Connah's Quay Low Carbon Power

Natural gas supply chain and Greenhouse Gas emissions reporting sensitivity analysis

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1. Introduction

1.1.1 This sensitivity analysis has been carried out in relation to the assessment of the impact on operational Greenhouse Gas (GHG) emissions associated with the proposed Connah's Quay Abated Generating Station (Proposed Development) presented in the Environmental Statement (ES) in **Chapter 20: Climate Change [APP-058]** and **without prejudice** to the appropriateness and adequacy of the assessment already undertaken. It considers the following:

- a higher proportion of liquefied natural gas (LNG) in the gas network;
- use of a shorter time horizon for the reporting of the global warming impacts of methane (CH_4); and
- a variable (and lower) effective carbon capture rate.

1.1.2 These scenarios are discussed in further detail below, with an outline methodology explaining how this without prejudice sensitivity analysis has been conducted and a discussion of the results.

1.1.3 This sensitivity analysis exercise is supplemental to and is not intended to replace the existing GHG assessment presented in **Chapter 20: Climate Change [APP-058]**. For the avoidance of any doubt, Uniper UK Limited (the Applicant) maintains that the existing GHG assessment has been carried out in line with the requirements of the environmental impact assessment (EIA) process and in a manner consistent with all relevant guidance, including that issued by the Institute of Sustainability and Environmental Professionals (ISEP) and it represents the reasonable and realistic worst case scenario for EIA purposes. This sensitivity testing is provided without prejudice to that position and should not be treated or interpreted in any other way.

1.1.4 The sensitivity analysis illustrates that assuming increased quantities of LNG in the gas network, the use of a shorter period for the global warming potential (GWP) of CH_4, and a lower effective carbon capture rate there would be changes to the reported GHG impact of the Proposed Development. The sensitivity analysis quantifies those changes, considering the relative carbon intensity of the Proposed Development compared to a counterfactual scenario in which the electricity otherwise supplied by the Proposed Development continues to be provided by the existing unabated combined cycle gas turbine (CCGT), a generator of the sort that currently acts as the marginal generator within the GB electricity grid. In so doing, the sensitivity analysis is not purporting to suggest that such different inputs are in fact the appropriate ones to use. To the contrary the ones used in **Chapter 20: Climate Change [APP-058]** are considered to remain the appropriate ones to use as has been explained in detail elsewhere.

1.2 Increased proportion of LNG in the UK gas network

1.2.1 It is well understood that the upstream LNG supply chain results in higher carbon emissions per unit of fuel energy supplied, relative to natural gas supplied via pipeline. This is largely due to the energy required in the liquefaction and transport process associated with LNG.

1.2.2 The upstream well to tank (WTT) emissions factor for natural gas supplied via the UK gas grid already takes account of the fact that a proportion of gas consumed in the UK is supplied in the form of LNG.

1.2.3 It is also acknowledged that the proportion of LNG in the gas grid is variable over time, with this proportion being influenced by, among other things, overall demand, availability of supply from offshore fields, and the international unit price of gas.

1.2.4 According to energy statistics published by the UK Government[1], imports of LNG accounted for around 17.5% of total gas demand (with the percentages based on energy content in GWh) over the five calendar years from 2020 to 2024 inclusive.

1.2.5 This proportion varies from year to year and from quarter to quarter, and it is not possible to make any more reliable predictions around the future share of gas in the UK network that may be supplied as LNG.

1.2.6 Without prejudice to that, this sensitivity analysis simply looks at two future gas supply scenarios regardless of the fact that neither scenario is considered realistic or appropriate for these purposes. The first is one in which LNG is treated as accounting for as much as 60% of the overall supply (a much higher figure which does not reflect the reality of the existing or predicted situation), and the second is an even more extreme and unrealistic scenario in which all of the gas consumed in the UK is assumed to be imported in the form of LNG. Again, it should be stressed that neither of these scenarios is considered to be realistic or reasonable.

1.2.7 The UK Government publishes an annual dataset of emissions factors, including those for 100% mineral gas, gas as currently supplied via the UK grid[2], and LNG imported by sea.

1.2.8 It is quite straightforward, therefore, to apply the UK Government's published WTT factor for LNG in order to represent the extreme but completely unrealistic scenario in which 100% of gas demand enters the UK in this form.

1.2.9 In order to represent the also unrealistic 60% LNG scenario, however, it can be assumed that there is a linear relationship between LNG share of supply and upstream emissions intensity. This exercise allows the Scope 1 (combustion) and Scope 3 (WTT) emissions factors for the default position and the two scenarios in the sensitivity analysis to be produced. These are shown in **Table 1** below.

[1] Department for Energy Security and Net Zero (2026) *Energy Trends: UK gas, Table ET 4.1 – Natural gas supply and consumption (quarterly)*. Available at: https://www.gov.uk/government/statistics/gas-section-4-energy-trends (Accessed: 13 April 2026).

[2] Gas supplied via the UK network includes a small amount of biogas; the emissions factor for 100% mineral gas omits this biogas blend but does reflect the existing share of LNG in the network.

Table 1: Scope 1 and Scope 3 emissions factors for LNG concentration sensitivity analysis (all emissions factors apply GWP100)

Fuel	Unit	kg CO2e/unit (Scope 1 combustion)	Kg CO2e/unit (Scope 3 WTT)	Ratio of Scope 3 to Scope 1 (%)
Existing UK gas supply	kWh (NCV)	0.20489[3]	0.03347	16.34%
60% LNG	kWh (NCV)	0.20489	0.05530	26.99%
100% LNG	kWh (NCV)	0.20489	0.07214	35.21%

1.2.10 It is clear that only the upstream emissions factor varies with the proportion of LNG; the direct emissions from the combustion of natural gas are the same irrespective of whether the gas has been produced in the North Sea or imported as LNG.

1.2.11 Having identified upstream WTT emissions factors for gas with a 60% and 100% LNG mix, the overall operational emissions impact of the Proposed Development - if it were to consume such gas mixes - can be quantified for these theoretical scenarios.

1.2.12 The Heat and Material Balance (HMB) dataset[4] provides the hourly mass flow rates of unabated carbon dioxide between the gas turbines and heat recovery steam generator, and the abated carbon dioxide post carbon capture plant discharged to the atmosphere.

1.2.13 The latter quantity represents the Proposed Development's Scope 1 emissions, while the former (unabated) quantity can be used to estimate the upstream emissions using the ratio of Scope 3 to Scope 1 emissions shown in the final column of **Table 1** above.

1.2.14 The difference between unabated and abated flow rate provides the quantity of captured carbon dioxide, and from this it is possible to estimate additional Scope 3 downstream emission from unplanned outages in the transport and storage (T&S) system using a conservative estimate of 5% T&S unavailability.

1.2.15 Applying the Scope 1 and Scope 3 factors to the HMB data for the Proposed Development gives the hourly emissions figures shown in **Table 2** Including the theoretical scenarios 2 and 3**.**

[3] Within this exercise, the emissions factor for 100% mineral gas as published by the UK Government has been applied, rather than the slightly lower factor that reflects a modest biofuel blend. This is to facilitate the extrapolation of upstream emissions factors for intermediate proportions of LNG in the mix, and does not materially affect the overall conclusions of the sensitivity analysis in any way.

[4] *CCGT and CCP Heat and Material Balance - Operating Mode 1: Reference Case*. This technical dataset was provided by the Design Team of the Proposed Development.

Table 2: Hourly emissions from the operation of the Proposed Development under three scenarios (all data in kg CO_2e/hour)

Emissions source and scope	Scenario 1: Default position	Scenario 2: 60% LNG share	Scenario 3: 100% LNG share
Direct emissions (Scope 1)	25,299	25,299	25,299
Upstream (WTT) (Scope 3)	92,217	152,363	198,761
Downstream (T&S unavailability (Scope 3)	26,961	26,961	26,961
Total	144,476[5]	204,622	251,020

1.2.16 It can be seen that only the upstream well to tank emissions are affected by differing proportions of LNG in the fuel gas mix. Direct emissions from combustion and additional emissions from periodic unavailability of the downstream T&S system are the same irrespective of the fuel gas mix.

1.2.17 Relative to the operational GHG impact using the default gas mix as shown in **Chapter 20: Climate Change [APP-058]**, assuming the theoretical 60% and 100% LNG proportions, increases the hourly operational GHG impacts by 39% and 74% respectively.

1.2.18 As discussed in paragraphs 20.4.6 – 20.4.8 of **Chapter 20: Climate Change [APP-058]** the operational impact of the Proposed Development must be seen relative to that of a non-specific comparable, existing gas fired generating station that does not benefit from the use of a carbon capture plant, resulting therefore in the discharge of all combustion gases into the atmosphere (referred to here for these purposes therefore as the "counterfactual generator").

1.2.19 Such a counterfactual generator, along with any other generator or other consumer of natural gas in the UK system, will have the same upstream emissions from the natural gas supply chain as the Proposed Development.

1.2.20 In order to estimate the relative GHG benefit of the Proposed Development compared to that of the existing generator (or of a counterfactual generator to use the terminology adopted above) in each of the additional theoretical scenarios, it is necessary to apply the emissions factors for each sensitivity analysis scenario shown in **Table 1** above to the natural gas expected to be consumed in that counterfactual generator.

1.2.21 It is assumed that the comparable counterfactual generator supplies 1,380 MWe to the national grid with a thermal efficiency of 52%, requiring a fuel gas input rate of 2,654 MWth. Applying the emissions factors in **Table 1** results in the hourly emissions totals shown in **Table 3** below.

[5] Within the data tables in this document, totals presented to the nearest whole number may differ from the sum of individual values. This is due to rounding and is not a misstatement.

Table 3: Hourly emissions from the operation of an existing, unabated CCGT under three scenarios (all data in kg CO_2e/hour)

Emissions source and scope	Scenario 1: Default position	Scenario 2: 60% LNG share	Scenario 3: 100% LNG share
Direct emissions (Scope 1)	543,747	543,747	543,747
Upstream (WTT) (Scope 3)	88,824	146,758	191,448
Total	632,571	690,504	735,195

1.2.22 As before, direct emissions from the combustion of fuel gas are unaffected by a variation in the proportion of LNG in the gas mix, with only the upstream WTT emissions increasing with the share of LNG. Overall, the hourly emissions for the 60% and 100% LNG scenarios result in a percentage increase over the default scenario of 9% and 16% respectively. The percentage increase in emissions is lower for the counterfactual due to the higher proportion of unaffected scope 1 emissions for the existing unabated generator.

1.2.23 The total emissions for the Proposed Development compared with those for the counterfactual existing CCGT are summarised in **Table 4** below.

Table 4: Total hourly emissions from the Proposed Development and a counterfactual generator (all data in kg CO_2e/hour)

Generator	Scenario 1: Default position	Scenario 2: 60% LNG share	Scenario 3: 100% LNG share
Proposed Development	144,476	204,622	251,020
Counterfactual existing CCGT	632,571	690,504	735,195
Emissions reduction	488,094	485,882	484,175
Percentage reduction	77.2%	70.4%	65.9%

1.2.24 The percentage reduction is lower in scenarios with higher LNG share, but even with a fuel mix comprising a theoretical 100% LNG, it is clear that the Proposed Development has hourly emissions 65.9% lower than those of a counterfactual CCGT supplying the same amount of electricity to the national grid.

1.2.25 The data shown in Tables 2, 3 and 4 above can be converted into carbon intensity metrics and presented graphically in a similar way to Plate 20-2[6] in **Chapter 20: Climate Change [APP-058]**. This expresses the operational

[6] The graph shown in Plate 20-2 includes some relatively minor operational emissions not associated with the consumption of natural gas. These are not affected by the Sensitivity Analysis described here and have been omitted from the calculations and figures. Their omission does not materially affect the conclusions of this analysis.

carbon impact for the Proposed Development and a counterfactual existing CCGT in terms of tonnes of CO_2e per MWh of electricity generated.

1.2.26 These comparisons are shown graphically in **Figure 1**, **Figure 2** and **Figure 3** below.

Figure 1: Relative carbon intensity of the Proposed Development vs. Counterfactual generator; default emissions factors

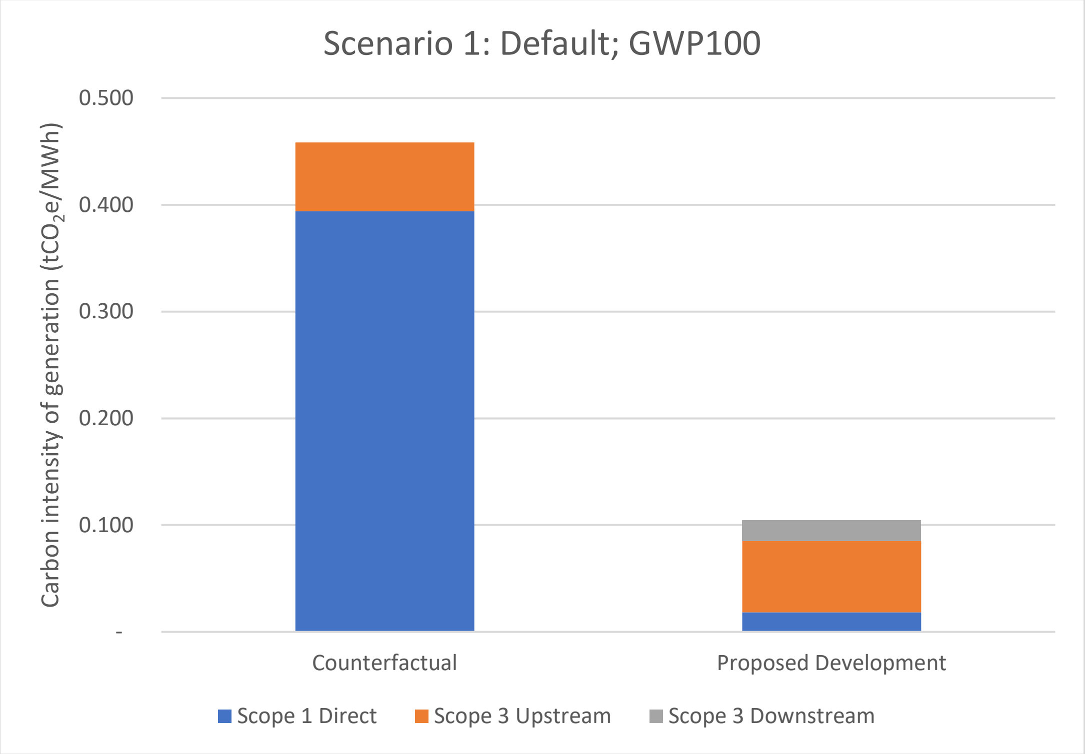


Figure 2: Relative carbon intensities; theoretical 60% LNG in fuel supply

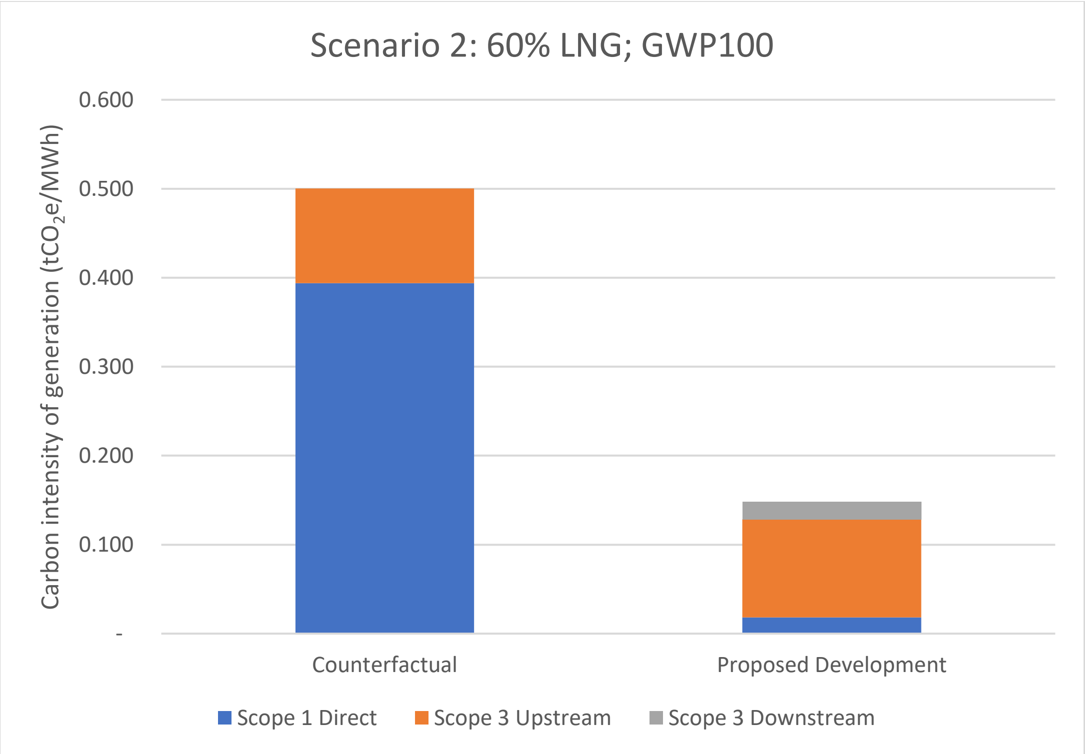
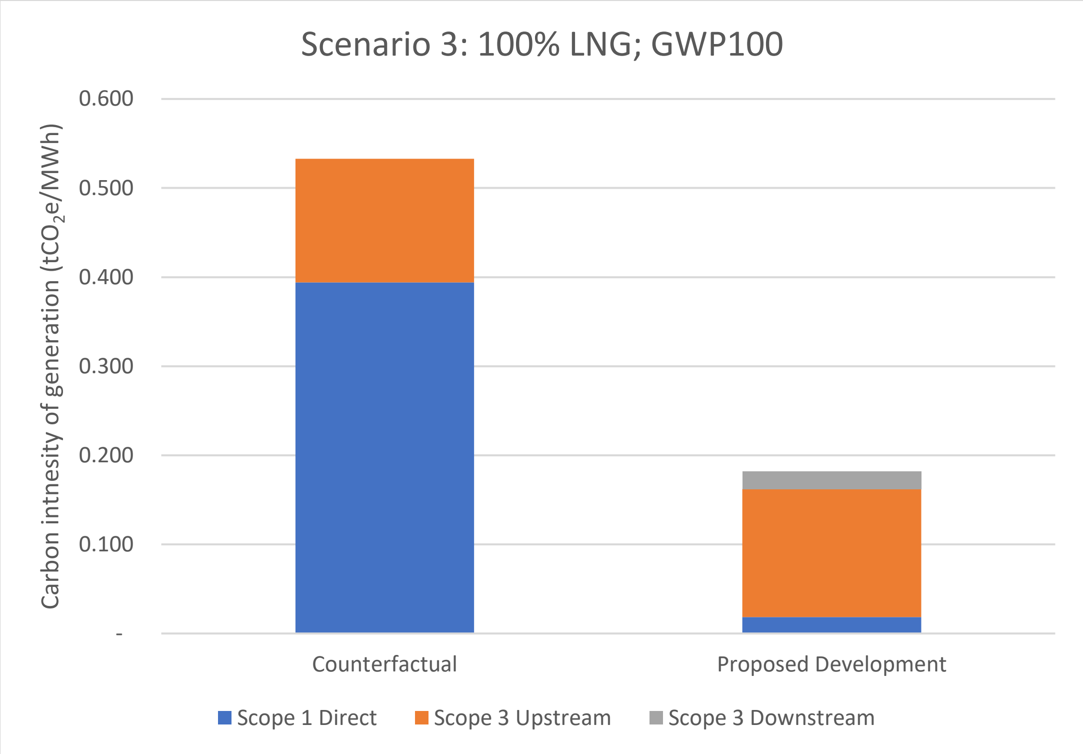


Figure 3: Relative carbon intensities; theoretical 100% LNG in fuel supply



1.3 Reporting the global warming impacts of methane (CH_4) and CO_2 emissions over a 20-year time horizon

1.3.1 The second part of the sensitivity analysis does not involve modifying any of the operating assumptions or parameters made within **Chapter 20: Climate Change [APP-058]**, but instead considers a change to the metric used to report the warming impact of CH_4 over a shorter time period.

1.3.2 Global warming potentials (GWPs) express the warming impact of different GHGs relative to that of carbon dioxide, which is always expressed as 1. The time period over which the warming impact of gases is expressed can have a bearing on this factor, with CH_4 being a good example of this.

1.3.3 National and international carbon accounting systems and protocols are overwhelmingly based on the reporting of GHGs over a 100-year period; this is because this period most accurately represents the long-term warming impact of carbon dioxide. (All the figures cited in Section 1.2 of this document above apply the standard 100-year time horizon for the GWPs of all gases.)

1.3.4 Over a 100-year period, CH_4 has a GWP of 27.9, meaning that over this period a tonne of CH_4 will be expected to have a similar warming impact to that of 27.9 tonnes of CO_2.

1.3.5 But the atmospheric lifetime of CH_4 is relatively short at only around 12 years. This means that if one were (contrary to established practice) to seek to assess the relative warming impact of CH_4 and CO_2 over a 20-year period, the CH_4 has a GWP 81.2 times that of CO_2.

1.3.6 So in order to report CH_4 over a 20-year period (contrary to established practice), it would be necessary to multiply emissions of that specific GHG by a factor of 81.2/27.9 = 2.91.

1.3.7 The majority of CH_4 emissions from the Proposed Development would take place in the upstream natural gas supply, although the direct Scope 1 combustion of natural gas does result in a very small amount of CH_4 being emitted to the atmosphere.

1.3.8 The UK Government's dataset of emissions factors breaks down Scope 1 emissions from the combustion of fuel between the different constituent gases, enabling relative contribution of CH_4 to be identified and the uplift multiplier directly applied.

1.3.9 Upstream WTT emissions, however, are not broken down in this way within the Government's dataset as they are reported in mass of CO_2 equivalent, applying a 100-year time horizon for CH4 and other gases.

1.3.10 This part of the sensitivity analysis therefore seeks to apply a 20-year reporting horizon for CH4 (contrary to established practice) taking account of these constraints, to the three scenarios already discussed in relation to LNG above:

- the default scenario assuming the existing UK natural gas mix;
- a gas mix containing 60% LNG (a theoretical and unrealistic scenario); and
- a gas mix containing 100% LNG (a theoretical and unrealistic scenario).

1.3.11 As each of these scenarios is considered using a 20-year time horizon for CH_4, it is then necessary to try and identify a representative split between CO_2 and CH_4 within the upstream emissions for each of these gas mixes.

1.3.12 For pure LNG, a recent report from the International Energy Agency[7] provides information suggesting a CO_2:CH_4 split of 71.8% to 28.2% (with the percentages based on the relative 100-year CO_2 mass equivalents).

1.3.13 For gas supplied from the North Sea, the North Sea Transition Authority (NSTA) has provided data[8] showing a CO_2:CH_4 split of 91.5% to 8.5% (with the percentages based on the relative 100-year CO_2 mass equivalents).

1.3.14 Taking these two sets of data to represent the position for 100% LNG and zero% LNG respectively, and assuming a linear distribution between these extremes, it is possible to articulate a split for the current gas mix and for a mix containing 60% LNG.

1.3.15 Identifying the CH_4 element in the upstream emissions for each gas mix then enables them to be multiplied by the uplift factor so that their warming impact

[7] This report gives upstream emissions in mass of CO_2e per MJ; when this is converted into mass of CO2e per kWh, it corresponds almost perfectly with upstream data for LNG published by the UK Government. International Energy Agency (IEA) (2025) *Assessing emissions from LNG supply and abatement options*. Paris: IEA. Available at: https://iea.blob.core.windows.net/assets/5ad737ee-750d-460e-8c33-fb9140f1043d/AssessingemissionsfromLNGsupplyandabatementoptions.pdf (Accessed: 13 April 2026).

[8] This was submitted as written evidence to a parliamentary inquiry on methane during 2024. For ease of calculation, the 8.5% share assigned to methane includes a small proportion of emissions from nitrous oxide, but this is a conservative approach that overstates the uplifted methane figure over 20 years. UK Parliament (2024) *Methane inquiry: Written evidence (reference 129662)*. Available at: https://committees.parliament.uk/writtenevidence/129662/pdf/ (Accessed: 13 April 2026).

can be expressed over a 20-year period, rather than over the standard 100-year period that is the default and industry standard approach used to generate emissions factors, carbon budgets and which is applied across carbon accounting systems more generally.

1.3.16 The uplifted factors for Scope 1 combustion and Scope 3 WTT are shown in **Table 5** below. This table is analogous to **Table 1** shown above, but seeking to apply a 20-year time horizon.

Table 5: Scope 1 and Scope 3 emissions factors for GWP20 sensitivity analysis

Fuel	Unit	kg CO_2e/unit (Scope 1 combustion)	Kg CO_2e/unit (Scope 3 WTT)	Ratio of Scope 3 to Scope 1 (%)
Existing UK gas supply	kWh (NCV)	0.20548	0.04111	20.0%
60% LNG	kWh (NCV)	0.20548	0.07696	37.5%
100% LNG	kWh (NCV)	0.20548	0.11101	54.0%

1.3.17 It can be seen that the Scope 1 factor has increased very slightly when compared to values reported in **Table 1** due to the very small amount of CH_4 released during combustion, while the Scope 3 WTT factor has increased to a greater extent, with the greatest proportional increase being seen in the gas mix comprising 100% LNG, since this has the highest proportion of CH_4 in the upstream supply chain.

1.3.18 The sensitivity analysis results are now set out in exactly the same way as described above for the different proportions of LNG. **Table 6** shows hourly emissions for the Proposed Development for three further scenarios, similar to scenarios 1 to 3 but with CH_4 values expressed over a 20-year period.

Table 6: Hourly emissions from the operation of the Proposed Development under three scenarios and using a 20-year GWP for CH_4 (all data in kg CO_2e/hour)

Emissions source and scope	Scenario 4: Default position; GWP20	Scenario 5: 60% LNG share; GWP20	Scenario 6: 100% LNG share; GWP20
Direct emissions (Scope 1)	25,372	25,372	25,372
Upstream (WTT) (Scope 3)	114,134	208,282	305,859
Downstream (T&S unavailability (Scope 3)	27,039	27,039	27,039
Total	166,545	258,692	358,269

1.3.19 As before, the same assumptions around the reporting period of CH_4 has then been applied to the corresponding emissions from the counterfactual generator, since this must have the same methodological assumptions applied in order to provide a valid comparison. This is then set out in **Table 7**.

Table 7: Hourly emissions from the operation of an existing, unabated CCGT under three scenarios and using a 20-year GWP for CH_4 (all data in kg CO_2e/hour)

Emissions source and scope	Scenario 1: Default position	Scenario 2: 60% LNG share	Scenario 3: 100% LNG share
Direct emissions (Scope 1)	545,318	545,318	545,318
Upstream (WTT) (Scope 3)	109,935	198,693	294,606
Total	655,254	744,011	839,925

1.3.20 Finally, **Table 8** below shows the total hourly operational emissions for the Proposed Development and counterfactual generator for each of the three scenarios using the 20-year GWP for CH_4.

Table 8: Total hourly emissions from the Proposed Development and a counterfactual generator and using a 20-year GWP for CH_4 (all data in kg CO_2e/hour)

Generator	Scenario 1: Default position	Scenario 2: 60% LNG share	Scenario 3: 100% LNG share
Proposed Development	166,545	258,692	358,269
Counterfactual existing CCGT	655,254	744,011	839,925
Emissions reduction	488,709	485,319	481,656
Percentage reduction	74.6%	65.2%	57.3%

1.3.21 As with the sensitivity analysis for the unrealistic higher proportions of LNG shown above, as expected it is the scenarios with the highest amounts of LNG that have the lowest percentage saving if a 20-year GWP for CH_4 is applied.

1.3.22 But even with such highly unrealistic fuel mixes, including that containing 100% LNG, and applying a GWP value for CH_4 that is 2.91 times greater than that conventionally used within accepted industry standard carbon accounting systems, the Proposed Development still has operational emissions over 57% lower than those of an existing gas fired CCGT.

1.3.23 The operational emissions for these scenarios can also be expressed in terms of carbon intensity, similar to the approach taken in Plate 20-2 in **Chapter 20: Climate Change [APP-058]**. These are shown in **Figure 4**, **Figure 5** and **Figure 6** below.

Figure 4: Relative carbon intensity of the Proposed Development vs. Counterfactual generator; default emissions factors and GWP20 value for CH_4

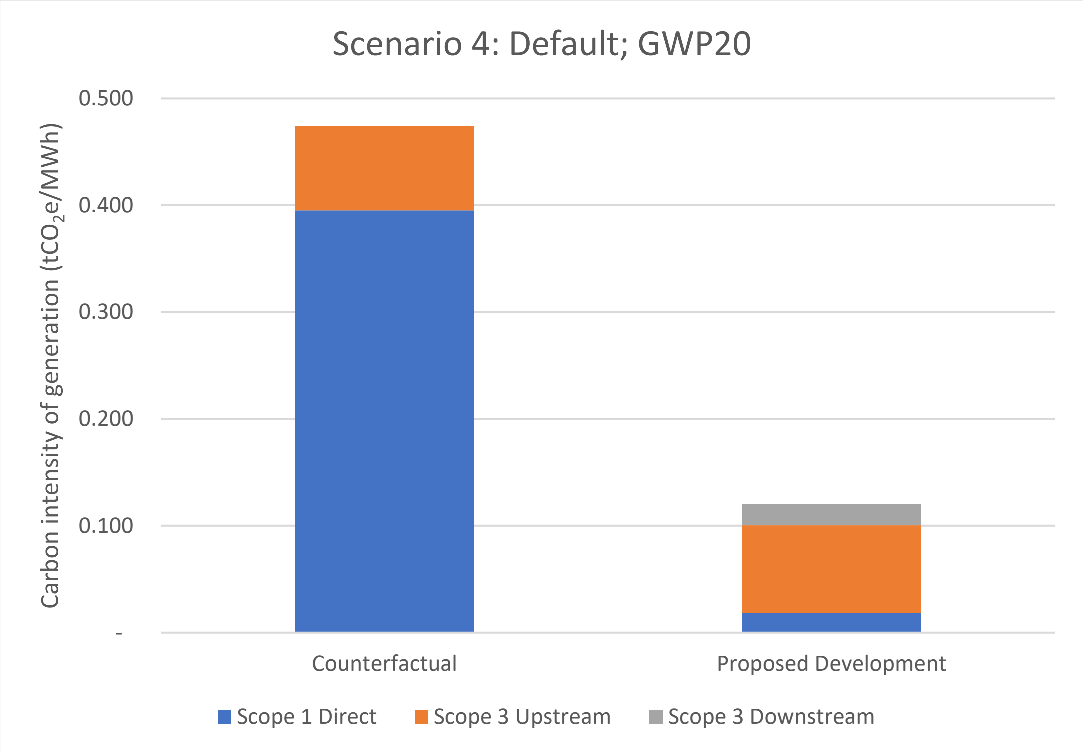


Figure 5: Relative carbon intensity of the Proposed Development vs. Counterfactual generator; 60% LNG and GWP20 value for CH_4

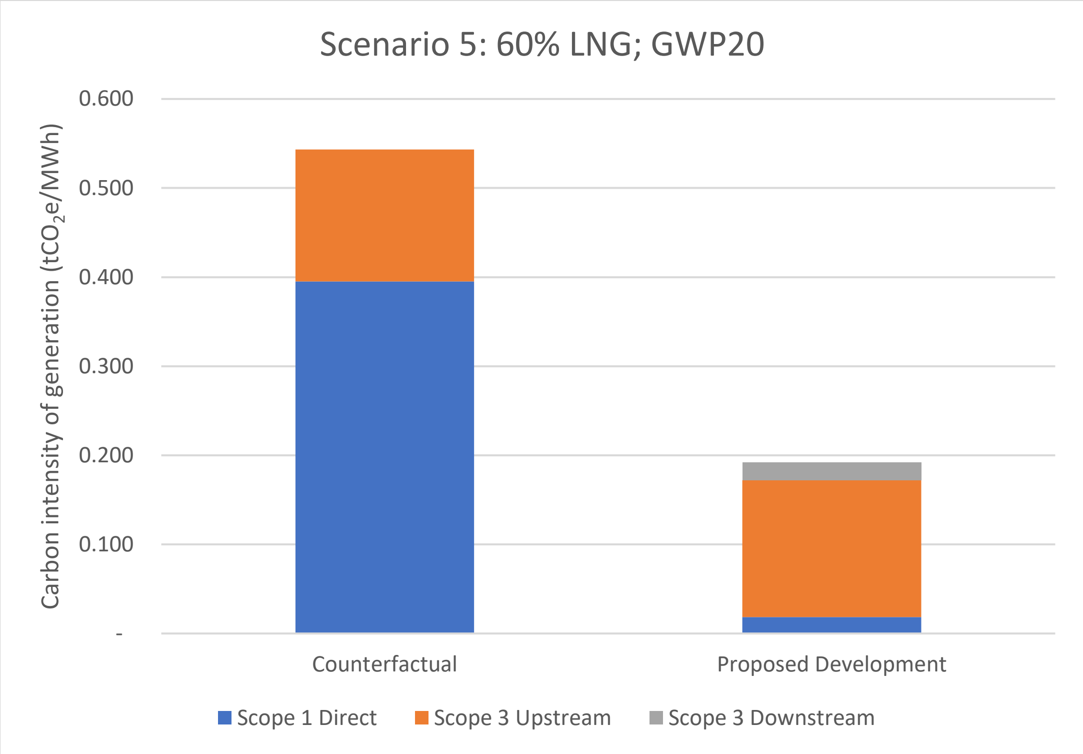
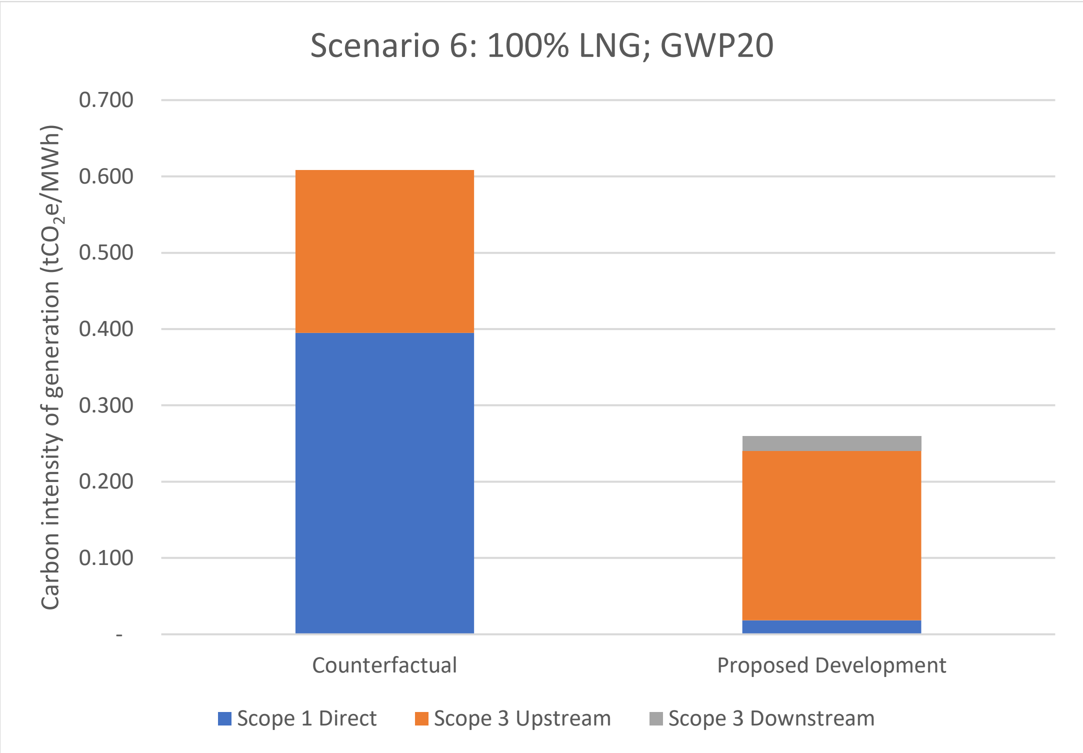


Figure 6: Relative carbon intensity of the Proposed Development vs. Counterfactual generator; 100% LNG and GWP20 value for CH_4



1.4 Applying a lower capture rate within the Carbon Capture Plant (CCP) within the Proposed Development

1.4.1 The GHG assessment presented in **Chapter 20: Climate Change [APP-058]** is based on a 95% capture rate. This approach is consistent with existing guidance from the Environment Agency (EA) on the Best Available Technique (BAT) for post-combustion carbon dioxide capture[9]:

"Capturing at least 95% of the CO_2 in the flue gas during normal operating conditions is considered BAT. You can base this on average performance over an extended period (for example, a year). To achieve this, you should make sure the design capture level for flue gas passing through the absorber equates to at least 95% of the CO_2 in the total flue gas from the plant."

1.4.2 The Carbon Capture Plant (CCP) of the Proposed Development will be designed to achieve this level of carbon capture, and the GHG assessment for the Reference Case is based upon the Heat and Material Balance data developed by the design team. The Applicant maintains that a 95% capture rate therefore is a realistic and appropriate assumption for these purposes.

1.4.3 The **Draft Development Consent Order (DCO)** (**EN010166/APP/3.1**) for the Proposed Development requires the CCP to be designed to capture a minimum rate of 95% of the carbon dioxide emissions of the generating station operating at full load. This is consistent with the approach taken in the case of the Net Zero Teesside Order 2024, although in that instance a minimum 90% capture rate was specified. Paragraph 4.24 of the Decision Letter for that project states that:

"The Applicants considered that the [Environmental Permit] and [Dispatchable Power Agreement] would sufficiently address [the minimum capture rate] and the ExA [Examining Authority] concluded that the EP would provide appropriate controls to secure the capture rate. The Secretary of State has considered this issue and the representations of the Applicants, the EA and ClientEarth. Whilst the EA has stated that it is likely that a 95% capture rate would be provided for in the EP, ***an amendment to the definitions section of the DCO as proposed by ClientEarth will secure a minimum capture rate in the DCO itself and is consistent with the approach in Keadby 3. The DCO has been amended accordingly.****"* (Emphasis added)

1.4.4 The Applicant, therefore, considers that the 95% capture rate in the GHG assessment is reasonable and appropriate given this design requirement.

1.4.5 The Applicant addresses in more detail elsewhere the reasons why this approach to the DCO and the consequential GHG assessment is consistent with the relevant EIA Regulations. Again, without prejudice to that, a sensitivity analysis can be carried out to quantify and assess the impact on operational emissions of a varied carbon capture rate, but conducting such an analysis is not intended to suggest that the assumptions underpinning the GHG assessment as presented in **Chapter 20: Climate Change [APP-058]**

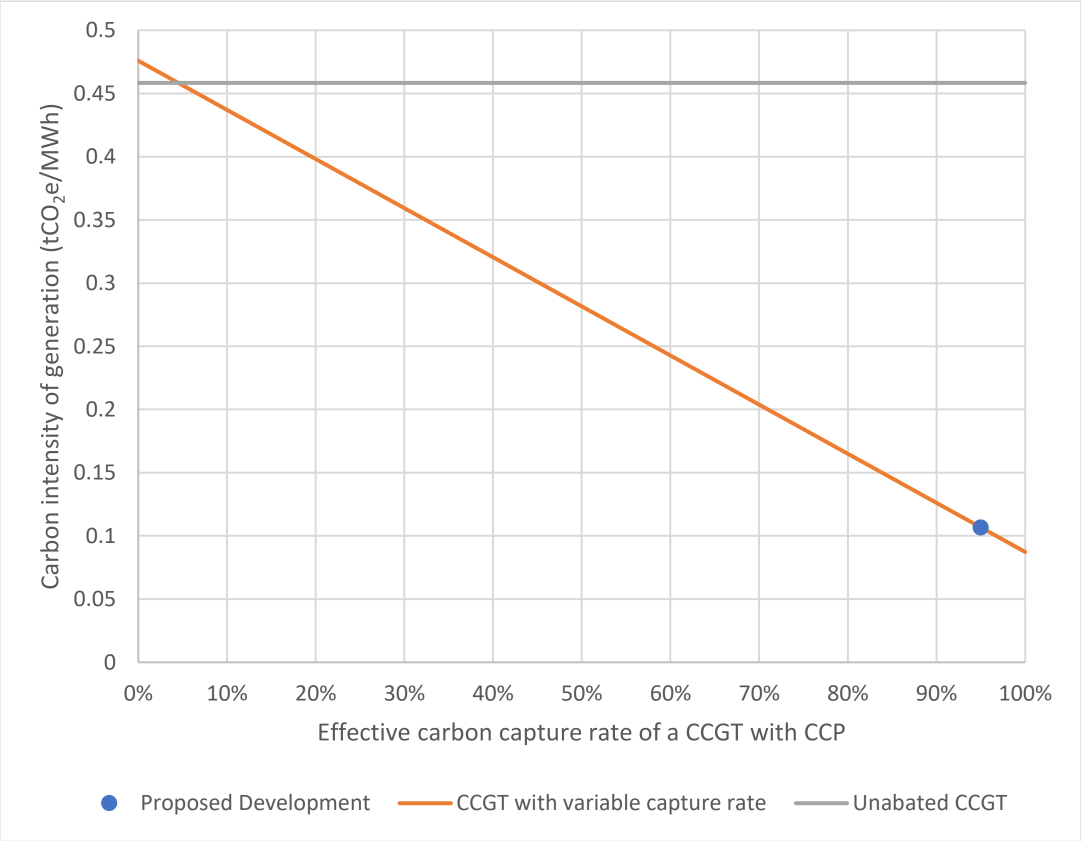
[9] UK Government (2024) *Post-combustion carbon dioxide capture: best available techniques (BAT)*. Available at: https://www.gov.uk/guidance/post-combustion-carbon-dioxide-capture-best-available-techniques-bat (Accessed: 20 April 2026).

are unrepresentative of the future operation of the Proposed Development or inappropriate for assessment purposes. To the contrary the Applicant considers that the GHG assessment in Chapter 20 is appropriate. The sensitivity analysis provides information on GHG emissions if (for whatever reason) the carbon capture rate were lower.

1.4.6 For the purposes of this sensitivity analysis, the effects of varying the capture rate are provided for the entire spectrum ranging from a 0% capture rate (i.e. unabated) up to 100% capture and are shown graphically. This has been done in preference to selecting some other single, arbitrary capture rate different to that which reflects the 95% design requirement.

1.4.7 In the same way that has been done above, the consequential difference in carbon intensity of electricity generation (in tonnes of CO_2e per MWh) for the CCGT operating at different carbon capture rates is then compared against the counterfactual unabated CCGT, as shown in and below. shows the effects of varying the capture rate for Scenario 1 described above, i.e. the default position regarding the LNG content of the fuel mix and reporting the warming impact of CH_4 over a 100-year time horizon.

Figure 7: Carbon intensities of the Proposed Development with varying levels of carbon capture relative to the counterfactual unabated CCGT – Scenario 1 (default fuel mix; 100-year time horizon for CH_4)

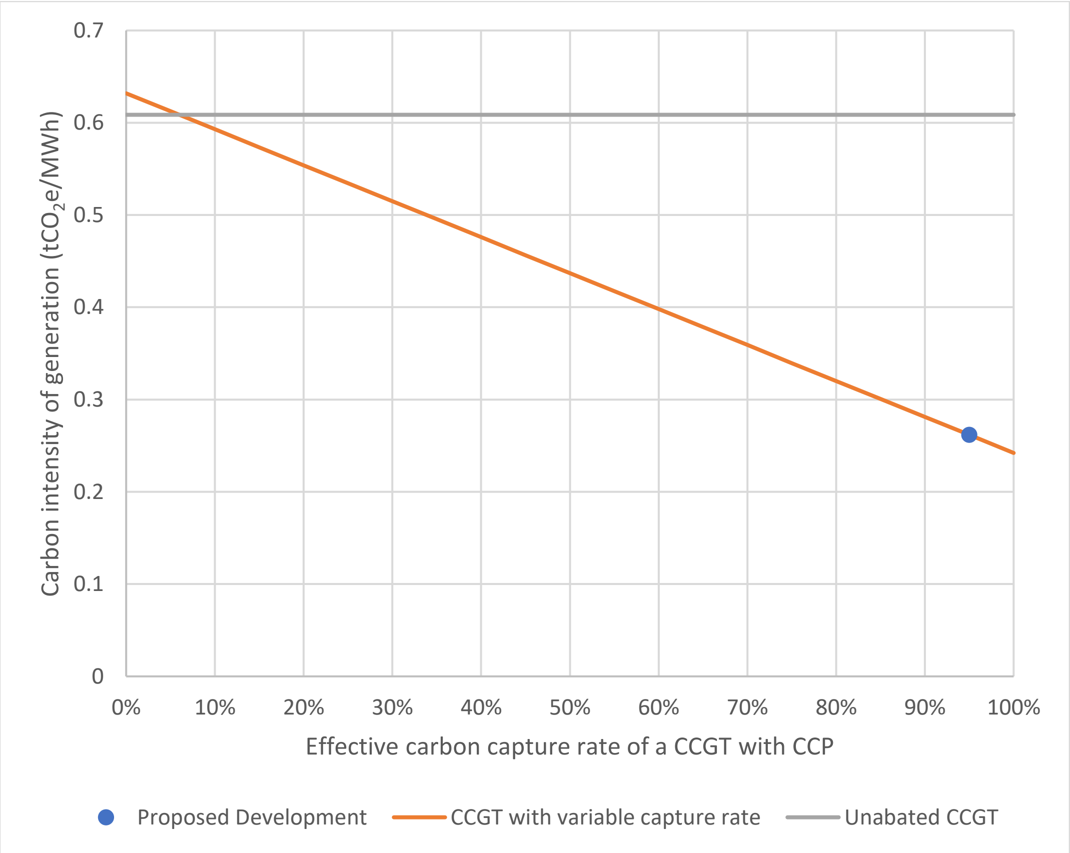


1.4.8 The design requirement carbon capture rate of the Proposed Development, i.e. 95%, is shown by the blue dot. The orange line shows the effect on carbon intensity of varying the capture rate from 0% on the left up to 100% on the right. The horizontal grey line denotes the carbon intensity of the counterfactual unabated CCGT; this has no carbon capture irrespective of the x-axis.

1.4.9 It can be seen that the two orange and grey lines cross at an effective carbon capture rate of 4.5% for the CCGT. This shows that operating the Proposed Development with a carbon capture rate above this percentage, the Proposed Development CCGT with CCP means that it will have operational carbon emissions lower than those of the unabated CCGT. In reality, this reflects a highly precautionary approach, since if the CCGT were in fact to be operate with a carbon capture rate as low as this, it would not be operating with the efficiency penalties assumed, meaning that the overall carbon intensity at such low capture rates would likely be broadly comparable – or even lower – to the unabated counterfactual. It becomes challenging, however, to factor this effect into the sensitivity analysis and it is considered unnecessary to do so because even this highly precautionary percentage rate is very low in any event (namely a 4.5% carbon capture rate). As already self-evident, the CCGT is required to be designed to achieve a minimum 95% carbon capture rate

1.4.10 **Figure 8** below shows the similar graph, but for what is identified as Scenario 6 as described above, i.e. a fuel mix containing 100% LNG and reporting the warming impact of CH_4 over a 20-year period. As with Figure 7, the anticipated operational carbon intensity of the Proposed Development is shown by the blue dot, with the operational intensity of a comparable CCGT rising as the capture rate falls.

Figure 8: Carbon intensities of the Proposed Development with varying levels of carbon capture relative to the counterfactual unabated CCGT – Scenario 6 (100% LNG; 20-year time horizon for CH_4)



1.4.11 As with the scenario illustrated in **Figure 7** above, the capture rate for the Proposed Development could be far lower than the anticipated 95% carbon capture rate for the Proposed Development and still result in an operational carbon intensity well below that of the counterfactual unabated generator. In this scenario, the break-even carbon capture rate – the point where the orange line crosses the grey line – is only slightly higher, at 6.05%; this has the same highly precautionary element described above. But it demonstrates that even adopting such a highly precautionary approach with the assumption as to the existing efficiency penalty, the Proposed Development will result in lower operational carbon emissions than a comparable unabated dispatchable power station even if it were not to operate at a 95% carbon capture rate.

1.4.12 **Figure 7** and therefore clearly demonstrate that even if the Proposed Development were to operate with carbon capture rates considerably lower than that anticipated and designed for the Proposed Development, the operational carbon intensity of the Proposed Development and therefore operational carbon emissions would still be much lower than that of an existing unabated dispatchable CCGT installation.

1.4.13 The sensitivity analyses that relate to LNG supply (Section **1.2**) and CH_4 reporting (Section **1.3**) are only applicable to upstream Scope 3 emissions, those that fall beyond the control or influence of the Applicant, as well as largely falling beyond our own national boundaries. But varying the capture rate within the CCP will affect the direct Scope 1 emissions from the combustion of fuel gas. These are the emissions that would occur at the site of the Proposed Development, and as such these emissions would fall within the remit of the UK Emissions Trading Scheme (UK ETS).

1.4.14 The Applicant discussed the effect of the UK ETS on the Proposed Development in its Deadline 3 submission (**Applicant's Response to Deadline 2 submissions [REP3-057]**), but this is summarised again in the context of this sensitivity analysis of lower capture rates.

1.4.15 As an electricity generator, the Proposed Development is not eligible for any free allocation of allowances, so all direct emissions to the atmosphere must be covered by allowances purchased either at auction or on the secondary carbon market. Either way, additional emissions will result in increased costs to the operator, providing a powerful economic incentive to reduce emissions. Any reduction in effective carbon capture rate will incur a direct economic penalty on the operator. Over time, as the emissions cap falls in line with the UK's pathway to net zero, scarcity of allowances will inevitably result in higher prices, increasing the economic incentive to reduce emissions.

1.4.16 Furthermore, at a macro level the overall emissions cap of the UK ETS is now aligned with the UK's net zero trajectory[10]. This cap represents the overall quantity of allowances that are available to operators, either through free allocation or purchase. The overall effect of this is to guarantee that collective direct Scope 1 emissions covered by the UK ETS cannot exceed the cap, and these collective emissions must therefore be consistent with the UK's overall net zero emissions trajectory. Any increase in emissions from a

[10] UK Government (2023) *The Greenhouse Gas Emissions Trading Scheme (Amendment) Order 2023*. SI 2023/850. Available at: https://www.legislation.gov.uk/uksi/2023/850/made (Accessed: 20 April 2026).

particular installation, for whatever reason, cannot jeopardise the delivery of the UK's net zero targets.

1.5 Conclusion

1.5.1 This sensitivity analysis has been provided without prejudice to the Applicant's position on the adequacy and appropriateness of the existing analysis in the ES. It is supplemental to and does not replace the existing GHG assessment previously carried out and presented in **Chapter 20: Climate Change [APP-058]**. The Applicant maintains that the assessment presented in the ES accurately represents the realistic and reasonable worst case for the operation of the Proposed Development and clearly shows a substantial reduction in GHG emissions when it is compared to the operation of an existing, unabated gas fired power station.

1.5.2 The sensitivity analysis testing with unrealistic scenarios however still demonstrates the significant relative GHG benefits of the Proposed Development against the counterfactual generator. Even under a 100% LNG scenario, the Proposed Development has GHG emissions almost 66% lower than the counterfactual.

1.5.3 The Applicant would note that whilst the sensitivity analysis related to the proportion of LNG in the gas to be consumed by the Proposed Development may have a bearing on the upstream emissions from the natural gas supply chain, it has no impact on the direct Scope 1 emissions from combustion or the downstream emissions from anticipated unavailability in the CO_2 T&S system.

1.5.4 As noted in paragraph 20.6.59 of **Chapter 20: Climate Change [APP-058]**, a substantial proportion of the emissions from the natural gas supply chain are likely to fall outside the UK, and would therefore not be reported within UK or Welsh carbon budgets. Increased upstream supply chain emissions resulting from a higher proportion of LNG within the fuel mix would also occur beyond the geographic boundaries of the UK or of Wales, and would similarly not be reported within the carbon budgets of the UK or Wales.

1.5.5 This is not to dismiss or downplay the importance of GHG emissions that take place outside the UK – as noted in paragraph 20.3.9 of **Chapter 20: Climate Change [APP-058]**, the identified receptor for GHG emissions is the global climate, and the sensitivity of the global climate to GHG emissions is High. But it is important to recognise that any increase in emissions in the upstream natural gas supply chain resulting from a higher proportion of LNG in the fuel mix will not affect the ability of UK or Welsh Ministers to meet their legal obligations around net zero targets or interim carbon budgets.

1.5.6 Under the further sensitivity analysis considering the impact of reporting CH4 using a much shorter 20-year time horizon than the GWP value routinely used within national and international carbon accounting protocols, the Proposed Development delivers operational GHG reductions of almost 75% for the default fuel gas mix and over 57% for the extreme scenario consisting of 100% LNG.

1.5.7 As discussed in Table 6 of the **Applicant's Response to Deadline 1 Submissions [REP2-019]**, the use of a 100-year time horizon for the reporting of greenhouse gases is a standard approach that has been applied across international carbon accounting systems and frameworks because it best represents the long-term warming that is driven by the cumulative emissions of CO_2. It is explicitly used within the generation of the UK Government's emissions factor dataset, and by the Committee on Climate Change when developing their statutory advice to government on national carbon budgets.

1.5.8 Although it is notionally possible to quantify in the way done above the warming impact of certain gases over shorter time periods, this is not a superior methodology or one that is required and it faces the basic problem that there are no relevant benchmarks against which to assess the results for that shorter time period. Such different approach to emissions reporting is not one that follows standard practices as adopted by national governments and international bodies such as the Intergovernmental Panel on Climate Change.

1.5.9 Crucially, emissions of methane expressed using a 100-year time horizon are not being underreported. The GWP100 value for CH_4 is numerically lower than the GWP20 value as the climate impacts of CH_4 take place over a shorter timescale (due to the 12-year atmospheric lifetime of Ch_4) before dropping to near zero. As such the GWP100 value simply averages this impact over the 100-year period used to manage long-term temperature increases.

1.5.10 Moreover, and fundamentally, because emissions totals reported using a 20-year time horizon are not merely quantitatively but qualitatively different from those used for carbon budgets generated using a longer time period, such totals are not comparable and cannot be compared against the carbon budgets, and cannot be contextualised against them, and cannot be used to inform any evaluation of significance that relies on such a comparison.

1.5.11 In relation to effective carbon capture rates, the Applicant maintains that the 95% capture rate assumed within the GHG assessment is realistic, and this is supported by the Environment Agency's BAT guidance for post-combustion carbon dioxide capture. But it is possible to model the effect of lower capture rates to illustrate that even with substantially reduced capture rates, a CCGT with CCS will continue to provide secure, dispatchable electricity in support of the national grid with carbon intensity far below that of an existing, unabated CCGT.

1.5.12 The Applicant would also note that the required participation of the Proposed Development within the UK ETS provides not only a powerful economic incentive to reduce emissions through maintaining a high capture rate, but also ensures that the collective emissions from all installations participating in the scheme cannot exceed the net zero trajectory required for the UK to achieve its legally binding net zero targets and interim carbon budgets.