

Wrexham Power Limited ◆ Proposed Wrexham CCGT power station

The need case

1. INTRODUCTION

- 1.1. The purpose of this section is to explain why a CCGT power station is needed, why the site at Wrexham Industrial Estate is suitable for a CCGT power station development, and to explain the need for the associated overhead power line and gas connection.

2. NATIONAL POLICY STATEMENTS

- 2.1. The Overarching National Policy Statement for Energy (EN-1)¹ sets out the need for new electricity generating stations. This policy document indicates at paragraph 3.3.14 that *‘at least 22 GW of existing electricity generating capacity will need to be replaced in the coming years, particularly to 2020. This is as a result of tightening environmental regulation and ageing power stations.’*
- 2.2. The NPS continues at paragraph 3.3.15 that *‘In order to secure energy supplies that enable us to meet our obligations for 2050, there is an urgent need for new (and particularly low carbon) energy NSIPs to be brought forward as soon as possible, and certainly in the next 10 to 15 years, given the crucial role of electricity as the UK decarbonises its energy sector.’*
- 2.3. It is within this context that paragraphs 3.1.1-3.1.3 state:

‘3.1.1 The UK needs all the types of energy infrastructure covered by this NPS in order to achieve energy security at the same time as dramatically reducing greenhouse gas emissions.’

3.1.2 It is for industry to propose new energy infrastructure projects within the strategic framework set by Government. The Government does not consider it appropriate for planning policy to set targets for or limits on different technologies.’

3.1.3 The IPC should therefore assess all applications for development consent for the types of infrastructure covered by the energy NPSs on the basis that the Government has demonstrated that there is a need for those types of infrastructure and that the scale and urgency of that need is as described for each of them in this Part.’

¹ Overarching National Policy Statement for Energy (EN-1), Department of Energy and Climate Change, July 2011

2.4. According to paragraph 2.2.23 of National Policy Statement EN-1:

The UK must ... reduce over time its dependence on fossil fuels, particularly unabated combustion. The Government plans to do this by improving energy efficiency and pursuing its objectives for renewables, nuclear power and carbon capture and storage. However some fossil fuels will still be needed during the transition to a low carbon economy.

2.5. At the same time, the government is committed to ensuring that homes and businesses do not suffer through intermittent loss of electricity. Maintaining security of energy supply is therefore an important consideration. NPS EN-1 indicates that the main challenges facing security of supply during the transition to a low carbon economy are:

- *Increasing reliance on imports of oil and gas as North Sea reserves decline in a world where energy demand is rising and oil and gas production and supply is increasingly politicised; and*
- *The requirement for substantial and timely private sector investment over the next two decades in power stations, electricity networks and gas infrastructure.*

2.6. As stated previously, at least 22GW of existing electricity generating capacity is due to shut down up to 2020, and 'any reduction in generation capacity from current levels will need to be replaced in order to ensure security of supply is maintained' (NPS EN-1, para 3.3.9).

2.7. The required increase in renewable energy capacity, to meet commitments under the EU Renewable Energy Directive, will require some back-up generating stations to support intermittent renewable sources of electricity. NPS EN-1 states:

some renewable sources (such as wind, solar and tidal) are intermittent and cannot be adjusted to meet demand. As a result, the more renewable generating capacity we have the more generation capacity we will require overall, to provide back-up at times when the availability of intermittent renewable sources is low. If fossil fuel plant remains the most cost-effective means of providing such back-up, particularly at short notice, it is possible that even when the UK's electricity supply is almost entirely decarbonised we may still need fossil fuel power stations for short periods when renewable output is too low to meet demand, for example when there is little wind.

2.8. CCGT power stations are well suited to providing a role as back-up plant at such times that are needed given that they can vary their generating capacity at relatively short notice, generating more electricity when required, and less when electricity consumption is lower.

- 2.9. A CCGT power station at Wrexham industrial estate would therefore satisfy national need for electricity in the short-medium term resulting from the closure of existing generating stations, and provide back-up capacity in the longer term for renewable energy generation if required.

3. THE CURRENT UK ENERGY MIX

- 3.1. The Digest of UK Energy Statistics (DUKES) provides an annual review of energy generation and use in the UK. Table 5.7 from the digest details the contribution each generating plant type provides, which is reproduced at table 1 below.

Table 1: Electricity generation capacity in the United Kingdom

	2006	2007	2008	2009	2010
All generating companies					
Total capacity (MW)	82,403	82,742	83,446	84,766	90,208
Conventional steam stations	36,667	36,658	35,145	35,244	35,196
Combined cycle gas turbine stations	26,965	26,930	28,593	29,214	34,099
Nuclear stations	10,969	10,979	10,979	10,858	10,865
Gas turbines and oil engines	1,444	1,445	1,456	1,560	1,560
Hydro-electric stations:					
Natural flow	1,417	1,419	1,519	1,526	1,524
Pumped storage	2,726	2,744	2,744	2,744	2,744
Wind	822	1,042	1,432	1,860	2,260
Renewables other than hydro and wind	1,392	1,525	1,578	1,760	1,960

- 3.2. Table 1 shows that generation capacity in the UK is dominated by conventional steam stations (predominantly fired by coal) and CCGT power stations, providing approximately 39% and 38% of the UK capacity respectively. Renewable energy capacity at 2010, including hydro-electric stations, accounted for less than 10% of capacity.

4. THE FUTURE UK ENERGY MIX

- 4.1. Future energy mix in the UK is dependent on the deployment of renewable energy sources of electricity generation, with the government aiming to increase significantly the amount of electricity generated this way. Furthermore, electricity demand is anticipated to increase in the future, as outlined further below.
- 4.2. NPS EN-1 notes at paragraph 3.3.22 that *‘the UK would need at least 113 GW of total electricity generating capacity (compared to around 85 GW now), of which at least 59 GW would be new build.’*

4.3. This is further broken down in the policy statement as follows:

- *around 33 GW of the new capacity by 2025 would need to come from renewable sources to meet renewable energy commitments;*
- *it would be for industry to determine the exact mix of the remaining 26 GW of required new electricity capacity, acting within the strategic framework set by the government;*
- *of these figures of 33 GW and 26 GW respectively, around 2 GW of renewables and 8 GW of non-renewable technologies are already under construction. This leaves a balance of 18 GW to come from new non-renewable capacity; and*
- *the government would like a significant proportion of this balance to be filled by new low carbon generation and believes that, in principle, new nuclear power should be free to contribute as much as possible towards meeting the need for around 18 GW of new non-renewable capacity by 2025.*

4.4. The policy statement continues at paragraph 3.3.24 to state that:

'It is not the Government's intention in presenting the above figures to set targets or limits on any new generating infrastructure to be consented in accordance with the energy NPSs. It is not the IPC's role to deliver specific amounts of generating capacity for each technology type. The Government has other mechanisms to influence the current delivery of a secure, low carbon, affordable electricity mix. Indeed, the aim of the Electricity Market Reform project (see Part 2 of this NPS for further details) is to review the role of the variety of Government interventions within the electricity market.'

5. PREDICTED UK ENERGY DEMAND

5.1. The government has carried out an analysis of the potential future energy demand for the period up to 2050 in its 2050 Pathways Analysis, published in 2010. Whilst this indicates that the demand for energy as a whole is unlikely to change significantly, it indicates that demand for electricity could double by 2050 as a result of the electrification of much of industry, heating and transport which traditionally met their energy requirements through other sources.

5.2. Consequently, NPS EN-1 states at paragraph 3.3.14 that *'Depending on the choice of how electricity is supplied, the total capacity of electricity generation (measured in GW) may need to more than double to be robust to all weather conditions. In some outer most circumstances, for example if there was very strong electrification of energy demand and a high level of dependence on intermittent electricity generation, then the capacity of electricity generation could need to triple. The Government therefore anticipates a substantial amount of new generation will be needed.'*

- 5.3. CCGT power stations, such as that proposed at Wrexham Industrial Estate, are currently the most efficient method of generating electricity from fossil fuels (for example modern car combustion engines operate at an average efficiency of 25-30%, whilst CCGT power stations operate at an average efficiency of 60%).

6. LOCAL NEED

- 6.1. Modern CCGT power stations require a significantly smaller area of land for development than conventional coal-fired power stations. However, a site with an area of 10-15 ha is required for the plant switchgear, and to allow for an adequate area of land to be set aside for future carbon capture and storage plant. In addition to this, the need for a CCGT power station to be located proximate to national gas and electricity infrastructure is a key consideration.
- 6.2. While not specifically a 'need' the desire to identify a site close to existing industrial uses has been a strong influence in site selection. There is a legal requirement places upon promoters of new combustion generating stations to demonstrate that opportunities to exploit combined heat and power has been fully investigated. Co-locating the power station close to existing industrial uses, and the potential for new industrial developments in the area, maximises the potential that waste heat from the power station could be utilised by occupiers of the industrial estate. In addition, an industrial estate provides a compatible landscape context within which to locate a power station.

7. ELECTRICAL GRID CONNECTION

- 7.1. As noted previously, the CCGT power station would need to connect to the national electricity network to allow electricity generated to be exported.
- 7.2. This will require a new high voltage overhead power line connecting the power station to the Legacy sub-station to the west of Wrexham. Whilst there is an existing overhead power line feeding into the Wrexham Industrial Estate this does not have the required capacity to support the export of electricity from a CCGT power station. However, options to replace this existing line with a new, higher capacity, overhead line are being considered with discussions on-going with the network operator.
- 7.3. There are currently electricity supply constraints at Wrexham Industrial Estate resulting from the ageing existing electrical infrastructure and expanding industrial development at the estate. There is therefore a need to reinforce the network to ensure that a secure supply of electricity is available in the long-term at the estate. A CCGT power station would ensure that a more than adequate supply of electricity is available, which could further encourage development and investment in the area.

8. FUTURE CARBON CAPTURE AND STORAGE

- 8.1. In addition to requiring a site which is large enough to accommodate a CCGT power station, and which is also relatively close to the required grid infrastructure, developers of fossil fuel power stations are required to demonstrate that the development would be carbon capture ready (CCR). This is to ensure that, once the technology is proven, carbon capture and storage plant can be retrofitted to the generating station to capture carbon emissions.
- 8.2. Once captured, the carbon dioxide would be stored in an offshore oil or gas fields, or other suitable geological formation offshore. As such a location close to the coast and suitable storage locations is needed for new fossil fuel combustion plants to minimise the length of pipeline required to transport the CO₂.
- 8.3. At this stage, it is considered likely that a suitable storage location for CO₂ captured from a power station at Wrexham would be gas fields in the Irish Sea. A more detailed assessment of the CCR options will be completed in due course.

9. ENERGY REQUIREMENTS IN WALES

- 9.1. In March 2012 the Welsh Government published Energy Wales: a Low-Carbon Transition with the intention of defining the strategic direction of future energy investment in Wales.
- 9.2. The report is considered in the policy section of this report. In summary, it notes that Wales was responsible for 9% of generation in the UK between 2004 and 2010. Total electricity generation in Wales has fallen 10% over this period, driven largely by a fall in generation from coal and nuclear plants. Gas currently accounts for 50% of the electricity generated in Wales.
- 9.3. The report acknowledges that gas will be a key transitional fuel because greenhouse gas emissions from gas are significantly less than coal subject to the method of extraction. Gas is recognised as a flexible, responsive and reliable source of energy which can play a key role in the transition to a genuinely low carbon energy system. The commercialisation of carbon capture and storage is highlighted to be an important part of this.

10. CONCLUSION

- 10.1. The national need for the development is enshrined in government policy through the relevant National Policy Statements.
- 10.2. The selection of the site at Wrexham Industrial Estate is the direct result of technical and special needs which are required to facilitate the development of a CCGT power station, including an adequate sized site and proximity to gas and electricity networks.

10.3. Further assessment will be carried out to quantify the need for waste heat from the power station to be utilised within existing or future development in the industrial estate, and infrastructure will be built into the CCGT development to allow for the use of waste heat, if feasible.