Performance of the Riverside Energy Park in the context of the NPS framework

Report for the Greater London Authority

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Report for Doug Simpson, Greater London Authority

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1.0 The REP and NPS Requirements

1) This report considers the performance of the proposed Riverside Energy Park (REP) in the context of the requirements of National Planning Statement 1 for low carbon energy developments. The report starts by considering the changes in the marginal source of grid electricity over the coming decades. The anticipated performance of the REP against the anticipated carbon intensity of grid electricity is considered. Finally the report considers the potential need for additional heat generation to account for the difference in carbon intensity between the carbon performance of the REP when compared to the carbon intensity of grid electricity.

1.1 Changes in the marginal source of grid electricity over time

2) A key consideration in this type of assessment is which source of electricity should be assumed to be offset by the electricity generated at the REF. In this respect, BEIS publishes guidance in which it sets out an agreed set of carbon values to be used in policy appraisal and evaluation.[1] These values include a long-run marginal value which declines over time, reflecting the decarbonisation of the electricity grid. Values are typically updated by government on an annual basis.
3) Cory confirmed in its carbon assessment that the offset for electricity generation used in its assessment is derived based on a report from Defra published in 2014.[2] No direct reference is made to the BEIS data other than the statement that the applicant does not support the use of the long-run marginal data (in para 4.3.1) used by UKWIN in its alternative assessment of the carbon performance of the REF. Instead, Cory's case appears to be that gas CCGT should be used specifically as the marginal for Waste from Energy facilities – by implication suggesting that these facilities should deviate from the general application of marginal data as advised by government. Reference is made to the energy from waste facilities bidding in the capacity market and offsetting the operation of gas CCGT facilities.
4) The carbon assessment suggests that Gas CCGT is the appropriate comparator for energy from waste facilities when calculating the benefit from electricity

[1] Available from https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal
[2] Cory Riverside Energy (2019) Riverside Energy Park: Carbon Assessment, Document Reference 8.0208

generation. The approach is justified with reference to the following quote from Defra:[3]

'A gas fired power station (Combined Cycle Gas Turbine – CCGT) is a reasonable comparator as this is the most likely technology if you wanted to build a new power station today.'

5) It is noted that the above quote from Defra does not say that this comparison is relevant specifically for energy from waste facilities – the comparison is made with the building of a power station.
6) Alongside this, it is worth considering what the government documentation on the development of the long-run marginal says (noting that the text was originally drafted in 2009):[4]

…until very recently, a Combined Cycle Gas Turbine (CCGT) plant was the long-run marginal electricity generation plant on the basis that it was both relatively cheap and quick to build. Therefore, the marginal emissions factor in 2010 reflects that of a typical CCGT plant (0.34 kgCO2e/kWh before taking into account distribution and transmission losses). However, going forward there are reasons to think that this may not remain the case, particularly given the policies in place to incentivise low carbon electricity generation.

7) It is clear from this text that earlier guidance from Defra supported the use of gas CCGT as the marginal for emissions offsets for power generation in general, but that – even in 2009 - this was expected to change in the future with policies being put in place for grid decarbonisation. The most recent data by BEIS indicates that the long-run marginal is expected to decline from 0.357 kg CO_2 per kWh in 2010 (at which point the figure is consistent with the assumption that the marginal is gas CCGT) to 0.030 CO_2 per kWh in 2046.
8) More generally, waste plants do not operate like gas CCGT facilities, which can be switched on and off according to demand for power from the grid: the REP will need to continue to treat waste even if there is less demand for the electricity. In this sense, the operation of a waste incineration plant has more in common with a nuclear waste facility, in that both will generate electricity constantly, rather than being able to be switched off and on in response to changing demand like gas plant. If the electricity generated from combusting the waste is not exported to the grid (because of the lack of demand for the power, for example), this would worsen the overall carbon performance, as the waste would still need to be treated.

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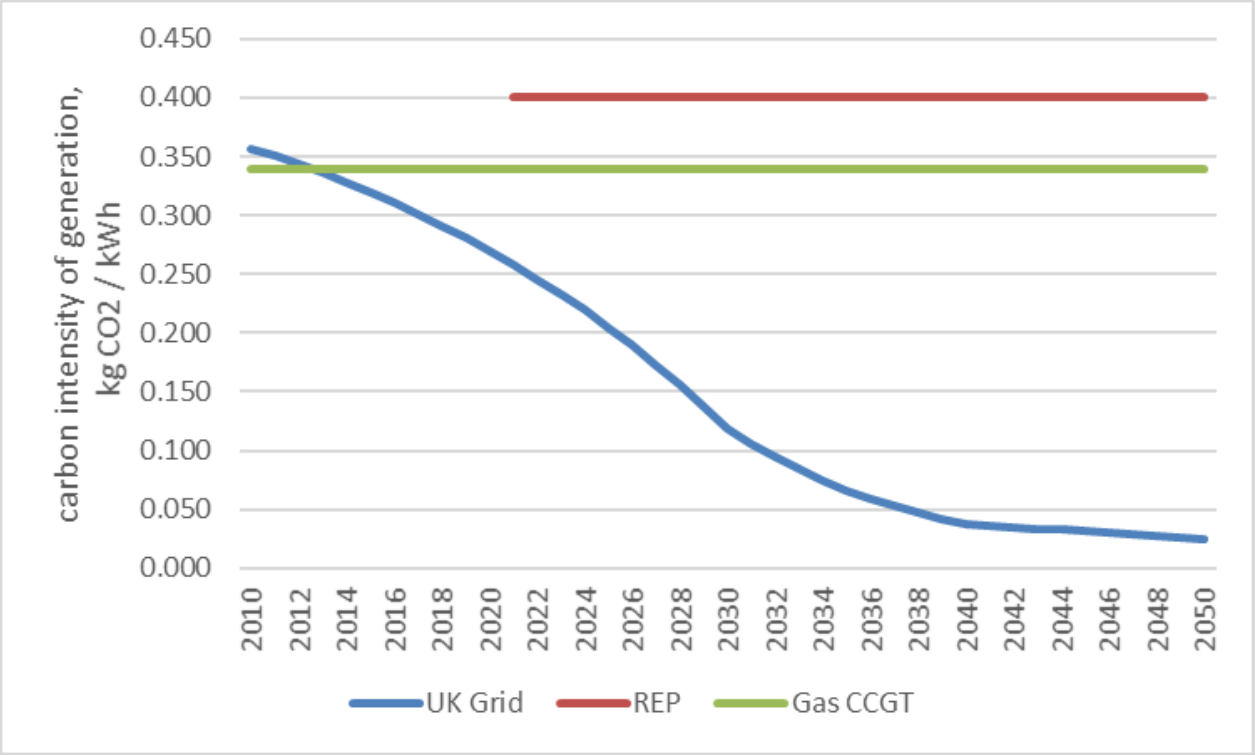
[3] Defra (2014) Energy from Waste: A Guide to the Debate 2014
[4] BEIS (2019) Valuation of Energy Use and Greenhouse Gas: Background documentation, available from https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

1.2 Comparison of the REP with Grid Electricity

9) Carbon emissions associated with the combustion of waste at an incineration plant are related to the composition of waste accepted by the plant for treatment. This also determines (in part) the amount of energy generated at the facility. Only materials in the composition that are derived from biogenic sources – such as food waste, garden waste, paper – are renewable sources of energy. The remainder is a source of fossil carbon, and the combustion of such materials will result in climate change emissions.
10) Data provided by Cory (within the carbon intensity floor calculations provided to the GLA using its Ready Reckoner tool, as referenced in Section 4 of the Combined Heat and Power Supplementary Report[5]) indicates that the anticipated carbon emissions for the facility are 379 kg CO_2e per tonne of waste treated.
11) With the same composition, the facility is assumed to generate 998 kWh of electricity per tonne of waste treated, where only electricity is generated. Taking into account emissions associated with energy used at the facility, emissions resulting from energy generated at the facility are estimated to be around 0.4 kg CO_2e per kWh of electricity generated. This confirms that the facility will generate electricity that is of a higher carbon intensity than that generated by the UK electricity grid in 2010. By the time the facility is likely to start generating electricity, the carbon intensity of the grid will be much lower, in the order of 0.25 kg CO_2e per kWh electricity. Over time, the difference in carbon intensity between electricity generated at the REP and that of the grid will widen, as is shown in the graph below.

[5] Cory Riverside Energy (2019) Riverside Energy Park: Combined Heat and Power Supplementary Report, Document Reference 5.4.1



12) The above confirms that the REP plant cannot be considered to be a low carbon energy facility unless it is generating heat as well as electricity. Low carbon sources of generation on the grid include nuclear as well as renewables; electricity generated by the REP is clearly of a much higher carbon intensity than either of these sources. Indeed, the above data confirms that the REP is also of a higher carbon intensity than that of gas CCGT (for which Defra gives the carbon intensity as 0.34 kg CO_2 / kWh electricity). Thus all major sources of electricity likely to be used on the UK grid in the future are envisaged to be of a lower carbon intensity than that of the REP.

1.3 Heat Generation Requirement to meet the Shortfall

13) If the REP were to begin operating in 2021, at this point, the difference between grid electricity and the carbon intensity of electricity generated at the REP is around 0.14 kg CO_2 per kWh. An additional carbon benefit from heat generation of around 118 kg CO_2 per tonne of waste treated is needed for the facility to make up the difference between grid electricity and the emissions actually generated by the facility (0.14 kg CO_2 per kWh of electricity). This, in turn, requires around 590 kWh of heat to be generated per tonne of waste, on top of the 998 kWh of electricity (assuming the heat generated by the incineration were to offset heat otherwise coming from gas).

14) In practice, the facility will generate less electricity when significant amounts of heat are generated, requiring the heat off-take to be greater than that calculated above. In addition, the discrepancy between grid electricity and that of the REP

will increase over time, requiring greater amounts of heat to be generated to achieve the same carbon intensity as that of grid electricity.

15) It is clear, therefore, that even the achievement of the same carbon intensity as grid electricity – which has a higher carbon intensity than either renewables or nuclear - will require considerably more effort in terms of securing heat off-take agreements than is currently proposed by Cory.