 6000 km², located 14km off the coast of Norfolk and Suffolk. Although not the whole area will be developed this is expected to generate c. 7200MW of electricity, enough to supply 5 million homes. Construction of the wind farm is expected to start in 2015.

The construction of wind farms will have some effects on the current seascape. Arrays are mostly sited in areas removed from shipping lanes, with low recreational and fishing activity, good seabed properties and the absence of known archaeology. However, some effects are inevitable, with safe zones set up for recreational traffic and restrictions on fishing activity. Further change may be produced by the development of wave and tidal power (http://www.thecrownestate.co.uk/mrf_renewables).

RARITY AND VULNERABILITY

As a sub-type in its own right the energy industry is generally neither rare or vulnerable but its expressions are liable to rapid and radical change. The main drivers affecting the industry's expression are environmental concerns and technological change. With the increasing change from fossil fuels to renewable energy sources it is likely that elements of the hydrocarbon industry and possibly the nuclear industry will quickly become obsolete in the coming years. As such some provision to preserve some aspects of the industry may be appropriate, as illustrated by the 'Lives in the Oil Industry' project outlined above.

The Pressured Water Reactor dome at Sizewell is unique in England and has become a form of structure which is becoming increasingly rare. Recently it was announced that a similar dome at the former nuclear plant at Dounreay in Caithness was to be demolished as its preservation would be impractical.

The effects of the energy industry on the historic environment can be various. For example scour around the base of turbines can affect the physical remains on or within the seabed and precautions have to be taken to prevent this. However, the physical effects of turbines are expected to be relatively small comparable with storm and flood events, commercial shipping, dredging and trawling.

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