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## **D5 / Section A**      **Introduction**

- 1 Climate Emergency Science Law (CESL), established in 2017 by Dr Andrew Boswell, brings together multidisciplinary expertise in science, computing, energy and climate governance, and evidence-based legal and policy analysis to deliver rigorous, scientifically grounded scrutiny of UK climate decision-making. A resume of my professional background was provided at Section F of my Part A Written Representation (D1 Part A submission, [REP1-077]).
- 2 This submission (deadline D5 submissions) provides my written comments on ISH4 and applicant's written summary of ISH4 [REP4-084]. It also provides:
  - (A) New evidence at sections B and C on latest UK Energy Trends, the DESNZ WTT factor methodology (following a Government EIR response) and on established international regulation for modelling and assessing short term methane impacts;
  - (B) Response to the applicant's submissions on non-CO2 emissions in aviation at section D;
  - (C) New submissions on significant assessment and benchmark at section E;
  - (D) Response to the applicant's substitution arguments made at ISH4 at section F;
  - (E) And written summary of CESL's ISH4 oral submissions on the climate benefits of CQLCP at section G.
- 3 An inventory / summary of this submission is given at section H.
- 4 I have used AI to assist with drafting and refining the textual content of submissions to the examination for clarity and presentation. Following the recent update to the PINS guidelines, a revised full statement<sup>1</sup> on the use of AI is provided at Section I of this submission
- 5 This submission has three in-document short appendices. In addition, twelve full documents have been submitted to the examination library, as noted in the footnote<sup>2</sup>.

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<sup>1</sup> In accordance with PINS guidance on "Use of artificial intelligence in casework evidence", 6 September 2024, as updated 20 February 2026

<sup>2</sup> Appendices provided as full documents for the examination library:

- (1) EIR response, DESNZ 27 March 2026, on Natural Gas WTT Emission Factor Calculation Methodology
- (2) Exergia et al. (2015). "Study on actual GHG data for diesel, petrol, kerosene and natural gas".
- (3) Sherwin et al (2024), "US oil and gas system emissions from nearly one million aerial site measurements".
- (4) Burdeau (2025), "High-resolution national mapping of natural gas composition substantially updates methane leakage impacts".
- (5) Cusworth (2026), "Duration of super-emitting oil and gas methane sources".
- (6) DESNZ, "Energy Trends", Statistical Release 2 April 2026
- (7) Balcombe (2018), "Methane emissions: choosing the right climate metric and time horizon"
- (8) *R (LADACAN) v Secretary of State for Transport* [2025] EWHC 3206 (Admin), Judgment, Mrs Justice Lang, 8 December 2025
- (9) Seventh Carbon Budget, Methodology report (2025)
- (10) UK OPRED guidance (2025) on offshore oil and gas Scope 3 emissions
- (11) DESNZ, 2025, Clean Flexibility Roadmap
- (12) DESNZ, 2026, Fossil Fuel Price Assumptions (FFPA) 2025



**B.1 Latest DESNZ “Energy Trends” data**

- 6 The latest DESNZ Energy Trends<sup>3</sup> (April 2026) [supplied to the examination library as stand-alone Appendix to this submission] reports that US LNG accounted for 76% of UK LNG imports in 2025 (up from 68% in 2024), with US LNG volumes increasing by 38% year-on-year. LNG imports overall also rose in 2025. By contrast, Qatari LNG has declined to a negligible share, with Qatar accounting for just 1.8% of total UK gas imports in 2025. This confirms that the UK’s LNG supply is now overwhelmingly dominated by US shale-derived gas, and that the trend is increasing.
- 7 The statistics also show that UK gas supply from imports in 2025 was broadly split between:
- Norwegian pipeline imports meeting around 47% of UK domestic demand;
  - with US LNG meeting c.15% of demand;
  - and other LNG around 4-5% of demand<sup>4</sup>.

This demonstrates that while UK and Norwegian pipeline gas dominates baseline supply, LNG is the predominant marginal gas supply layer, and it is now three quarters US-derived LNG. LNG is the swing supply in times of system stress when dispatchable power would be engaged, the driver of imports increase (+24% in 2025) and the enabler of UK gas exports (+12% in 2025). CESL laid out arguments at D3 why this trend is set to continue based on NESO and other official modelling [REP3-085, section B.1].

- 8 CESL requests that the ExA treat this latest UK government data as a material post-ISH4 hearing document for the examination record.

**B.2 EIR Response from DESNZ Regarding the Natural Gas WTT Emission Factor Calculation Methodology**

**B.2 (A) Official confirmation of evidence previously supplied by CESL**

- 9 CESL notified the examination of an EIR request submitted to DESNZ on its Natural Gas WTT Emission Factor Calculation Methodology at deadline D3 (with the full EIR reproduced at [REP3-085, Appendix E]). A response was received from DESNZ on 27 March 2026 and is reproduced in Appendix A of this submission (with a stand-alone copy supplied to this examination library).
- 10 The EIR evidence establishes that the DESNZ WTT factor is not capable of representing a reasonable range of current and foreseeable upstream emissions conditions. As this

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<sup>3</sup> DESNZ, “Energy Trends”, Statistical Release 2 April 2026, [https://assets.publishing.service.gov.uk/media/69cd1451b5210036050bc625/Energy\\_Trends\\_March\\_2026.pdf](https://assets.publishing.service.gov.uk/media/69cd1451b5210036050bc625/Energy_Trends_March_2026.pdf) - supplied as stand-alone appendix. Page 14: “**Liquefied natural gas (LNG) imports increased by 24 per cent in 2025 compared with 2024, which included a 38 per cent increase in imports from the USA (though LNG imports were relatively low in 2024). The US remained the largest source of LNG in 2025 after overtaking Qatar for the first time in 2022. LNG imports from the US accounted for 76 per cent of LNG imports and 23 per cent of total imports, equivalent to 15 per cent of demand. Imports of LNG from Algeria increased by 56 per cent in 2025 compared with 2024, making it the second largest source of LNG and overtaking Qatar. Qatari LNG imports fell by 4.2 per cent in 2025, accounting for 1.8 per cent of total imports, down from a peak of 39 per cent in 2011.**”

<sup>4</sup> Actual domestic demand figures are: UK domestic production - ~48–50%; Norwegian pipeline gas - ~47%; US LNG - ~15%; Other LNG (Algeria, Qatar, etc.) - ~4–5%. Gross demand sums to >100% because the UK exports ≈ 10–12% of UK gross gas demand.

parameter drives the majority of lifecycle emissions, the ES fails to identify and describe the project's likely significant effects. Any significance assessment derived from it is therefore unsafe and cannot support a lawful reasoned conclusion. The details are explained below.

11 The EIR confirmed the evidential facts as previously presented by CESL at deadline D1 [REP1-077] and D3 [REP3-085] submissions, as follows:

- (A) **Emission intensities associated with upstream and midstream stages (extraction, processing, liquefaction, shipping) are frozen at Exergia (2015)<sup>5</sup> values with no subsequent updates.** DESNZ confirms that the source-specific emission intensities for upstream and midstream stages for UK, Norway, Netherlands, and Qatar LNG are taken from this single 2015 European Commission study<sup>6</sup> and that "*an updated version of the report has not been published since they were introduced into the methodology.*"

The Exergia report data for the underlying intensity data pre-dates the now very comprehensive satellite-era evidence base by over a decade (eg: Sherwin (2024)<sup>7</sup> [supplied to the examination library as stand-alone Appendix to this submission], Burdeau (2025)<sup>8</sup> [supplied to the examination library as stand-alone Appendix to this submission], Cusworth (2026)<sup>9</sup> [supplied to the examination library as stand-alone Appendix to this submission], IEA (2025) [REP3-076], MethaneSAT (2026) [REP3-080], and others submitted by CESL in appendices at D1 and D3). This directly confirms CESL's D3 argument that any annual reweighting of the emission factor adjusts supply proportions within a fixed and outdated intensity framework.

- (B) **Only Qatar LNG intensity data exists in the model — all LNG is treated as Qatar LNG.** The response states explicitly that "*as only a factor for Qatar LNG is available this is used for all LNG imports.*" This is highly material as CESL notes above that approximately 76% of 2025 LNG imports originated from the United States. US LNG carries materially higher upstream emission intensity than Qatar LNG, due to the energy-intensive liquefaction process in US export terminals and higher wellhead leakage rates from US shale extraction<sup>10</sup>.

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<sup>5</sup> Exergia et al. (2015). Study on actual GHG data for diesel, petrol, kerosene and natural gas. A study by Exergia, E3 Modelling and COWI for the European Commission, DG ENER. [https://energy.ec.europa.eu/system/files/2015-08/Study%2520on%2520Actual%2520GHG%2520Data%2520Oil%2520Gas%2520Final%2520Report\\_0.pdf](https://energy.ec.europa.eu/system/files/2015-08/Study%2520on%2520Actual%2520GHG%2520Data%2520Oil%2520Gas%2520Final%2520Report_0.pdf)

<sup>6</sup> Exergia (2015), *ibid*, **supplied as a stand-alone Appendix for the examination library with this submission**

<sup>7</sup> Sherwin, E.D., Rutherford, J.S., Zhang, Z. *et al.* US oil and gas system emissions from nearly one million aerial site measurements. *Nature* **627**, 328–334 (2024). <https://doi.org/10.1038/s41586-024-07117-5> - supplied as stand-alone appendix to this submission

<sup>8</sup> Burdeau, P.M., Sherwin, E.D., Biraud, S.C. *et al.* High-resolution national mapping of natural gas composition substantially updates methane leakage impacts. *Nat Commun* **16**, 11297 (2025). <https://doi.org/10.1038/s41467-025-66465-6> - supplied as stand-alone appendix to this submission

<sup>9</sup> Cusworth, D.H., Bon, D.M., Varon, D.J. *et al.* Duration of super-emitting oil and gas methane sources. *Nat Commun* **17**, 2011 (2026). <https://doi.org/10.1038/s41467-026-68804-7> - supplied as stand-alone appendix to this submission

<sup>10</sup> The distinctive characteristics between Qatar and US LNG production are structural. Qatar's LNG is [was] produced from a highly concentrated conventional reservoir (the North Field) within a vertically integrated system operated by QatarEnergy, with short gathering distances and co-located liquefaction infrastructure. By contrast, US LNG is predominantly derived from shale gas systems (notably the Permian and Marcellus basins), characterised by very large numbers of wells, extensive gathering and transmission networks, and multiple operators. This structural distinction is directly relevant to greenhouse gas assessment because methane emissions scale with system complexity, component count, and operational heterogeneity. Empirical studies using aerial and satellite measurements demonstrate that oil and gas methane emissions are highly skewed, with a small number of "super-emitting" sources contributing a disproportionate share of total emissions, and that such emissions are more prevalent in large, distributed production systems. (For example, Sherwin, E.D., Rutherford, J.S., Zhang, Z. *et al.* US oil and gas system emissions from nearly one million aerial site measurements. *Nature* **627**, 328–334 (2024) <https://www.nature.com/articles/s41586-024-07117-5>, provided as a stand-alone appendix, provides one of the most comprehensive, measurement-based estimates of methane emissions from the US onshore oil and gas system to date).

The DESNZ model, if applied to recent years of UK DUKES data<sup>11</sup>, would therefore systematically apply an outdated emission intensity from the wrong country, and a country with structurally lower emissions intensity, to the largest import sector: US LNG. This is regardless of how the supply weightings are applied.

- (C) **The DUKES data used to weight supply shares is also frozen.** Table 2 in the EIR response shows that the DUKES year used for the 2024 and 2025 conversion factor publications is the 2022 edition, covering supply chain mix data for 2021<sup>12</sup>. The factor labelled "DESNZ 2025" in the ES [APP-058] is in fact weighted on 2021 supply data — which predates the recent surge in US LNG imports.
- (D) **Annual updates were explicitly discontinued from 2023 onwards.** The response confirms: "*Since 2023, annual updates of the WTT factors, including that for natural gas, were ceased. The value supplied in 2024 and 2025 publications is therefore the value published in 2023.*"
- (E) **DESNZ intends to review and revise the WTT factors ahead of the 2027 publication.** The response ends: "*DESNZ intend to review the well-to-tank factors for fuels, including those for LNG and natural gas, ahead of next year's publication of the UK GHG Conversion Factors 2027.*" This is an official acknowledgement by the responsible department that the current factors require review.

12 This contradicts the statements, made by the applicant at ISH4 (para 1.5.12 of REP4-084), which imply that the factor dynamically tracks recent LNG share changes with a 2-year lag and that specific data for US LNG is included:

- (A) the "*supply of natural gas in the UK comes from various sources. Substantial amounts come from Norway, plus a share of the existing UK natural gas market that comes in by ship from Texas or Qatar [sic] etc. These various sources need to be aggregated to create an overall Well to Tank (WTT) emissions factor*"; and
- (B) "*Evidence for an increase in natural gas WTT emissions due to an increase in LNG imports can be found in the UK Government's methodology paper published in 2021... Those factors are published 2 years in arrears.*"

The EIR response makes clear that historic annual updating ceased after 2023, with the last DUKES year used being 2021, and that all LNG is treated as Qatari LNG regardless of actual provenance.

The very significant increase in US LNG imports from 2022 onwards cannot have been modelled in the DESNZ WTT 2025 factor used in the ES under any circumstances, because (a) the weighting data is frozen at 2021 and (b) the underlying US LNG intensity is not in the model at all.

13 CESL requests that the ExA treat UK government official clarification of the WTT factor as a material post ISH4-hearing document for the examination record.

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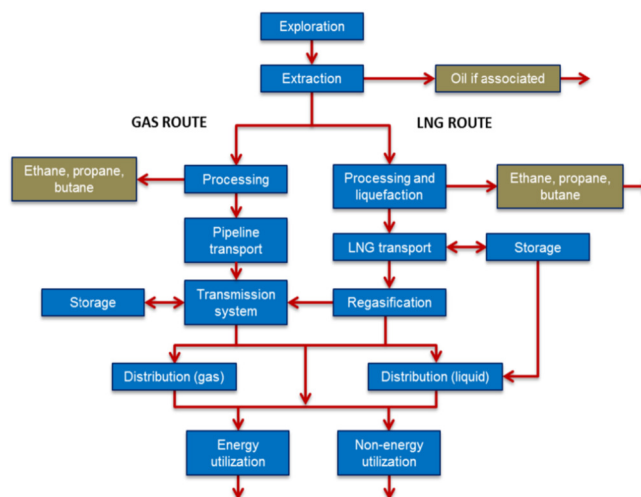
<sup>11</sup> Which it is not, see next bullet

<sup>12</sup> as previously highlighted by CESL at REP3-085, section B.3 (B)

**B.2 (B) Upstream emissions calculations: an established methodology exists, but the data applied is both out of date and incomplete**

- 14 The EIR release confirms that a methodology exists for calculating natural gas upstream emissions. In fact, this methodology is laid out in detail in the EU Exergia report<sup>13</sup> from 2015 at section 3.4 “Methodological Approach for Natural Gas GHG Assessment” on page 101 of the report. Exergia itself refers to previous contributing studies on which the Exergia methodology was founded at section 1.4 “Contribution of the Present Study to Oil and Gas GHG Emissions Assessment”. These go back further based on official reports from around the world. Similar methodologies for emission accounting inventories exist around the world<sup>14</sup>. The point is that the methodological basis for calculating upstream emissions has been available for many years in official technical reports and scientific literature.
- 15 At the simplest level, the methodology simply sums the different supply chain gas streams and the emission intensity of each stream. So, for example, each tonne of natural gas arriving at the CQLCP development from the UK National Transmission Service, has the accumulated upstream emissions from each different supply chain stream composed in that tonne of natural gas.
- 16 The emissions released to the atmosphere along each stage of a stream may be summed along the different stages depending upon the source and type of transport (pipeline or LNG). This is illustrated below from Exergia Figure 3-30.

Figure 3-30 Natural gas supply chain (Source: CE, Delft)



**Figure 1: Exergia report Figure 3-30 reproduced**

<sup>13</sup> supplied to the examination library as stand-alone Appendix to this submission

<sup>14</sup> For example, the GREET model from the US Argonne National Laboratory, see “Updated Natural Gas Pathways in GREET 2022”, A Burnham, 2022, [https://greet.anl.gov/files/update\\_nq\\_2022](https://greet.anl.gov/files/update_nq_2022)

17 In 2015, Exergia identified these natural gas streams arriving into the North EU area, as shown by Figure 3-33 from the report. The EIR says “Data from the upstream and mid-stream stages for gas supplied from UK, Norway, Netherlands and Qatar liquefied natural gas (LNG) are taken from Table 5-23 Carbon Intensity of Natural Gas streams arriving to North EU” which makes it clear that the UK has used these gas streams for its modelling its emissions factors since Exergia was adopted in 2017 (DUKES year 2015). This assumption of UK gas stream sources may have been adequate in 2015, but as above it is quite clearly inadequate in 2025/2026 and for 2035-2065.

Figure 3-33 Natural gas streams arriving to the North EU region

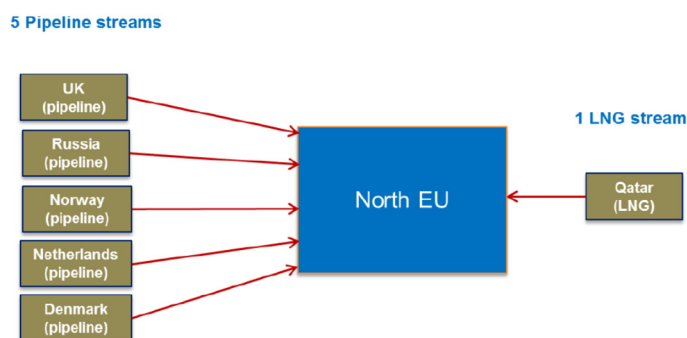


Figure 2: Exergia report Figure 3-33 reproduced

18 This methodology at its simplest is what is reproduced in all GHG calculations for upstream emissions. Some recent academic studies have calculated the emissions along one overall type of supply chain stream (eg: US LNG export supply chains, including to the UK, in the case of Howarth (2024)<sup>15</sup>) which may have considerable variation within it due to different extraction, processing and transportation modes. However, the overriding principle of summing effects along gas streams is the same.

## B.2 (C) Lower and upper bounds for the upstream emissions

19 The Applicant characterises the DESNZ WTT factor as a representative aggregate of upstream emissions derived from multiple gas supply sources [REP4-084], section 1.5.12.

20 However, this characterisation is not tenable. An aggregate of this kind is only meaningful if it reflects the distribution of reasonably foreseeable supply conditions. The evidence now before the examination demonstrates that the DESNZ WTT factor does not do so quite starkly. In particular:

- LNG provenance is not represented: all LNG is modelled as Qatar LNG;
- US LNG, which now dominates UK LNG imports, but is absent from the model;
- underlying emission intensities are fixed to a 2015 dataset;
- supply weighting is fixed to 2021 conditions and not updated thereafter.

21 These are not neutral simplifications. Each operates in the same direction, excluding or suppressing higher-intensity supply pathways that are already material to current UK gas supply, and will be more so in the future particularly under the marginal supply conditions

<sup>15</sup> Howarth, “The greenhouse gas footprint of liquefied natural gas (LNG) exported from the United States”, Energy Science & Engineering, October 2024, <https://scijournals.onlinelibrary.wiley.com/doi/10.1002/ese3.1934> - supplied to examination library as [REP1-086] and [REP1-087].

relevant to a dispatchable plant like CQLCP. The result is a systematic downward bias in the aggregated value which is then reflected in the identification and description of the upstream emissions in EIA.

- 22 It is helpful here to consider what reasonable lower and upper bounds of the upstream emissions might be. A reasonable formal lower bound of the upstream emissions could be taken as the current static gas supply mix for the latest year available eg: 2025 from the latest Energy Trends data. And a reasonable upper bound being the likely projection of emissions during the 2035-2065 period with US LNG providing the marginal supply to dispatchable plants like CQLCP (and with less UKCS and Norwegian gas in the available background supply, as evidenced in [REP3-085], sections B.1(A) and B.1(B)). This upper bound is effectively the indicative sensitivity test which CESL has already presented at Table 5, [REP3-085], based on credible future stress-system operating conditions.
- 23 A full derivation of a formal lower bound of the upstream emissions could be undertaken, for example, using the current supply mix eg: from the latest Energy Trends data.
- 24 Whilst CESL has not undertaken the derivation of such a formal lower bound. However, CESL does submit that it is clear the direction of that bias in the DESNZ WTT factor is unambiguous as laid out above: correcting the relevant inputs to realistic 2025 supply would increase the upstream emissions estimate considerably upwards.
- 25 Accordingly, CESL submits that the DESNZ WTT factor cannot be relied upon as a representative lower bound aggregate of upstream emissions for the purposes of identifying and describing likely significant effects.

## **B.2 (D) The status of the DESNZ WTT based EIA**

26 CESL submits these points to the ExA:

- (A) There is an established methodology for calculating upstream emissions for natural gas. The issue for the examination with respect to the DESNZ WTT factor is not whether the methodology is correct. The methodology is well established. The issue is that, as applied currently, it is not representative of foreseeable conditions and even underestimates even a reasonable lower bound of the upstream emissions based on today's conditions. This is an issue that can be corrected by updating the data, not the methodology itself: updating the source streams and updating their emission intensities.
- (B) Therefore, the DESNZ 2025 WTT is not fit for purpose as an input to the EIA. It does not accurately describe current or foreseeable conditions, and associated emissions at the EIA stage identifying and describing likely significant effect. It cannot provide a realistic lower bound estimate of likely significant effects of today's conditions of UK natural gas supply. This underestimate then infects the later significance assessment stage (this is explained in more detail later in section B.3(A) "Implications for significance assessment").
- (C) CESL has submitted at D3 that to correctly estimate the reasonable worst case scenario for a dispatchable power station such as CQLCP which is operational at times of system stress when LNG is predominant the marginal gas supply, that the upper bound case should be modelled on LNG-dominated marginal supply conditions (as evidenced in NESO/GSSA stress scenarios, see [REP3-085]). As above, this can provide the upper bound estimate of the uncertainty of the upstream emissions as long as it is based also on recent emissions intensity

studies. The dynamics of marginal gas supply, and its difference to static annual averages were presented at [REP3-085], sections B.1(A) and B.1(B).

### **B.3 Clarification of CESL's position on the WTT factor**

27 CESL previously said at D3 [REP3-085/146]:

*"The solution sought is proportionate. CESL invites the ExA to ensure that where upstream variability is acknowledged and may materially influence lifecycle totals, the ES demonstrates—through sensitivity testing—that likely significant effects have been assessed on a reasonable worst-case basis. Absent that demonstration, the reasoning chain between emissions calculation and significance conclusion remains incomplete."*

28 Based on this solution where sensitivity testing is assumed to be carried out and the likely significant effects have been assessed on a reasonable worst-case basis, I made statements at the ISH4 accepting the WTT factor as a "starting point". These were recorded by the applicant at [REP4-084], section 1.5.24 as:

*"Dr Boswell stated that he is not challenging the use of the government WTT factor, but is saying that there is an uncertainty associated with that which has not been assessed. The starting point is the WTT factor and then a sensitivity test is needed over the top of that. When it comes to short-term methane, there is a second sensitivity test to bring in the GWP20 factor to identify and describe the likely significant impacts for those effects. Dr Boswell is not saying the existing factor should be removed but that step-wise sensitivity tests need to be built in."*

29 CESL does not dispute the fairness of the applicant's recording here.

30 However, following the new evidence presented above, and also another factor which will be covered later (that the DESNZ WTT factor is NOT used for upstream emissions modelling in the UK carbon budget modelling, see section E.1 (C)), CESL wishes to revisit this and make the following clarifications. CESL requests that the ExA treats the following as an update of CESL's position as of Deadline D5.

31 CESL has now presented new evidence demonstrating that the DESNZ WTT factor is not merely uncertain, but it is structurally unrepresentative of the current UK gas supply; therefore it cannot function even as a baseline descriptor. This is clear evidence that the DESNZ WTT factor does not adequately or accurately capture the upstream emission effects that are reasonably foreseeable across CQLCP's operational lifetime, and understates those effects, even in a lower bound case, based on current supply conditions.

32 As set out in Section B.2 above, the EIR response confirms that the DESNZ WTT factor clearly understates upstream emissions. It includes no accurate emission intensity for US LNG imports, which comprised 15% of UK gas demand in 2025 (and is expected to increase year-on-year), but forms a structurally higher proportion of marginal supply during periods of grid stress when CQLCP would be dispatched. As it is frozen on historical data that does not reflect supply conditions since 2021, it provides no basis for forecasting the upstream intensity of gas supplied during CQLCP's operational period from approximately 2035 to 2065.

33 As such, the DESNZ WTT factor does not provide a "fit for purpose" identification or description of the likely significant effects of CQLCP on the climate. *'On the uncontentious basis that upstream emissions need to be factored in, they need to be done so "in an*

*appropriate manner*” (reg 5(2))’ [CESL legal submission, REP4-092], CESL submits that calculations based on the DESNZ WTT factor cannot be considered “appropriate”.

34 In the light of this new evidence, CESL, therefore, does not accept that the DESNZ WTT factor can be used for a “starting place” description of effects, later to be used for significance assessment.

35 However, CESL does submit, as above, that the principle of the underlying methodology of summing effects along different natural gas streams, as used in Exergia, is well established. The issue remains that as currently implemented by the DESNZ WTT, it is not fit for purpose as input to EIA process for CQLCP, either to identify and describe the effects of the emissions. or to subsequently assess their significance.

### **B.3 (A) Implications for significance assessment**

36 The ES [APP-058] makes percentage comparisons of CQLCP lifecycle emissions, based on using the DESNZ WTT factor, against the remaining UK [Table 20-9] and Welsh [Table 20-10] carbon budgets, and, based on these comparisons, later concludes at 20.6.68:

*“But the contextualisation of emissions against the UK and Welsh carbon budgets and targets leads to an overall evaluation of significance for the Proposed Development’s operational GHG impact of moderate adverse and significant (Ref 20-27).”*

37 CESL submits this significance assessment cannot provide a lawful basis for a reasoned conclusion. The logical sequence leading to this conclusion is as follows:

- The EIA Regulations (Regulation 5(2) and Schedule 4) require the Environmental Statement to identify and describe the likely significant effects of the proposed development on the environment, including its greenhouse gas effects.
- The upstream WTT factor is not a peripheral input to that description: on the applicant's own figures, it drives approximately 63% of the assessed operational lifecycle emissions total.
- A parameter that is materially inaccurate — as the DESNZ EIR response now confirms, being frozen on 2021 supply-share weightings, and based on source emission intensities from a 2015 study that has not been updated, and applying Qatar LNG intensity to all LNG imports regardless of actual provenance — does not produce an identification or description of likely significant effects.
- It produces an identification and description of a hypothetical and false emissions profile that does not reflect (1) the theoretical situation of a constructed CQLCP operating today (ie: in 2026) under today’s fuel supply scenario (ie: CESL’s suggested lower bound), and (2) the reasonably foreseeable upstream conditions under which CQLCP will operate in the future (ie: between 2035 and 2065, and CESL’s suggested upper bound).
- The assessed effects are therefore not the likely significant effects within the meaning of the Regulations.

- Because the significance conclusion at paragraph 20.6.68 of the ES is built directly upon that flawed description — it contextualises the calculated lifecycle total against UK and Welsh carbon budgets and derives its conclusion of "moderate adverse and significant" from that contextualisation — that the significance conclusion is infected by and inherits the legal insufficiency of the identification and description stage.
- A significance assessment cannot provide a lawful basis for a reasoned conclusion where the description of effects on which it rests does not meet the statutory standard.

- 38 This can be summarised: parameter error → lifecycle error → benchmark comparison error → unreliable significance assessment → unreliable decision.
- 39 There are in fact other methodological issues with the carbon budget comparison which will be described later in section E, "Significance assessment and benchmarking". However, CESL consider that the failure against the regulations, identified above, is alone sufficient to render any subsequent significance assessment unlawful.
- 40 It is now clear that the methodology is well established, but the data is out of date and incorrect. This has been acknowledged by the responsible government department: this is the same department responsible whose Secretary of State is the decision maker in this application.
- 41 The new evidence disclosed in the DESNZ EIR response reinforces CESL's proportionate request that the ExA direct the applicant to provide a sensitivity analysis of upstream emissions using a higher-intensity WTT factor representative of reasonably foreseeable supply conditions.
- 42 CESL's position remains that a lawful EIA significance assessment can only be made after a sensitivity analysis of upstream emissions as per the legal submission [REP4-092]:

*"Obtaining the additional information suggested by CESL – namely via a sensitivity analysis of the upstream emissions, the use of the short-term GWP20 methane metric, and the Scope 1 combustion emissions– would help correct the deficiencies in the ES that have been identified, which (as above) are legal as opposed to subjective deficiencies. There may be other legally adequate ways to do this, but none have yet been suggested."*

## **D5 / Section C      Evidential Updates: Established international modelling of short term methane impacts by the International Maritime Organization (IMO)**

- 43 Since the ISH4, CESL has become aware that since 2023 the International Maritime Organization (IMO)<sup>16</sup> Guidelines on Life Cycle GHG Intensity of Marine Fuels (LCA Guidelines<sup>17</sup>) have mandated the use of GWP20 as well as GWP100. In other words, current scientific and regulatory practice for LCA<sup>18</sup>s for international shipping now uses the short-term GWP20 methane metric alongside GWP100 – the same modelling approach that CESL is requesting is used for CQLCP.
- 44 The actual text of those guidelines<sup>19</sup> states explicitly that GHG intensity must be reported in two ways:
- (A) The sustainability theme for greenhouse gases requires: GHG intensity in gCO<sub>2</sub>eq/MJ (GWP100); and GHG intensity in gCO<sub>2</sub>eq/MJ (GWP20) for comparative purposes.
  - (B) The mathematical formulae for both calculations were set out directly in the guidelines text, with GWP values of CH<sub>4</sub> at 28 (GWP100) and 84 (GWP20) based on IPCC AR5.
- 45 Further information on the adoption of this international regulatory guidance, is given at Appendix C of this document. The UK Government supported and voted for this at the IMO.

### **C.1 Relevance to CQLCP EIA assessment**

- 46 CESL's legal submission [REP4-092] sets out that the "*decision-maker must have "full knowledge" of the project's likely significant effects on the environment*" (para 11); that the "*assessment of the scheme's emissions must be done on a reasonable worst-case basis: Rochdale*" (para 21). Further "*there is a clear risk that if the deficiencies identified by CESL are not corrected ... climate metrics (particularly with respect to the short-term impacts of methane) ... will lead to a decision that is: i. irrational, ii. In breach of the EIA Regulations ...*" (para 25).
- 47 The argument is that a GWP100-only assessment of a natural gas CCS plant systematically suppresses the short-term climate forcing of upstream methane emissions [REP4-092, para 25(c)] from the EIA descriptions of the environmental impacts. The difference between GWP100 and GWP20 assessments is substantial – see the indicative sensitivity test provided by CESL at D3 [REP3-085, Table 5] which shows both. This is based on forecasting for the development years of 2035-2065 when UK and Norwegian gas supplies will be significantly less in the static annual supply of UK natural gas, and the dispatchable power plants are likely to draw from the marginal supply provided by LNG, primarily for the US.

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<sup>16</sup> From IMO website, <https://www.imo.org/en/about/pages/default.aspx>, "*IMO – the International Maritime Organization – is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. IMO's work supports the UN SDGs.*"

<sup>17</sup> which set out methods for calculating well-to-wake and tank-to-wake GHG emissions for all fuels and other energy carriers used on board a ship

<sup>18</sup> Life Cycle Assessments

<sup>19</sup> Annex 14 of MEPC 80/17/Add.1 provided as a stand-alone appendix

- 48 The difference in the likely significant effects in the 30-year CQLCP Scope 3 upstream emissions<sup>20</sup> is 130,233,559 tCO<sub>2</sub>e on GWP100, and 249,025,106 on GWP20 [REP3-085, Table 5]. That is the climate impacts are approximately doubled when the short-term impacts of methane are included in the analysis. For CQLCP, this change of magnitude of climate impact, representing short-term rises in global temperature, must inevitably be seriously considered at the significance assessment stage (see section E “Significance assessment and benchmarking”).
- 49 Further the failure to even look at short term climate impacts in the EIA represents a failure to describe the uncertainty envelope of the lifecycle analysis: *“In any event, a degree of uncertainty is not a free pass to fail to assess likely significant effects. There is a requirement in Schedule 4, paragraph 6 of the EIA Regulations to describe details of difficulties and the main uncertainties involved”* ([REP4-092], para 25 b) (ii) ).
- 50 The IMO adoption of the GWP20 metric, alongside GWP100, provides direct evidential support for the proposition of modelling both the short-term and long-term climatic impacts of the supply chain emissions. The IMO's own LCA Guidelines state explicitly that GWP100 alone is insufficient and that GWP20 must be provided for comparative purposes. This is the considered view of a 175-nation regulatory body, adopted after years of negotiation and extensive scientific input, specifically because GWP100 alone was found to be inadequate for the modelling methane-intensive fuels. That finding applies with at least equal force to a gas CCS plant using reasonably foreseeably significant quantities of LNG as it does to LNG fuelled shipping by the IMO.

## **C.2 The EIA Directive's Own Language**

- 51 The EIA Directive requires assessment of "short-term, medium-term and long-term" effects. GWP100 is by definition a 100-year average. It does not measure the short-term effect of methane at all — it averages the short-term peak forcing (at typically 12 years) with the 88 subsequent years during which the methane has largely decayed. GWP20 by contrast models the actual atmospheric climate forcing more temporally accurately (see the graph from Balcombe (2008)<sup>21</sup> reproduced at Figure 5 in [REP1-077]) over the period most relevant to near-term temperature targets, including the 1.5°C Paris temperature target to which the UK is committed, and also relevant to the projects lifetime 2035 – 2065. An EIA that uses only GWP100 therefore cannot, by construction, fulfil the directive's requirement to assess short-term effects of methane emissions.

## **C.3 Scientific Consensus**

- 52 The IMO decision supports the scientific consensus of GWP20 being a useful metric for short-term methane impacts (as per Balcombe etc al<sup>22</sup>, referred to at [REP1-077, section J.2], and now supplied as a stand-alone appendix).
- 53 Whilst GWP100 is used for national inventory reporting and accounting under the UN Climate regime, it does not mean it is adequate for project-level EIA assessment. National inventories are aggregate accounting tools — they are not designed to assess whether a

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<sup>20</sup> against 24,242,682 tCO<sub>2</sub>e based on the underestimated DESNZ WWW factor

<sup>21</sup> Balcombe etc al, 2018, “Methane emissions: choosing the right climate metric and time horizon”, <https://pubs.rsc.org/en/content/articlelanding/2018/em/c8em00414e> supplied to the examination library as stand-alone Appendix to this submission

<sup>22</sup> Balcombe, ibid, supplied as a stand-alone appendix

specific project's methane emissions are adequately characterised for planning purposes. The IMO recognised exactly this distinction: it uses GWP100 for its primary regulatory metric but mandates GWP20 for comparative purposes precisely because the single-metric approach hides important information about near-term climate forcing. The same logic applies to the project-level EIA here for CQLCP.

- 54 The IPCC does not recommend GWP100 over other metrics. The IPCC AR5 explicitly stated there is no scientific argument for selecting 100 years over other choices, and AR6 repeated this. The Balcombe paper makes this point directly<sup>23</sup>. The IMO, in adopting dual GWP reporting, was implementing the IPCC's own position that no single time horizon is adequate. A developer who relies on GWP100 as the "IPCC standard" is misrepresenting the IPCC's actual position (see [REP3-085, section C.1]), but more crucially filtering out vital information from the EIA on short-term climate impacts.
- 55 Further dual use of GWP20 and GWP100 is mandated by the IMO precisely because neither alone is sufficient. The point for EIA purposes is not which metric is primary but whether a GWP100-only assessment provides the complete "full knowledge" picture that EIA Regulations require. The IMO's position supports the case being made here that both GWP20 and GWP100 are required to see the "full knowledge" EIA picture: and provides strong corroborative evidence that this is considered good practice.

#### **C.4 Sector neutrality**

- 56 The scientific basis for dual GWP reporting is not sector-specific — it derives from the physics of methane's atmospheric lifetime and radiative forcing, which is the same regardless of whether the methane originates from an LNG ship engine or a gas supply chain feeding a power station. The IMO's conclusion that GWP100 alone is inadequate is a conclusion about the properties of methane, not about the properties of ships. It applies with equal force wherever methane emissions are significant and near-term climate impacts are in question, including for CQLCP.

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<sup>23</sup> Balcombe, *ibid*, see section 6.1 "Selecting the timeframe"

**D5 / Section D      Response to ISH4: applicant's example of non-CO2 emissions from aviation**

57 At ISH4, Mr Strachan KC for the applicant argued that CESL's request for sensitivity analysis or scenario testing of upstream methane variability in the CQLCP Environmental Statement should be rejected by analogy with the treatment of non-CO<sub>2</sub> aviation emissions in "recent litigation". The relevant section of the ISH4 transcript<sup>24</sup> is reproduced in the footnote<sup>25</sup>.

58 Following the oral submission, the applicant submitted [REP4-084], para 1.5.34:

*"Mr Strachan KC noted that realistic worst cases are those which are realistic, not every conceivable scenario. Likely significant effects are those which are likely. It is not about dealing with every scenario. It is important to refer to what Lord Leggatt said in the Finch judgment that conjecture and speculation have no role in the EIA process. Using the Finch judgment to say that every uncertainty in the world needs to be covered and included in an ES is precisely what Finch was trying to avoid. In that case, there were established knowns; if that is applied to what has been discussed and raised by Dr Boswell, one is automatically in the realms of the unknown and so speculation. The ExA will be assisted in that respect by considering the more recent litigation applying Finch in the aviation sector. The court found it legitimate that without a benchmark, there is nothing to compare against for the purposes of an assessment. That is precisely what is happening in this discussion."*

59 The applicant's argument has three parts:

- (A) The position on upstream emissions for CQLCP is directly analogous to the treatment of non-CO<sub>2</sub> aviation effects in an unspecified recent aviation litigation case where the court upheld the Secretary of State's decision not to carry out quantitative assessment due to the absence of a benchmark.
- (B) There is no benchmark against which any figure generated for upstream methane variability could be assessed for significance;
- (C) Upstream methane variability is 'speculation' (and within the realms of "unknowns") within the meaning of Lord Leggatt's dictum in Finch;

60 These are now considered in turn.

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<sup>24</sup> [EV6-006] from "01:05:23.140" and reformatted

<sup>25</sup> From *ibid*, "If you apply that to what we've been discussing, you're automatically into the world of speculation, in addition to the fact that there is no benchmark for, for, for assessing those, speculative figures. And I, I think you will be assisted in that respect by considering the more recent litigation applying Finch in the aviation sector, where a very similar issue arose. How do you deal with non-CO<sub>2</sub> emissions generated by aircraft — where there are no carbon budgets for them, and they're very difficult to assess, but there's no doubt they occur. And the courts most recently have said it's a legitimate thing for the Secretary of State applying the Finch process to say, 'Well, if I haven't got a benchmark, it's not in my carbon budget, I could generate a f— notional figure, but what on earth am I gonna do with it, because I can't assess its significance to the wider, effects on greenhouse gases?' And that's precisely what's happening in this discussion here."

## D.1 The unidentified recent aviation litigation case

- 61 CESL believes, and continues from here on that understanding, that the case is *R (LADACAN) v Secretary of State for Transport [2025] EWHC 3206 (Admin)* handed down by Mrs Justice Lang on 8 December 2025. LADACAN is “Luton and District Association for the Control of Aircraft Noise”.
- 62 The judgment<sup>26</sup> is provided to the examination library as a stand-alone appendix and will be referred to as LADACAN from here on. It records that James Strachan KC and Victoria Hutton (instructed by the Government Legal Department) appeared for the Defendant Secretary of State. Ground 3 is “*Error of law in excluding from the EIA the likely significant impacts of non-CO2 emissions on the climate, contrary to Finch*”.
- 63 The LADACAN group has reported on its website<sup>27</sup> that it filed for an application for permission to appeal on 24 December 2025, and that it has been “*granted a hearing at the Court of Appeal in May*” (2026) including on Ground 3<sup>28</sup>.
- 64 CESL requests that the ExA note that it was Mr Strachan KC himself who constructed at the High Court, the very legal position that he referred to at the ISH4. However, the case, including Ground 3 on non-CO2 impacts, cannot be treated as settled authority - based on an established arm’s-length precedent - as LADACAN are appealing the case with a hearing next month. The ExA, therefore, cannot take the aviation litigation mentioned as an authority at this stage.

## D.2 LADACAN is different to CQLCP

- 65 Irrespective of the on-going LADACAN appeal which may not be resolved within the examination timeframe or before the SoS decision on the CQLCP application, CESL submits that in any case the LADACAN case does not provide an analogy for CQLCP as implied by the applicant at ISH4. The facts of the cases are quite distinguishable as below.

### D.2 (A) In CQLCP, the applicant has already undertaken and committed to Quantitative Assessment of upstream emissions

- 66 In the LADACAN Ground 3, the effects of the non-CO<sub>2</sub> aviation emissions had not been quantified in the ES<sup>29</sup>.
- 67 For CQLCP, the situation is precisely the opposite: the applicant has already quantified upstream Scope 3 emissions as part of the overall Scope 3 emission figure in Table 20-8 [APP-058]<sup>30</sup>.

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<sup>26</sup> <https://www.judiciary.gov.uk/wp-content/uploads/2025/12/Luton-and-District-Association-for-the-Control-of-Aircraft-Noise-v-Secretary-of-State-for-Transport-and-another.pdf>

<sup>27</sup> <https://ladacan.org/ladacan-to-consider-appeal-of-high-court-ruling/>

<sup>28</sup> From *ibid*, the grounds of appeal include “that the Judge erred in concluding that the assessment of non-CO<sub>2</sub> effects was lawful” (ie Ground 3 from the High Court judgment is included in the appeal).

<sup>29</sup> For example, the ExA reported that “... *the GHG assessment did not seek to quantify non-CO<sub>2</sub> impacts* ...” [London Luton Airport Expansion EXaR report, paragraph 3.12.101 as quoted in the LADACAN judgment at para 100]. The EXaR is available at <https://nsip-documents.planninginspectorate.gov.uk/published-documents/TR020001-003768-London%20Luton%20Airport%20Expansion%20-%20Final%20Recommendation%20Report.docx.pdf>

<sup>30</sup> The overall Scope 3 emission figure in Table 20-8 is 31,590,077 tCO<sub>2</sub>e. CESL calculated at Table 2 of [REP1-077] that this is made up of 24,242,682 tCO<sub>2</sub>e of Scope 3 upstream emissions (calculated with the DESNZ WTT factor) along with 7,346,267 tCO<sub>2</sub>e of T&S unavailability emissions and 1128 tCO<sub>2</sub>e of diesel Scope 3 emissions).

68 Therefore, the quantification contested as missing in the Luton Airport EIA (LADACAN Ground 3) has already been undertaken and committed to in the CQLCP EIA.

### **D.3 The CQLCP applicant has already committed to a benchmark for upstream emissions**

69 The applicant stated at [REP4-084], para 1.5.34 “*The court found it legitimate that without a benchmark, there is nothing to compare against for the purposes of an assessment*”.

70 It is not relevant to the CQLCP ES whether there is a relevant benchmark or not in the Luton case, as the upstream emissions (WTT based component) is already embedded within the lifecycle figure that the applicant compares against carbon budget in Tables 20-9 and 20-10 [APP-058]. In other words, there is already a benchmark employed by the CQLCP applicant and it is the UK and Welsh carbon budgets. The applicant’s comparison to the LADACAN litigation does not stand because the applicant has already compared a quantification of the CQLCP upstream emissions to the UK and Welsh carbon budgets.

#### **D.3 (A) Further comments on the CQLCP benchmark**

71 In any case, CESL submits that the obligation to describe the full environmental impacts of CQLCP applies, whether or not a benchmark exists. CESL’s legal submission [REP4-092] lays out that obligation at para 10:

*‘Schedule 4 requires the description under regulation 14 to include “the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions),” the “technologies and the substances used,” and “short-term, medium-term and long-term” effects: Schedule 4, paragraph 5. The description must also include “A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved”: Schedule 4, paragraph 6. Evaluation of these effects again requires the decision-maker to take into account all obviously material considerations.’*

72 And at the later significance assessment stage, a benchmark is not mandatory following the judgment in *R (Boswell) v Secretary of State for Energy, Security and Net Zero* [2025] EWCA Civ 669, the Court of Appeal held, at [80-81]:

*“In our view the evaluation of the significance of an estimated amount of GHG emissions and its acceptability is a matter of fact and judgment for the decision-maker. He or she may decide to choose benchmarks to help in arriving at that judgment. But that choice too is a matter of judgment for them. ...*

*Nor is there any legal principle which requires a public authority deciding whether to grant a development consent to “contextualise” the GHG emissions or to compare them with a benchmark. ...”*

73 Notwithstanding that the applicant has already committed to a benchmark for upstream emissions in CQLCP (and this distinguishes CQLCP from LADACAN), CESL submits these points on the CQLCP benchmark:

- (A) CESL submits that a territorial based carbon budget, as the UK based carbon budgets are, is not the correct benchmark for the full lifecycle emissions from the CQLCP which include both UK and ex-UK territorial emissions. It is simply not methodologically sound – it is comparing apples with oranges.
- (B) CESL requests that ExA to note that this is a new submission from CESL, and CESL will address this point and further methodological issues with carbon budgets as benchmark in more detail later at section E in this submission. However, the points remain that currently the applicant has already committed to a benchmark (so the LADACAN comparison falls), and the statutory requirement under Regulation 14 and Schedule 4 for a description of the environmental effects of CQLCP exists in any case.
- (C) Whilst CESL submits that a territorial based carbon budget is not the correct benchmark for the full lifecycle emissions from the CQLCP, CESL also submits and will address in more detail later, that potential relevant benchmarks do exist (in Section E).

#### **D.4 Upstream emission variability**

- 74 The Applicant asserts ([REP4-084], para. 1.5.34) that variability in upstream emissions falls within the realm of “speculation” and “unknowns”. This conflates established scientific and empirical quantified uncertainty with conjecture. The uncertainty associated with upstream emissions from natural gas is well characterised and extensively documented in the literature, drawing on decades of empirical research; it does not constitute speculative or unknown factors.
- 75 The ExA is respectfully requested to note that there is a very wide and deep evidential base of scientific and technical literature, and data from numerous empirical measurement-based research programmes, on the uncertainties of upstream methane emissions, and there are clear scientific methods to resolve the uncertainty (including fully developed lifecycle analysis studies which take into account the observational uncertainties<sup>31</sup>). From the outset of the examination, CESL clearly laid out the uncertainties relevant to the GHG emissions, see for example [REP1-077], section B.1 “*The four uncertainties in forecasting operational GHG emissions in Power CCS projects*”. Then [REP3-085] took a deep dive into three<sup>32</sup> of these uncertainties providing a considerable review of the scientific evidence, and the latest studies which can provide the basis for formulating a reasonable worst case scenario for the CQLCP.
- 76 CESL’s legal submission [REP4-092] then supplemented these examination submissions and “*sets out the legally required approach to the interdependencies and uncertainties*”.
- 77 CESL has been sensitive at every stage to be clear about the proportionate remedies of this situation, namely the use of the Rochdale envelope and sensitivity testing.
- 78 CESL respectfully recognises Lord Leggett’s words in *Finch* in its legal submission [REP4-092] at para 12: “*In R (Finch) v Surrey CC [2024] P.T.S.R. 988, Lord Leggatt emphasised that “Conjecture and speculation have no place in the EIA process” and “if there is*

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<sup>31</sup> For example the Howarth (2024) paper submitted to the examination as [REP1-086], itself based on the observational study from Sherwin (2024) submitted to the examination as a stand-alone appendix of this submission.

<sup>32</sup> As yet, CESL has not challenged the fourth assumption/uncertainty: the 5% T&S unavailability

*insufficient evidence available to found a reasoned conclusion that a possible environmental effect is “likely”, there is no requirement to identify, describe and try to assess this putative effect” ([77]).”*

- 79 To be absolutely clear, “speculation” is not what is happening here. It is well established that the upstream emissions are “likely”. In fact, the applicant has already included a quantitative assessment within the EIA of the likely significant impacts of upstream emissions on the climate. Even though CESL has provided the evidential basis above that this quantification does not even adequately capture the lower bound of the effect, based on today’s gas supply, the applicant’s quantification of the impact is approximately 63% of the assessed operational lifecycle emissions total described by the applicant.
- 80 Further CESL has provided indicative sensitivity test examples at Table 2 of [REP1-077] and Table 5 of [REP3-085] – one for each of the uncertainties concerned:
- a) *Upstream methane emissions (WTT factor),*
  - b) *Methane climate metric (GWP100),*
  - c) *Assumed CO<sub>2</sub> capture rate (95%).*

The Upstream methane emissions (WTT factor) and methane climate metric (GWP100/GWP20) sensitivity tests being based upon the latest scientific literature<sup>33</sup> on upstream emissions.

- 81 To correct the legal errors identified [REP4-092], it is now up to the applicant to identify the appropriate sensitivity tests and reasonable worst-case scenarios. This is a proportionate request, asking the applicant to undertake what is, in any case, a standard and well-established component of environmental impact assessment. It does not present any unusual methodological difficulty, nor does it require disproportionate complexity. The issue is therefore not one of practicability but of omission. Unless, and until these analyses are properly undertaken and reported, the Environmental Statement remains deficient for the reasons set out in CESL’s submissions, including its legal submissions.

- 82 At para 25 (b), the legal submission [REP4-092] notes:

- (A) at 25 (b)(i) *“Upstream methane intensity varies materially by supply source and source intensity (CESL deadline D3 submission, B.6(E))”*. As explained above, there is a well-established methodology for calculating upstream emissions on this basis.
- (B) at 25 (b)(ii) *“That variability is clearly capable of assessment, as are the different potential scenarios within it: Finch. In any event, a degree of uncertainty is not a free pass to fail to assess likely significant effects. There is a requirement in Schedule 4, paragraph 6 of the EIA Regulations to describe details of difficulties and the main uncertainties involved.”*
- (C) CESL requests that the ExA note that CESL itself has already described the *“difficulties and the main uncertainties involved”* in its submissions to date, and. In effect, these are a substantial contribution to that part of the required ES description.

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<sup>33</sup> ie the Howarth (2024) paper submitted to the examination as [REP1-086], itself based on the observational study from Sherwin (2024) submitted to the examination as a stand-alone appendix of this submission.

83 The matter remains as at 25 (f) *“Obtaining the additional information suggested by CESL – namely via a sensitivity analysis of the upstream emissions, the use of the short-term GWP20 methane metric, and the Scope 1 combustion emissions– would help correct the deficiencies in the ES that have been identified, which (as above) are legal as opposed to subjective deficiencies. There may be other legally adequate ways to do this, but none have yet been suggested.”*

## **D.5 Summary**

84 CESL's position on CQLCP is that there is **no** correspondence to the issues in the, yet to be concluded, LADACAN litigation. CESL is simply saying, despite a well-established methodology for calculating upstream emissions for natural gas existing, the DESNZ WTT factor does not implement that methodology correctly. For example, (a) the weighting data for different natural gas streams is frozen at 2021; (b) the underlying emission intensities of different streams is frozen at 2015 values which predate recent satellite and research data; and the emission intensity of US LNG is not in the model at all, despite it being, as of government records for 2025, over 75% of all UK LNG imports.

85 However, all these issues may be readily rectified, and one rectification route is the very one suggested by CESL from the outset: sensitivity analysis and describing a realistic and reasonable worst case scenario.

86 Whilst the applicant remains using the DESNZ 2025 WTT factor to model upstream emissions, and also solely using the GWP100 metric, it infects the whole EIA description of the CQLCP GHG emissions, and any subsequent significance assessment.

87 As a consequence of the misapplication of the methodology—now evidenced by the relevant Government department in its response under the Environmental Information Regulations—and the failure to update key inputs, including source stream composition and emission intensities, CESL submits that the upstream emissions figure derived from the DESNZ WTT factor in the Environmental Statement does not represent even a realistic lower bound for the upstream emissions associated with CQLCP. To be clear, it represents a serious understatement of even the lower bound of the upstream emissions as of today's gas supply. This is the reason why, from deadline D5, CESL does not accept the DESNZ WTT factor as a “starting place”, as at section B.3 above.

88 CESL has submitted from the outset of the examination that the sensitivity testing is required to generate the upper bound – the reasonable worst case scenario – for the upstream emissions.

89 CESL is not requesting quantification of impacts which have not been previously included in the EIA, or quantified in the ES, as in LADACAN. Rather CESL is requesting that the already existing quantitative figure for upstream emissions in the CQLCP ES is (1) corrected as it does not even establish a realistic lower bound, and (2) sensitivity tested to establish a realistic upper bound. ( (1) effectively being optional if the realistic upper bound, or the sensitivity tested reasonable worst case scenario is taken directly into the significance assessment stage).

## **D5 / Section E      Significance assessment and benchmarking**

90 At section D.3 (A), sub-bullet (A), CESL submitted “that a territorial based carbon budget, as the UK based carbon budgets are, is not the correct benchmark for the full lifecycle emissions from the CQLCP which include both UK and ex-UK territorial emissions”. This section provides more detail on this, and other issues with the benchmarking and the significance assessment, and their implications.

91 The ExA is respectfully requested to note this is new information, and that CESL had previously indicated that it could not make submissions on the significance assessment earlier (ie [REP1-077], para 77 and [REP3-085], paras 10 and 176).

### ***E.1 Territorial and methodological misalignment between upstream emissions and carbon budget based benchmarks***

92 These key factual points need to be noted first.

#### **E.1 (A)      UK carbon budgets are on a strict territorial basis, and the ex-UK part of the upstream emissions from imported gas are NOT included.**

93 This is confirmed unambiguously by the Seventh Carbon Budget methodology report from the CCC at the “Sectoral attribution of emissions reductions” section on page 45 of the report:

*“As discussed in Section 1.7.2, our Balanced Pathway covers territorial UK emissions, as required under the Climate Change Act. This means that if some of the steel used in constructing a new building is made overseas, then the emissions associated with its production will not be included in the pathway. In Chapter 10 of the Seventh Carbon Budget advice report, we recommend that the Government should monitor imported emissions and identify priority sources and policy levers that can be used to reduce these emissions alongside delivering territorial emissions reductions to meet carbon budgets.”*

This is the fundamental comparing “apples to oranges” point, and means that the comparison of EIA calculated upstream emissions against the UK and Welsh carbon budgets – as performed by the applicant at in Tables 20-9 and 20-10 [APP-058] – is fundamentally flawed. Using the carbon budget as a benchmark cannot validate or contextualise the upstream component of the CQLCP lifecycle figure at all.

Put simply the benchmark does not measure the same thing as what it is being compared with.

Therefore significance must be assessed by absolute emissions magnitude and an uncertainty range as explained in this section E.5 (C) following detailed analysis of the issues in sections E.3, E.4 and E.5.

94 CESL does not argue that the applicant was legally obliged to use the carbon budget as a benchmark, nor that it was obliged to use a different one. The objection is narrower: where the applicant has chosen to use a specific benchmark as the primary basis for its significance conclusion (para 20.6.68), and where that benchmark is structurally incapable of measuring the dominant emission component being assessed, the significance conclusion built upon it cannot support a lawful reasoned conclusion — not because the

wrong benchmark was chosen, but because the comparison produces a result that actively misleads rather than informs.

**E.1 (B) Methane IS a targeted GHG under the Climate Change Act and IS included in UK carbon budgets — but only for UK territorial sources.**

95 The CCC 7CB methodology report says at page 44 under “1.8.2 Emissions outputs” :

*“Our analysis covers emissions of all targeted GHGs in the Climate Change Act – these are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and a variety of fluorinated gases (F-gases). Our sectoral models produce time series of emissions of each of these gases, and these time series are reported within our dataset and aggregated into total emissions using global warming potentials.”*

So methane is within scope of the carbon budgets — but only where it arises from UK territorial sources. This is largely the methane from domestic gas distribution network leakage, from UK North Sea platforms (flaring and venting).

The upstream methane, and carbon dioxide, emissions from overseas gas extraction and LNG supply chains, prior to arriving in UK territory, is not included.

The Climate Change Act intends that methane, and carbon dioxide, emissions from UK processing (including UK regasification for LNG imports) and distribution for UK gas imports should be included. However, CESL notes that the latest CCC advice to Government (ie the Seventh Carbon Budget report and its methodology report) are not entirely clear as to how this done in practice.

**E.1 (C) The DESNZ WTT factor is NOT used for upstream emissions modelling in the UK carbon budget modelling.**

96 The CCC 7CB Methodology report states at section 12.1 (“The baseline for fossil fuel supply”):

*“The baseline is made up of specific projections for fossil fuel subsectors, which include oil refining, oil and gas platforms and processing terminals, gas distribution, and coal mines (open and closed). Emissions are largely associated with operating oil and gas platforms, as well as leakage, flaring, and venting of methane.*

*The emissions baseline starts aligned to historical emissions for 2023, based on the National Atmospheric Emissions Inventory (NAEI). Energy starting points are calibrated to the NAEI Energy Background Dataset, which underpins the UK's GHG inventory. The source of our baseline is the Government's Energy and Emission Projections (EEP) reference scenario, as published in October 2023.”*

And the Carbon Budget Delivery and Growth Plan, Technical Annex<sup>34</sup>, says at paragraph 78 under “Methane Action Plan”:

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<sup>34</sup> Carbon Budget Delivery and Growth Plan (2025), Technical Annex, <https://assets.publishing.service.gov.uk/media/6901dfae71b575684c3cf78a/carbon-budget-and-growth-delivery-plan-technical-annex.pdf>.

*“Emissions analysis captured within the UK’s Methane Action Plan mirrors the underlying emissions analysis from the CBGDP, as described within this Technical Annex. Methane emissions presented over the period of 1990 to 2023 reflect the latest UK territorial methane emissions from the GHG Inventory. Projections of methane emissions post 2024 are based on an adjusted version of the EEP 2023 to 2050 reference case, with an adjustment made for the waste sector in line with Table 3 of this annex.”*

This establishes that the modelling of methane for carbon budgets, both by CCC and DESNZ, is based on a bottom up approach using data in from the NAEI inventory for each physical source within UK territory.

The implication for the CQLCP EIA is that it is not appropriate to compare upstream emissions derived from the DESNZ WTT factor against UK and Welsh carbon budgets. Again, this is an “apple and orange” situation of not comparing like-with-like. This time it is methodological: the UK-based upstream component of UK and Welsh carbon budgets is derived for completely different modelling to the DESNZ WTT Factor.

For clarity, CESL understand that Scope 1 emissions for combusting natural gas to be derived from the DESNZ conversion factors<sup>35</sup> in the carbon budget. CESL does not dispute this factor.

**E.1 (D) The carbon budgets appear not to include any modelling corresponding to downstream Scope 3 emissions from “T&S unavailability emissions”.**

97 This is when the CO<sub>2</sub> transport and storage infrastructure is being maintained or not available as CO<sub>2</sub> is vented directly to the atmosphere. CESL has reach this provisional conclusion from a detailed search of relevant documents including the Carbon Budget Delivery and Growth Plan, Technical Annex and the CCC 7CB reports including the Methodology report. On current evidence, this appears to be a further methodological “apples and orange” issue between the carbon budgets and the EIA lifecycle modelling.

98 On the basis of the points at E.1(A), E.1(B), and E.1(C) above, CESL concludes that there are multiple reasons why the UK and Welsh carbon budgets are not appropriate benchmarks for the CQLCP EIA.

**E.2 Applicant’s framing of the territorial methodological issue in the ES**

99 At paragraph 20.6.59 the ES states:

*“Under each operating case scenario, the Proposed Development contributes a substantial proportion of the UK and Welsh carbon reduction targets as the 2050 net zero date is approached. However, it should be noted that the majority of emissions attributed to the Proposed Development’s operation result from indirect upstream WTT emissions from the gas supply network (Table 20-8). In reality, a substantial proportion of natural gas supply chain emissions are likely to fall outside of the UK’s jurisdiction and would not be reported within the UK or Welsh carbon budgets. Therefore, by including these emissions and contextualising them against UK and*

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<sup>35</sup> CCC Seventh Carbon Budget, Methodology report (2025), page 45, as supplied as a stand-alone appendix to the examination – “For other fuels, we use emissions factors based on the conversion factors published by DESNZ. These report the amount of each GHG (in GWP100 terms as described above) produced from the combustion of 1 kWh of each fuel.”

*Welsh carbon budgets, this is taking a conservative/worst-case assessment approach.”*

100 CESL submits that referring to the comparison as “conservative” is misleading. It is methodologically flawed due to the territorial boundary issue described above. The percentages are higher, than they might be if the ex-territorial element of the upstream emissions were removed from the numerator of the ratio. All this shows is that the comparison is incoherent and therefore uninformative. This is due to “apples and oranges” nature of the comparison being made.

101 However, the observation does reveal that the applicant faced with this conundrum appears not to have tried to find separate but methodologically coherent ways:

(A) to assess the UK element of the lifecycle emissions; and

(B) to assess the non-UK element of the lifecycle emissions.

102 As a result neither is logically assessed, and a logically incoherent significance assessment has been presented for operational emissions.

103 CESL submits, on this basis, that the significance assessment in the ES risks being not capable of supporting a reasoned conclusion, and therefore cannot be relied upon.

104 A fundamental issue which remains for the applicant is how assess the ex-UK territorial upstream emissions which are by far the largest part of the operational lifecycle emissions. Without remedy which provides a way to do this, the SoS is unable to make a reasoned conclusion of the majority material component of the climate impacts for the project.

### ***E.3 Rationalising the significance assessment: holding statement***

105 On the basis of the analysis above, CESL makes this holding statement.

106 CESL submits that, once the “identify and describe” stages of the EIA have been extended with appropriate sensitivity testing and reasonable worst case scenarios, as laid out in the legal submission [REP4-092], that a further stage of rationalising is also required on the significance assessment stage for the EIA to be lawful. This should require different treatment for the significance assessment of the territorial and ex-territorial components of the operational lifecycle emissions. This might need different treatment within the territorial emissions part too.

107 It is entirely possible to demarcate the different emissions and to quantify each so that they may be classified, and assessed, according to their methodological basis. The applicant already does this for construction, operation and decommissioning emissions.

108 Broadly operational emissions fall into these sub-groups :

- (1) Scope 1 combustion emissions (CO<sub>2</sub>) - UK territory;
- (2) Scope 3 downstream emissions from T&S unavailability (CO<sub>2</sub>) - UK territory;
- (3) Scope 3 upstream emissions (CO<sub>2</sub> and methane) within UK territory;
- (4) Scope 3 upstream emissions (CO<sub>2</sub> and methane) outside UK territory.

109 With respect to (3) and (4) above, and the requirement to separately identify and describe the Scope 3 upstream emissions within and outside UK territory: this can be done as the

emissions at different stages of the supply chain are known, and reported under the standard methodologies:

- (A) As an example, this breakdown is inherent as part of the Exergia methodology and Exergia Table 5-23<sup>36</sup> provides values for “gas distribution, transmission and storage” – the key activity giving rise to a fraction of upstream emissions on UK territory in the UK NTS for both imported and UK sourced gas. This is purely an example showing the data required, in this case part of the UK territorial fraction of an upstream emission stream from any source, is separately reported, and therefore can be separated out in calculations: This is purely an example and Exergia is not recommended as the data is very out-of-date as previously described.
- (B) As another example, the recent Howarth study of upstream emissions from US LNG breaks down the analysis into 5 top-level divisions: Upstream & midstream emissions (US based); Liquefaction (US based); Emissions from tanker (Ocean based); Final transmission & distribution (UK Scope 3 upstream element); and Combustion by final consumer (UK Scope 1). Again, the UK Scope 3 upstream element is clearly demarcated.

This is illustrated by the data calculated at page 23 of CESL’s [REP1-077] submission which reproduces a Table from Howarth’s scientific paper supplementary data. For the “2-stroke engine tankers powered by LNG” case<sup>37</sup>, the UK Scope 3 emissions are 5.7% of the total upstream emissions (CO<sub>2</sub> and methane) whilst the non-UK Scope 3 emissions are 94.3% of the total<sup>38</sup>. This also indicates for this US to UK supply chain example that the vast majority of emissions are ex-UK.

The above are just examples to show that data readily exists and it is quite feasible to generate the UK NTS side of the upstream emissions for imported supplies by pipeline or by LNG import, or from UK gas itself.

110 The requirement for a significance method for the ex-UK emissions is material because the upstream emissions are the largest part of the operational footprint (and the ex-territorial upstream emissions will be an increasing part of that due to increasing LNG and US LNG shares).

111 To illustrate this, the table below shows the percentage of the upstream emissions (both UK and ex-UK in this case) of the total “Fuel Usage (CCGT emissions and other fuels)” part of the operational emissions<sup>39</sup> for the ES and two indicative sensitivity tests<sup>40</sup> (from Table 5, [REP3-085]).

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<sup>36</sup> which is the table used by the DESNZ WTT methodology, see the EIR, at Appendix A

<sup>37</sup> Dual-fuel two-stroke tankers have greater fuel efficiencies and are the increasing trend of the tanker fleet, and used by CESL for its indicative sensitivity tests, see [REP1-077], Table 1 and surrounding text

<sup>38</sup> at page 23 of CESL’s [REP1-077], the UK Scope 3 emissions are 3.6% of the total whilst the non-UK Scope 3 emissions are 59.8% of the total with the UK combustion emissions before any abatement being included in the share at 37%.

<sup>39</sup> in other words, the other operational emissions such as “Grid Electricity Use” from Table 20-8 [APP-058] are not included

<sup>40</sup> The capture rate assumption in these figures is 95%

Component (fuel-use lifecycle) (tCO <sub>2</sub> e)	ES **	ES Share	Impact GWP100 ***	100 year modelling share	Impact GWP20 ***	20 year modelling share
Scope 1 post-capture stack residual (natural gas “non-captured”)	6,648,512	17.4%	6,648,512	4.6%	6,648,512	2.5%
Scope 3 WTT upstream natural gas supply chain	24,242,682	63.4%	130,233,559	90.3%	249,025,106	94.7%
Other (T&S unavailability + diesel + diesel WTT) *	7,352,201	19.2%	7,352,201	5.1%	7,352,201	2.8%
<b>Total Scope 1 + Scope 3 (fuel usage)</b>	<b>38,243,395</b>	<b>100.0%</b>	<b>144,234,272</b>	<b>100.0%</b>	<b>263,025,819</b>	<b>100.0%</b>

\*\* NB – upstream emissions are below the realistic lower bound in ES  
\*\*\* Data from [REP3-085], Table 5

**Table 1: Percentage of upstream emissions in fuel operational emissions ES and two indicative sensitivity tests**

112 It can be seen that the upstream emission percentage increases from 63.4% to over 90% in the sensitivity tests.

113 The crucial point is that a fundamental omission in the EIA, which must be rectified, is the lack of any method to assess the significance for the ex-territorial upstream emissions. It has clearly been shown that it is methodologically incoherent to assess ex-territorial upstream emissions against UK territorial carbon budgets as done in the EIA.

114 The section is provided to show that remedies to this conundrum exist and should be taken up to make the EIA lawful.

#### **E.4 Policy framework for ex-UK upstream emissions**

115 In short, there is no policy framework to manage and constrain upstream methane emissions from imported gas (because they fall outside UK territorial jurisdiction).

116 The UK ETS covers territorial Scope 1 combustion emissions from the UK itself and does not reach overseas methane. The UK Carbon Budget Adjustment Mechanism (CBAM) does not cover natural gas or LNG imports, and it does not cover methane as a GHG. Exporting country regulation is entirely outside UK policy reach.

117 There is therefore no UK policy instrument in existence or proposed that will constrain or account for the upstream methane emissions from CQLCP's imported gas supply chain. This makes the EIA obligation to identify and describe that uncertainty under the regulations [REP4-092] not merely a procedural nicety but a substantive necessity. The decision-maker is being asked to approve a development whose dominant lifecycle emissions component sits entirely outside every UK regulatory framework. In this situation, the decision maker has even greater need to understand the range of outcomes that the development may be responsible for triggering in overseas supply chains, precisely because no UK policy lever will constrain them after the fact.

118 Whilst a formal benchmark is not mandatory (*Boswell (2025)* as above), the regulations do require a “reasoned conclusion” by the decision maker: “*Regulation 30(2)(b)(i)(aa) requires the Decision to include a “reasoned conclusion” on the significant effects of the development on the environment, taking into account the results of the Examination.*” ([REP4-092], para 14).

119 There is no international benchmark, equivalent to territorial carbon budgets for territorial emissions against which upstream ex-territorial supply chain emissions from natural gas can be assessed for EIA significance purposes to assist with making a “*reasoned conclusion*”.

120 However, the new UK OPRED<sup>41</sup> guidance (2025)<sup>42</sup> on offshore oil and gas Scope 3 emissions, provided as a stand-alone Appendix to the examination library, is the closest attempt globally to address this gap, and this is discussed next.

## **E.5 OPRED (2025): Environmental Impact Assessment (EIA) – Assessing effects of downstream scope 3 emissions on climate**

### **E.5 (A) Scope of OPRED (2025)**

121 By background, the OPRED guidance follows the UK Supreme Court concluding in the *Finch* judgment that a decision to grant planning permission for an onshore oil development project was unlawful, because downstream GHG emissions<sup>43</sup> from combustion of the oil produced were not assessed in the EIA.

122 As such, the OPRED guidance technically applies to offshore oil and gas projects<sup>44</sup> under the 2020 Offshore EIA Regulations, and not explicitly to onshore power generation<sup>45</sup> consented under the Infrastructure Planning (EIA) Regulations 2017.

123 However, both sets of regulations transpose the same EIA Directive, and the OPRED guidance explicitly draws on IEMA 2022 principles as good practice applicable across EIA. It therefore represents the most authoritative current statement of what good GHG EIA looks

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<sup>41</sup> Offshore Petroleum Regulator for Environment and Decommissioning

<sup>42</sup> [https://assets.publishing.service.gov.uk/media/6853fa3d1203c00468ba2b15/Supplementary\\_guidance\\_-\\_Effects\\_of\\_Scope\\_3\\_Emissions.pdf](https://assets.publishing.service.gov.uk/media/6853fa3d1203c00468ba2b15/Supplementary_guidance_-_Effects_of_Scope_3_Emissions.pdf) - provided as a stand-alone Appendix to the examination library

<sup>43</sup> GHG Protocol, 2001, <https://ghgprotocol.org/>

<sup>44</sup> The combustion of the oil falls under scope 3, category 11 (Use of sold products) of the GHG Protocol

<sup>45</sup> WTT emissions in CQLCP, are upstream emissions and fall within GHG Protocol Scope 3 Category 3: Fuel- and energy-related activities — specifically the extraction, production and transportation of natural gas purchased and consumed by the plant.

like for projects with large ex-territorial Scope 3 emissions<sup>46</sup> — and the IEMA consultation response points<sup>47</sup> it endorses are directly applicable to any EIA by analogy.

124 CESL suggests, therefore, that there are principles within the guidance which may assist in reaching conclusions about Scope 3 emissions in general including upstream emissions.

## **E.5 (B) OPRED – principles of Scope 3 emission assessment**

**125 Require the use of a baseline scenario which includes the ‘do nothing’ or ‘no action’ scenario and clearly state the additional total GHG emissions arising from the proposed project, including scope 3 emissions<sup>48</sup>.** This principle is a requirement for a description of absolute emissions<sup>49</sup>:

- (A) CESL understands the Table 20-8 [APP-058] in the CQLCP emissions to already follow this principle, and in effect, describe absolute upstream emissions. Once corrected with a realistic reasonable worst case, the description would accord with this principle;
- (B) However, the carbon intensity based description at 20.6.42 – 20.6.47, and its confusing inclusion in the significance assessment at 20.6.68, risk extending beyond this principle. It will also be discussed under substitution below **and in section F.8 (A) below**.

**126 Include an assumption that substitution will not occur.** The IEMA consultation response, page 3, says “*There should be an assumption that substitution will not occur, since the science and practice regarding substitution effects is not well developed and in many cases can be misleading, inaccurate or unproven. Therefore, substitution effects should not be included in the primary calculation and presentation of GHG emissions. If a case for substitution effects is to be made, it should be fully evidenced and put after the presentation of total GHG emissions arising, as an additional factor to be considered*”.

And the OPRED guidance, page 7, says: “*Scope 3 emissions from downstream combustion of the hydrocarbons should be considered regardless of any evidence that also may be put forward as to the extent to which ‘substitution’ may occur... Substitution is not considered to be a factor affecting whether scope 3 emissions from a project’s downstream activities are an effect that needs to be assessed in the ES.*”

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<sup>46</sup> The OPRED guidance itself explains (p.5–6): “the GHG Protocol defines 15 categories of scope 3 emissions, with categories 1 to 8 occurring upstream and categories 9 to 15 occurring downstream. Scope 3 GHG emissions include downstream emissions in their entirety and are not limited to emissions from the use of the sold product (scope 3, category 11).”

<sup>47</sup> ISEP/IEMA, “ENVIRONMENTAL IMPACT ASSESSMENT (EIA) – ASSESSING EFFECTS OF SCOPE 3 EMISSIONS ON CLIMATE, (2025) <https://www.isepglobal.org/media/c4aiz3vp/iema-scope-3-oil-and-gas-consultation-response-january-2025.pdf> - supplied as stand-alone appendix to the examination library

<sup>48</sup> direct quote from IEMA consultation response (page 3)

<sup>49</sup> OPRED guidance, page 9: “*OPRED expects that these downstream emissions from a new project will be presented in the ES against a no project (‘do nothing’) scenario (i.e. total quantity of scope 3 category 11 emissions from the project against zero scope 3 category 11 emissions for a no project scenario). Taking this approach confirms the absolute downstream emissions that may be associated with the combustion of the produced hydrocarbons over the lifetime of the project.*”

127 **The global climate is a relevant consideration.** OPRED guidance, page 7, says: “*Global GHG emissions are a relevant consideration to assessing scope 3 emissions and in understanding “the impact of the project on climate”, as required under Schedule 6 of the EIA Regulations. OPRED would expect that these considerations will feature in any assessment of GHG emissions effects on climate.*”

The IEMA consultation response, page 3, says “*There should be an assumption that the GHG emissions are released in the UK. It is consistent with the polluter pays principle, the rectification at source, and proximity principle, that all oil and gas arising from the UK should be considered in the UK context, even if subsequently exported and combusted outside UK territory. The atmosphere as a shared global resource is still affected if the combustion occurs internationally and the UK should take ownership and responsibility for managing the international and transboundary effects arising from developments within its territory.*”

128 **Methodological transparency.** OPRED guidance, page 11, says: “*The ES should explain and justify the methodology adopted and conversion factors used to estimate the scope 3 emissions from the different categories including the assumptions and associated uncertainties. Whichever methodology is adopted, it must follow the general principles applicable to EIA, including that it is current, credible, and widely accepted. It must be transparent in the ES as to how the total scope 3 emissions associated with the hydrocarbons produced from a proposed project have been estimated.*”

The IEMA consultation response, page 3, says “*Embed existing good practice by explicitly recommending the use of the IEMA GHG quantification principles and recognised good practice guidance to ensure the use of robust methodologies, the application of the reasonable worst-case scenario and provide transparency on limitations and uncertainties.*”

#### **E.5 (C) Significance assessment of ex-territorial upstream Scope 3 emissions**

129 CESL submits that the above points from the OPRED guidance should be considered in finding an appropriate significance assessment method and/or benchmark for the upstream Scope 3 emissions from CQLCP. The core principle of absolute emissions, no project baseline, no substitution to diminish assessment, global contextualization, transparency of uncertainty are derived from the Finch and Whitehaven judgement, and from the 2022 IEMA guidance, and apply to CQLCP directly.

130 In circumstances here for upstream supply chain emissions using the OPRED core principle is consistent with the approach in Finch v Surrey County Council, R (Boswell) v Secretary of State for Energy Security and Net Zero: significance must be assessed by reference to the magnitude of absolute emissions and the range of outcomes identified through uncertainty analysis.

**D5 / Section F      Response to ISH4 [REP4-084] and [APP-058]: Substitution of unabated CCGT**

131 At item 4.2 of the ISH4 agenda, the ExA tabled “The proposed development’s potential contribution to mitigating for climate change effects resulting from its operation and replacement of other technologies”.

132 The applicant responded in two ways:

(A) *“Mr Murray confirmed that the role of this installation is to provide low carbon power. In that capacity, it will explicitly displace an unabated gas-fired CCGT. By virtue of [t]having carbon capture technology fitted, the CCP guarantees that this has lower scope 1 emissions than the existing unabated plant. By virtue of being lower in the merit order, the Proposed Development will be dispatched first.”* [REP4-084], para 1.5.37; and

(B) *“Mr Strachan KC confirmed that by virtue of being a dispatchable power station, the Proposed Development is facilitating the shift to low carbon usage in the wider population because renewables cannot accommodate every power event. That is recognised in policy but it is a benefit nonetheless because it allows consumers to become low carbon and benefit climate change. The shift to a low carbon environment necessarily calls for dispatchable low carbon power generation of this kind.”* [REP4-084], para 1.5.39.

133 The first of these (A) is a substitution argument. The principle being that CQLCP will substitute for unabated gas electricity generation in the future. CESL will respond to these points later.

134 First, I will lay out methodological issues with the generation of the figures for substitution analysis as laid out in the ES at [APP-058] paras. 20.6.42 to 20.6.47, and later used as part of the significance assessment at para 20.6.60. Then, I will generate the same calculation with the methodological flaws removed and with uncertainty bounding: this will demonstrate that the emissions savings from substituting electricity from a CQLCP abated system over future unabated gas are materially significantly much less than the ES presents.

135 This section is necessarily complex, and covers the issue in depth. Both points (A) and (B) are answered in Section F.4 “Methodological issue: Merit-Order Assumptions and Substitution Claims” within the wider narrative presented. Point (A) on “... by virtue of being lower in the merit order, the Proposed Development will be dispatched first.” is answered sections F.4(A)-(E) which give evidence that the energy system and dispatch merit order post-2035 is much more complex than the applicant implied and cannot be reduced the applicant’s statements at the ISH4. And point (B) on the supposed “benefit nonetheless because it allows consumers to become low carbon and benefit climate change” is answered at section F.4 (F), and also by the CESL’s analysis that any substitution benefit over unabated gas is significantly less than claimed when the uncertainties in the EIA are properly included in the significance analysis which CESL does at sections F.6 and F.7.

***F.1 Calculation methodological issues with 20.6.42 – 20.6.47, Plate 20-2 [APP-058, page 31] and the applicant’s related references at ISH4 [REP4-084]***

136 The applicant’s method relies on comparisons between plant-specific modelling for the Proposed Development and generic statistical benchmarks for comparator cases, with inconsistent treatment of upstream emissions and unclear system boundaries.

137 The approach obscures key engineering parameters—most notably net electrical efficiency and the CCS-related energy penalty—which are numerically determinative of emissions. When these parameters are reconstructed from the applicant’s own data, they reveal a material efficiency penalty that is neither disclosed nor tested.

138 In addition, the use of differing upstream emission treatments and the absence of a consistent lifecycle boundary lead to non-equivalent comparisons and an overstatement of claimed emissions reductions.

139 To facilitate presentation, I reproduce the steps involved in the applicant’s calculations in Appendix C with detailed references to the text in paras 20.6.42 – 20.6.47, and then present brief descriptions of each methodological flaw below. I then present a calculation correcting these flaws at section F.6 (A).

#### **F.1 (A) Energy losses not transparently disclosed**

140 The relationship between the thermal energy from combustion and electrical energy output is not clear, and the applicant does not transparently disclose:

- (A) the electrical efficiency of the plant;
- (B) the CCS energy penalty

141 As background, the project emissions correspond to about 2.758 GW thermal fuel input, as derived from the natural-gas emission factor (see CESL’s derivation below) whilst the project electricity export is 1.380 GWe [20.6.43]. This implies an overall efficiency of approximately 50 % net (Net CV basis) – including both the energy losses due to “electrical efficiency” and the CCS energy penalty.

142 See Appendix C.1 (B), sub-bullet (A) for further details. See section F.6 (B) below for “Energy penalty omission: Legal Implications for EIA Adequacy and Rochdale Envelope”.

#### **F.1 (B) Inconsistent treatment of upstream emissions in the uplifted grid carbon-intensity figure**

143 Para 20.6.45 says UK grid carbon intensity of 0.177 tCO<sub>2</sub>e/MWh has been uplifted to 0.227 tCO<sub>2</sub>e/MWh to account for upstream emissions across electricity-generation sources. The uplift factor here is 28.2% which is greater, and with no explanation, than the 0.165 factor (ie the DESNZ WTT factor – 16.5% uplift) applied elsewhere in the ES. There is no disclosure of reasons for this inconsistent treatment of upstream emissions in the uplifted grid carbon-intensity figure.

144 This systematically biases the comparison against the project baseline, but without disclosure. This is a clear inconsistency in system boundary treatment, and a material methodological flaw. See Appendix C.1 (B), sub-bullet (B) for further details.

#### **F.1 (C) Possible inclusion of grid losses (boundary inconsistency)**

145 The grid intensity 0.177 tCO<sub>2</sub>e/MWh (para 20.6.45) is a delivered electricity metric, which typically includes generation mix, and may implicitly reflect transmission/distribution losses. By contrast, the project’s 1,380 MWe output is clearly a plant-level net output. This risks comparing system-level (grid) vs plant-level (project) level where the boundaries may be non-equivalent, leading to a distortion of relative performance. This is not clarified in the ES.

146 Because of this, and section F.1 (B) above, CESL does not consider the grid data sound and removes it from its comparison later.

**F.1 (D) Overstatement of effects**

147 The description ‘CQLCP is “approximately 75% lower than existing unabated CCGTs” [20.6.47] is not consistent with the quoted operational carbon intensity of CQLCP (0.118 tCO<sub>2</sub>e/MWh at para. 20.6.43) and the quoted carbon intensity of 0.354 tCO<sub>2</sub>e/MWh for unabated CCGTs (para. 20.6.43). This implies a  $0.118 \div 0.354 = 0.333 \rightarrow 66.7\%$  reduction.

148 However, in CESL’s calculation below (which removes the methodological flaws), the figure is 72.2%, see section F.7 (C) – still less than 75%. See Appendix C.1 (B) (D) for further details.

**F.1 (E) Mixing plant-specific modelling with generic statistical comparators**

149 The applicant combines project side data (detailed plant-specific modelling and explicit assumptions on capture rate, fuel use etc and compares to generic statistical averages eg: 0.354 tCO<sub>2</sub>e/MWh unabated CCGT and 0.177 tCO<sub>2</sub>e/MW / 0.227 tCO<sub>2</sub>e/MW for grid averages (the upstream uplift itself flawed for these figure).

150 This is a core methodological flaw. The problem is that these are not the same plant, not the same time period, not the same system boundary, not derived from the same modelling framework. The consequence is that this is not like-for-like, and not a controlled counterfactual.

**F.2 Methodological issue: Use for a static 2025 grid intensity comparator for a project between 2035 and 2065**

151 The applicant relies on a 2025 UK grid carbon intensity of 0.177 tCO<sub>2</sub>e/MWh derived from DESNZ conversion factors. However, authoritative system modelling from the National Energy System Operator (Future Energy Scenarios 2025), together with UK Government Clean Power 2030 policy and the Climate Change Committee’s Net Zero pathway, indicates that grid carbon intensity is expected to fall to approximately 0.02–0.05 tCO<sub>2</sub>e/MWh by 2035 and to near-zero levels ( $\approx 0.002\text{--}0.02$  tCO<sub>2</sub>e/MWh) thereafter, see table below.

Year	Grid carbon intensity (tCO <sub>2</sub> e/MWh)	Evidence base
2025	0.177	DESNZ conversion factors (2025)
2030	~0.05–0.10	Clean Power 2030 (unabated gas $\leq 5\%$ , high RES share)
2035	~0.02–0.05	NESO FES 2025 (net-zero-aligned pathways)
2045	~0.01–0.03	NESO FES 2025 (deep decarbonisation scenarios)
2050–2065	~0.005–0.02 $\rightarrow$ ~0.002–0.01	CCC Net Zero pathway + FES residual emissions

**Table 2: Projected grid carbon intensities**

152 This is important, and reveal a serious methodological flaw in ES. That is that para 20.6.47 [APP-058] materially overstates what the data in Plate 20-2 can establish. The comparison uses a 2025 UK grid average of 0.177 tCO<sub>2</sub>e/MWh, uplifted to 0.227 tCO<sub>2</sub>e/MWh (on unexplained or flawed methodology, see section F.1 (B) above), yet the Proposed Development is being assessed to operate from 2036 to 2065.

153 The applicant therefore compares a future plant against a historical grid average which as the table above show is projected to rapidly decrease in value before even the start of the project in 2035. The applicant then uses that historical comparison to “confirm” that the project is a low-carbon alternative to “the overall UK grid” and to illustrate its ability to support a future renewables-based grid. That is temporally and methodologically unsound. The comparator is not future-facing, the modelling boundaries are not like-for-like, comparator-side indirect emissions are not transparently calculated. At the ISH4 [REP4-084], the applicant then carried this flawed comparison forward into broader assertions that the project will be dispatched first to displace unabated gas, and facilitate decarbonisation in the wider population. Those broader claims are not demonstrated by Plate 20-2 and depend on assumptions and comparator choices that are themselves disputed.

154 The applicant’s use of a historical grid average therefore materially overstates the carbon intensity of the comparator over the operational lifetime of the Proposed Development (2035–2065).

### **F.3 Background information of operational costs of Power CCS**

#### **F.3 (A) Indicative annual and lifetime fuel costs for CQLCP**

155 This section sets out an indicative analysis of the projected annual and lifetime gas fuel costs of CQLCP. It does not assert specific future gas prices but rather it presents a range consistent with published government and independent projections, clearly sourced and explained below. All figures are in 2023/2024 real prices unless otherwise stated.

156 [APP-058] contains three operating cases: the Reference Case, Dispatchable Case (High), and Dispatchable Case (Low) described at paras 20.6.31–20.6.35 and referenced on Plate 20-1. From Plate 20-1, approximate capacities between 2035 and 2050 are estimated as: Reference Case<sup>50</sup>: close to 100% baseload; Dispatchable Case (High)<sup>51</sup>: ~50% capacity factor; Dispatchable Case (Low)<sup>52</sup>: ~25% capacity factor.

157 The Department for Energy Security and Net Zero (DESNZ) publishes annual Fossil Fuel Price Assumptions (FFPA), which are used across UK Government policy appraisal, the Climate Change Committee’s carbon budget modelling, and DESNZ’s own Electricity Generation Costs reports. The 2025 FFPA (published January 2026), and supplied as a stand-alone appendix to the examination library) provides three scenarios for UK natural gas wholesale prices out to 2050<sup>53</sup>, expressed in real 2024 prices as in the table below.

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<sup>50</sup> Summary of description at [APP-058], 20.6.32: Baseload operation at full load throughout the 30-year life. Adopted as the worst-case for GHG assessment. Acknowledged in APP-058 (para. 20.6.34) as unlikely to reflect actual operation.

<sup>51</sup> Summary of description at [APP-058], 20.6.32: Baseload Dispatchable operation in accordance with the NESO FES 2024 Counterfactual pathway – the scenario with the highest gas-CCS load factors of all FES pathways. Described in APP-058 footnote 5 as a scenario that “misses the UK’s net zero 2050 target” with heavy reliance on fossil fuels.

<sup>52</sup> Summary of description at [APP-058], 20.6.32: Dispatchable operation in accordance with the NESO FES 2024 Electric Engagement pathway – a “net-zero-consistent scenario” in which electricity supplies 66% of UK energy demand by 2050, reducing the hours that gas-CCS plant is required to operate.

<sup>53</sup> Note on assumptions: FFPA 2025 explicitly states that the assumptions “are not forecasts of future energy prices and do not provide Government’s view of future prices”. It recommends users consider the full A–C range. This note presents that full range. The FFPA

Year (pence per therm)	A Low	B Central	C High	Notes
2024 (outturn)	84	84	84	Outturn reference point. FFPA 2025 narrative notes prices rose to 94p/th in H1 2025 as Europe refilled storage.
2025	77	94	121	Based on market forward prices collected March–May 2025 with Black-Scholes 75% confidence interval.
2026	52	85	143	Short-term: A and B fall as new wave of LNG liquefaction increases supply. C rises due to supply-demand mismatch risk.
2030	42	71	120	Mid-term. Slight downward trend in A and B from short-term peak. C broadly stable.
2036	36	68	113	Plant commissioning year. Begins plant operating period.
2040	32	66	108	Long-term anchor year. All three assumptions flatlined from 2040 to 2050 (and beyond). Dominates the 30-year average as prices hold at these levels for 25 of the 30 operating years.
2041–2050 (flatlined)	32	66	108	FFPA 2025 states: “there is too much uncertainty after [2040] for robust analysis”. All scenarios held constant.

**Table 3: FFPA data for gas prices<sup>54</sup> (pre-Iran war analysis<sup>55</sup>)**

158 To translate a gas price in pence per therm into a fuel cost per MWh of electricity generated, the relationship between gas input energy and net electrical output must be applied. The fuel cost per MWh of electricity generated is derived directly from CQLCP’s plant-specific thermal efficiency<sup>56</sup>, calculated from data within [APP-058] by CESL at section F.6 (A). The fuel cost per MWh generated is calculated as in footnote<sup>57</sup>, using the abated efficiency of 50.03%. Then levelised averages across the 2036–2065 operating period are calculated from the above FFPA 2025 data: A ≈ 33p (36p in 2036, 32p from 2040); B ≈ 67p (68p in 2036, 66p from 2040); C ≈ 109p (113p in 2036, 108p from 2040)<sup>58</sup>. The output is summarised in the table<sup>59</sup> below.

further notes that all scenarios are flatlined from 2040, and that “*there is too much uncertainty after that point for robust analysis*” Since CQLCP operates to 2065 – 25 years beyond that point – the fuel cost estimates for the last 15 operating years (2051–2065) rest entirely on the flatlined 2040 assumptions, a significant additional source of uncertainty not captured in the range presented.

<sup>54</sup> DESNZ, Fossil Fuel Price Assumptions 2025 (January 2026), Table 1. All prices in real 2024 prices.

<sup>55</sup> Note that gas prices were ~78–84p in late January 2026 (Pre-crisis baseline. Europe exiting winter with low storage; FFPA 2025 central assumption ~84p for 2026 average). As of writing, 21 April 2026, there was (a) a Mid-Mar 2026 spike of ~175p (spike) (US strikes Kharg Island; Israel strikes South Pars. Ras Laffan “extensively damaged.” NBP spikes to 175p. Brent above \$115) dropping to ~136p at 1 April 2026 (b) 19–20 Apr 2026 ~97–103p (Iran re-closes Hormuz after US seizes Iranian vessel over weekend. Prices rebound ~6%. NBP front-month ~97–103p at time of analysis)..

<sup>56</sup> implied unabated net electrical efficiency ≈ 57.3%, implied CCS-related net output penalty = 7.23 %

<sup>57</sup> Gas input per MWh generated:  $1 \div 0.5003 = 1.999$  MWh of gas input per MWh of electricity output. Convert to therms:  $1.999 \text{ MWh} \div 0.02931 \text{ MWh/therm} = 68.2$  therms per MWh generated. Fuel cost formula: Fuel cost (£/MWh) = gas price (p/therm) ×  $68.2 \div 100$ .

<sup>58</sup> A:  $33\text{p} \times 68.2 \div 100 = \text{£}22.5/\text{MWh}$  ( $\approx \text{£}23/\text{MWh}$ ) B:  $67\text{p} \times 68.2 \div 100 = \text{£}45.7/\text{MWh}$  ( $\approx \text{£}46/\text{MWh}$ ) C:  $109\text{p} \times 68.2 \div 100 = \text{£}74.3/\text{MWh}$  ( $\approx \text{£}74/\text{MWh}$ ).

<sup>59</sup> Note: 1 therm = 0.02931 MWh (gross calorific value basis, consistent with UK gas metering). Gas prices are levelised averages across the 2036–2065 operating period from FFPA 2025: A ≈ 33p (36p in 2036, 32p from 2040); B ≈ 67p (68p in 2036, 66p from 2040); C ≈ 109p (113p in 2036, 108p from 2040).

Scenario (FFPA 2025)	Levelised gas price (2036–2065 average)	Therms per MWh (50.03% efficiency)	Fuel cost used (£/MWh generated)
A – Low	~33p/therm	68.2	£23/MWh
B – Central	~67p/therm	68.2	£46/MWh
C – High	~109p/therm	68.2	£74/MWh

**Table 4: Levelised gas price (2036–2065 average) (pre-Iran war analysis)**

159 The fuel costs in this note therefore represent a conservative range (even pre-Iran war) when compared to sources like the CCC as described in the footnote<sup>60</sup>.

160 The annual and lifecycle fuel costs then can be calculated by these three steps:

Step 1 — Annual and total generation by operating case:			
Case	CF	Annual generation (MWh)	30-yr total
Reference Case	100%	12,088,800	362.7 TWh
Dispatchable High	50%	6,044,400	181.3 TWh
Dispatchable Low	25%	3,022,200	90.7 TWh

Step 2 — Annual fuel cost			
Case	A - Low (£23/MWh)	B - Central (£46/MWh)	C - High (£74/MWh)
Reference (100%)	£278m/yr	£556m/yr	£894m/yr
Dispatchable High (50%)	£139m/yr	£278m/yr	£447m/yr
Dispatchable Low (25%)	£70m/yr	£139m/yr	£224m/yr

<sup>60</sup> **Corroboration and Independent Sources** The central fuel cost of approximately £46/MWh is consistent with published BEIS/DESNZ levelised cost analyses for CCGT+CCS, which placed the fuel cost component at £45/MWh (2018 prices) in the BEIS 2020 Electricity Generation Costs report – a figure that was derived using similar efficiency assumptions for a post-combustion CCS plant.

The Oxford Institute for Energy Studies (OIES) has modelled European gas prices in the range \$6–8/MMBtu by 2030 in its expected scenario, equivalent to approximately 45–60p/therm, broadly consistent with FFPA 2025 Assumption B in the operating period. OIES also identifies a lower ‘LNG supply glut’ scenario closer to \$6/MMBtu (~45p/therm), consistent with Assumption A.

The CCC Seventh Carbon Budget Methodology Report (May 2025) acknowledges an uncertainty range for gas costs in 2040 of –60% to +106% relative to the central scenario. Applied to FFPA 2025 B (66p/therm at 2040): this implies a plausible range of approximately 26–136p/therm – wider than the FFPA A–C range of 32–108p/therm. The fuel costs in this note therefore represent a conservative range relative to the full extent of uncertainty acknowledged by the CCC.

Step 3 — Total lifetime fuel cost (30 years)			
Case	A - Low (£23/MWh)	B - Central (£46/MWh)	C - High (£74/MWh)
Reference (100%)	£8.3bn	£16.7bn	£26.8bn
Dispatchable High (50%)	£4.2bn	£8.3bn	£13.4bn
Dispatchable Low (25%)	£2.1bn	£4.2bn	£6.7bn

**Table 5: Calculation of annual and lifetime fuel costs (pre-Iran war analysis)**

161 **Conclusion:** Under the central case operating scenario (Dispatchable High, 50% CF) at the central DESNZ gas price (Assumption B), CQLCP would spend approximately £8.3 billion in gas over its 30-year life, equivalent to £278 million per year. The range across all scenarios runs from £2.1 billion (Dispatchable Low, low gas price) to £26.8 billion (Reference Case, high gas price).

#### **F.4 Methodological issue: Merit-Order Assumptions and Substitution Claims**

##### **F.4 (A) Exclusive merit-order displacement implied, but not evidenced**

162 In [REP4-084]<sup>61,62</sup>, the applicant states that the Proposed Development, by virtue of being a lower-carbon plant with carbon capture, will be “dispatched first” and will therefore – by implication exclusively - displace unabated gas-fired generation.

163 This position is also explicit in [APP-058]/20.6.42, where it is stated that it is “reasonable to assume” that each MWh generated by the Proposed Development would displace a MWh from an existing unabated CCGT. This is equivalent to assuming that 100% of marginal generation displaced over the project lifetime is unabated gas, with no displacement of alternative technologies<sup>63</sup>. However, Chapter 20 provides only a static carbon-intensity comparison and does not demonstrate dispatch outcomes. No modelling is presented of dispatch frequency, marginal energy system displacement under varying system conditions, or interaction with alternative flexible resources. The displacement claim is therefore an assertion, not an evidenced result of the ES assessment.

##### **F.4 (B) Simplified two-technology framing is not representative of the post-2035 energy system**

164 The applicant’s reasoning assumes an implicit comparison between solely unabated gas generation, and gas generation with CCS, such that the latter will necessarily, and exclusively, be dispatched in preference to the former. However, official system planning does not describe the future electricity system in these terms. By the mid-2030s, the

<sup>61</sup> At [REP4-084], 1.5.37 “Mr Murray confirmed that the role of this installation is to provide low carbon power. In that capacity, it will explicitly displace an unabated gas-fired CCGT. By virtue of having carbon capture technology fitted, the CCP guarantees that this has lower scope 1 emissions than the existing unabated plant. By virtue of being lower in the merit order, the Proposed Development will be dispatched first.”

<sup>62</sup> At [REP4-084], 1.5.12 “When NESO is deciding which units to connect to the grid, they will apply the merit order. If you have a power station with CCP and one without, they will always take the CCP first. Then we can say, this power station will displace unabated gas.”

<sup>63</sup> For example, it implies that CQLCP would never displace other technologies available such as battery energy storage, LDES, interconnectors, hydrogen, demand side response, and that this applies across all hours and all years (2036–2065)

relevant competition set for dispatchable capacity is expected to include multiple low-carbon flexibility technologies, not solely gas+CCS.

165 The merit-order picture in the ES is incomplete and inadequate for EIA purposes. The full picture is explained in the next section.

#### F.4 (C) Official evidence for a portfolio of low-carbon dispatchable and flexible technologies

166 UK Government policy (Clean Power 2030 – supplied as a stand-alone appendix to the examination library) and system modelling by the National Energy System Operator (FES 2025 [REP3-069]) identify a portfolio approach to flexibility. The merit order for electricity dispatch is determined by marginal cost — principally, fuel cost and carbon cost — combined with zero-marginal-cost priority given to technologies with no fuel costs. By the mid-2030s and certainly into the 2040s and 2050s, the technologies with the strongest claim to priority dispatch before unabated gas CCGTs is not necessarily power CCUS (gas+CCS). Alternative flexible supply is forecast from:

- (A) Long-duration electricity storage (LDES)<sup>64</sup>;
- (B) Interconnectors<sup>65</sup>;
- (C) Hydrogen-to-power (H2P) generation<sup>66</sup>;
- (D) Short-duration grid storage (eg: battery parks)<sup>67</sup>; and
- (E) Demand-Side Flexibility (DSF)<sup>68</sup>, also referred to as consumer-led flexibility (CLF).

167 Together these can provide total system needs of tens of gigawatts of dispatchable and long-duration flexible capacity. These technologies are treated as complementary, with different operational roles depending on system conditions, duration of scarcity events, and energy availability. This has been described in the Government’s “Clean Flexibility Roadmap” (2025) supplied as a stand-alone appendix to the examination library: Figure 1 from this document is reproduced below.

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<sup>64</sup> **Long-Duration Energy Storage (LDES)** — including pumped hydro, liquid air energy storage, and emerging battery chemistries. The Clean Power 2030 Action Plan projects 5–8GW of LDES by 2030; the cap-and-floor scheme is specifically designed to deploy this at scale through the 2030s. When LDES is dispatching stored zero-carbon electricity, it displaces gas generation entirely — including gas+CCS.

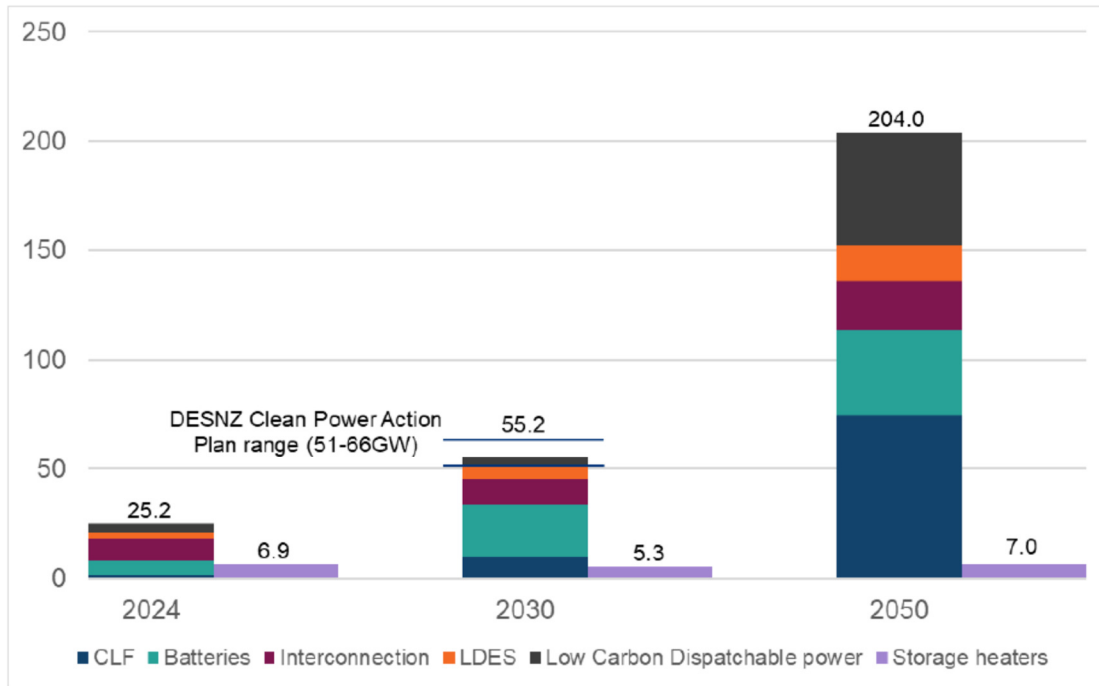
<sup>65</sup> **Interconnectors** - projected interconnector capacity of 10GW+ brings (potentially zero-carbon) European generation into the merit order ahead of any UK gas-burning technology

<sup>66</sup> **Hydrogen to power (H2P)** — government policy explicitly includes a Dispatchable Power Agreement mechanism for H2P plants, are forecasts scaling of deployment through the 2030s. FES 2025's Hydrogen Evolution pathway projects significant H2P capacity by 2035–2040. Where green hydrogen is used, H2P has zero Scope 1 emissions at the point of combustion — a lower carbon intensity than gas+CCS.

<sup>67</sup> **Grid-scale battery storage (“battery parks”)** - represents the dominant form of short-duration electricity storage in the UK, typically providing 1–4 hours of discharge. These assets operate ahead of thermal generation in many balancing and intraday market conditions, particularly where energy has been stored at low marginal cost. Whilst this technology cannot compete with dispatchable generation for prolonged scarcity periods, it is provided in the Clean Flexibility Roadmap (2025) for short duration flexibility. The ES does not assess the extent to which such storage would form part of the marginal generation for some fraction of energy system 2035-2065.

<sup>68</sup> **Demand-Side Flexibility** - The CCC's methodology report for the Seventh Carbon Budget describes smart demand flexibility as operating to “*reduce the need for generation or storage (particularly at peak demand periods) ... without affecting consumers' quality of service provision*” explicitly noting that it and short-duration grid storage “*are likely to play similar system roles*” The Clean Power 2030 Action Plan projects a four-to-fivefold increase in demand-side flexibility capacity by 2030, encompassing smart EV charging, heat pump pre-heating, hot water storage, and commercial and industrial demand turn-down. FES 2025 projects demand-side flexibility capacity at peak reaching many tens of gigawatts by 2035 across all net-zero pathways, with vehicle-to-grid alone projected at 41GW of potential peak capacity. To the extent that these resources suppress or shift the demand peaks that would otherwise call CQLCP into dispatch, DSF occupies — in functional terms — a position in the merit order ahead of any gas-burning plant, including gas+CCS. This becomes particularly significant as the CQLCP operational period progresses into the 2040s and 2050s when DSF penetration is projected to be substantially higher than today.

**Figure 1: indicative clean flexibility capacity scenario (GW), 2024-2050**



**Figure 3: Clean Flexibility Roadmap (2025) Figure 1 reproduced**

**F.4 (D) Implications for merit order and dispatch**

168 In the Government ‘s projected energy system, post-2035, dispatch is not determined by a simple ordering between unabated gas and gas+CCS. Rather:

- (A) Energy storage may be dispatched ahead of thermal generation where energy has been stored at low cost, particularly for short- to medium-duration balancing events;
- (B) Over the longer-term with more LDES in the system, LDES energy storage may be dispatched ahead of thermal generation;
- (C) The government expect hydrogen-to-power to play a role in low-load-factor, longer-duration or inter-seasonal balancing, particularly where large-scale storage is available;
- (D) Increasing DSF/CLF in the mix will reduce<sup>69</sup> the need to dispatchable sources – note CLF is shown at 2050 in Figure 3 above as the largest flexible source at around 70GW.
- (E) gas+CCS may operate alongside these technologies, particularly for sustained dispatch requirements.

<sup>69</sup> In a marginal dispatch framework, Demand Side Flexibility (DSF) effectively acts as a negative generator, reducing net demand and thereby shifting the system left along the demand curve; this lowers the marginal clearing price and displaces the highest-cost plant that would otherwise set the price. In merit-order terms, DSF inserts itself ahead of peaking units (e.g. OCGT or high-cost CCGT), so the marginal unit is either avoided entirely or replaced by a lower-cost generator, reducing both price and emissions.

- 169 The merit order is fundamentally an economic dispatch ranking: generators are ordered from lowest to highest short-run marginal cost (SRMC), and the system operator (e.g. National Energy System Operator in Great Britain) calls them in that order to meet demand. NESO's modelling and market operation descriptions make clear that generators are dispatched in order of marginal cost, and that generator bids reflect fuel costs, carbon costs under the UK ETS, and variable operating costs, together with operational and commercial considerations. At its core, the merit order is set by SRMC and marginal cost of producing one additional MWh from a plant that is already built and available.
- 170 Of the flexible technologies compared here, gas+CCS (e.g. CQLCP) is the only one with a large, ongoing, recurring fuel cost driven by internationally priced fossil gas. Even on a conservative and pre-Iran war estimate, in the evidence above (section F.3 (A)), the Dispatchable High case at central gas prices amounts to £278 million per year. As the system evolves post 2035, CQLCP will increasingly be less competitive in the SMRC based merit order, and other technologies increasingly displace unabated gas before abated gas.
- 171 The other flexible technologies have either zero fuel cost (LDES, batteries) or act as a net negative fuel cost (interconnectors, DSF), or a materially lower and declining fuel cost (green H2P, where the 'fuel' is domestically produced renewable electricity).
- 172 On a purely physical and thermodynamic basis, unabated CCGT has a lower marginal cost than gas with CCS, since the energy penalty associated with capture reduces net efficiency and increases fuel cost per unit of electricity generated. Even the existence of a DPA does not ensure that gas-CCS will systematically displace unabated CCGT in the merit order. Dispatch remains driven by marginal cost, and the CCS energy penalty means that, under plausible fuel and carbon price combinations, unabated gas could continue to set the margin.
- 173 Dispatch outcomes therefore depend on system state (e.g. renewable output, storage levels, fuel availability) and not solely on carbon intensity. It is not demonstrated that the Proposed Development would consistently displace unabated gas or be "dispatched first" ahead of all relevant alternatives.

#### **F.4 (E) Absence of evidence on marginal displacement**

- 174 The ES does not provide analysis of which technologies are expected to be on the margin during operation of the Proposed Development; how frequently the plant would displace unabated gas versus other low-carbon flexibility options; or how dispatch patterns evolve over the 2036–2065 operational period as the system decarbonises.
- 175 Without such analysis, the assumption that each MWh generated displaces unabated gas is not substantiated, and may materially overstate the emissions benefit attributed to the Proposed Development.
- 176 This undermines the substitution argument made at [APP-058], para 20.6.47, based on Plate 20-2 showing the different emissions footprints of abated and unabated gas: "... *This confirms the Proposed Development to be a low-carbon alternative to existing unabated CCGT power stations, and the overall UK grid, when meeting the UK's marginal generating capacity needs.*"
- 177 Further it undermines the use of this data in the significance assessment at para 20.6.68 [APP-058].

#### **F.4 (F) Consequence for claimed system and climate benefits**

178 The applicant's broader claim ([REP4-084], para 1.5.39 and [APP-058], paras 20.6.62 and 20.6.63) that the Proposed Development will facilitate the transition to low-carbon energy use in the wider population, by providing dispatchable low-carbon power, depends on the same displacement assumption. However, that claim is not evidenced within the ES given:

- (A) the absence of demonstrated dispatch modelling;
- (B) the uncertainty as to marginal generation displaced; and
- (C) the presence of competing low-carbon flexible technologies which much cheaper fuel costs in the future system.

179 It relies on a simplified and unsupported representation of the future electricity system, and cannot be treated as a "demonstrated climate benefit" of the Proposed Development. The absence of any dispatch modelling is an evidential gap in the EIA when the details of dispatch within the merit-order of a future energy system is a fundamental input to the substitution analysis and emission savings figures.

180 The arguments to this point have all been based upon the emissions data in the ES without uncertainty analysis (which CESL submits is necessary to make the identify and describe aspects of the EIA lawful [REP4-092]). CESL considers these uncertainties next.

#### ***F.5 The substitution analysis has not been modelled for uncertainty bounds on key parameters in the underlying data***

181 The analysis uses the three parameters which CESL's has evidenced [REP3-085] and this submission as not being reasonable worst cases, and requiring uncertainty modelling and sensitivity testing [REP4-092]: upstream emission factor (WTT), short-term methane effects attenuated (GWP100/GWP20) and the CO<sub>2</sub> capture rate. In the case of the upstream emissions based on the DESNZ WTT factor, CESL submits earlier in this submission that it does not even capture the lower bound effect.

182 CESL now provides the substitution analysis based on the same assumptions as the indicative sensitivity tests already submitted at [REP1-077] and [REP3-085], and correcting the methodological errors identified above. .

#### ***F.6 Indicative modelling including reasonable worst cases and correcting methodological errors***

183 CESL now generates the comparison based entirely on data in the ES from the plant specific parameters in the ES, and then generates the equivalent comparison for the reasonable worst case scenarios (from CESL's indicative sensitivity tests).

#### **F.6 (A) Calculation of Implied Net Electrical Efficiency and CCS-Related Net Output Penalty**

184 CESL has untangled the applicant's calculation and description at [APP-058], para 20.6.42 – 20.6.47 at section F.1 above, and Appendix C. The section provides an internally consistent stepwise calculation, based entirely on the data from the ES, with the flaws corrected.

185 CESL has previously identified the total unabated Scope 1 natural gas combustion emissions associated with the Proposed Development as 146,925,347 tCO<sub>2</sub>e ([REP1-077], Table 2).

186 Using the DESNZ 2025 natural gas Scope 1 emission factor of 0.2027 tCO<sub>2</sub>e/MWh (Net CV), this corresponds to an implied fuel energy input of:

$$146,925,347 \text{ tCO}_2\text{e} \div 0.2027 \text{ tCO}_2\text{e/MWh} = 724,841,376 \text{ MWh (fuel energy input, Net CV)}$$

187 The applicant states that an existing unabated CCGT has a direct operational carbon intensity of 0.354 tCO<sub>2</sub>e/MWh ([APP-058]/20.6.44). Applying this to the same unabated Scope 1 emissions gives an implied unabated net electrical output of:

$$146,925,347 \text{ tCO}_2\text{e} \div 0.354 \text{ tCO}_2\text{e/MWh} = 415,043,353 \text{ MWh (implied unabated net electrical output)}$$

188 The implied unabated net electrical efficiency is therefore:

$$415,043,353 \text{ MWh} \div 724,841,376 \text{ MWh} = 57.26\% \text{ (implied unabated net electrical efficiency)}$$

189 [APP-058]/20.6.43 states that the Proposed Development has a net electrical output of 362,664,000 MWh over 30 years (1,380 MWe × 8,760 hours/year).

190 The implied CCS-related net output penalty on a constant fuel-input basis is therefore:

$$415,043,353 \text{ MWh} - 362,664,000 \text{ MWh} = 52,379,353 \text{ MWh (implied CCS-related net output penalty)}$$

191 Expressed relative to fuel input, this penalty is:

$$52,379,353 \text{ MWh} \div 724,841,376 \text{ MWh} = 7.23\% \text{ (reduction in fuel-input efficiency, i.e. 7.23 percentage points)}$$

192 This corresponds to a reduction in net electrical efficiency from:

- (A) 57.26% (unabated) to
- (B) 50.03% (abated)

193 Expressed relative to the implied unabated net electrical output, the penalty is:

$$52,379,353 \text{ MWh} \div 415,043,353 \text{ MWh} = 12.6\% \text{ (reduction in net electrical output)}$$

194 Accordingly, on the applicant's own carbon intensity assumptions and CESL's reconstruction:

- (A) implied unabated net electrical efficiency ≈ 57.3%
- (B) implied abated net electrical efficiency ≈ 50.0%
- (C) implied CCS-related net output penalty = 7.23 %
- (D) equivalent to a 12.6% reduction in net electrical output

195 This is an inferred engineering performance reconstruction, derived from: CESL's quantified unabated Scope 1 combustion emissions [REP1-077], standard the standard DESNZ Scope 1 conversion factor, and the applicant's own unabated carbon intensity comparator and abated output [APP-058]. It follows directly from the numerical relationships embedded in the applicant's data.

## **F.6 (B) Energy penalty omission: Legal Implications for EIA Adequacy and Rochdale Envelope**

196 The above reconstruction demonstrates that the applicant's own data, when combined with standard DESNZ factors and the applicant's stated comparator, implies a material CCS-related net output penalty of 7.23% of fuel-input efficiency (or 12.6% of net electrical output).

197 This is a numerically determinative parameter of the development's environmental performance, directly affecting fuel throughput, upstream emissions, and total lifecycle greenhouse gas impacts. However, the Environmental Statement does not explicitly identify, disclose, or test this parameter, nor does it provide any sensitivity analysis of its variation.

198 In circumstances where such a parameter materially influences the scale of likely significant effects, the Rochdale Envelope approach requires that it be identified, bounded, and assessed on a reasonable worst-case basis, so that the decision-maker has full knowledge of the environmental consequences of granting consent.

199 The omission of any explicit treatment or sensitivity analysis of the CCS-related efficiency penalty therefore constitutes a failure to assess a defining parameter of the project's emissions profile, and indicates that the Environmental Statement does not robustly establish the maximum likely significant climate effects of the Proposed Development.

## **F.7 Comparison of abated and unabated operations with indicative sensitivity testing and methodological corrections**

200 CESL now builds the data for a comparison based entirely on the data in the ES and the figures derived so far.

201 Table 6 below shows the data and how it is generated from the absolute emissions derived from the ES and CESL's submissions [REP1-077] and [REP3-085]. This data:

- (A) Calculates the unabated case based on the same CCGT as in the ES – this differs from the applicant's figure where are generated from external data [APP-058], 20.6.44. Using the ES CCGT models gives a more precise comparison.
- (B) The net electrical outputs for the unabated and abated cases are explicitly used in the data calculation in the table, meaning that the CCS energy penalty is incorporated.
- (C) This enables the additional emissions due to the energy penalty to be calculated (these are not disclosed or reported in the applicant's approach).

**F.7 (A) Data derivation for abated versus unabated comparisons with sensitivity testing**

<b>Absolute Carbon values tCO<sub>2</sub>e</b>	<b>Unabated CCGT</b>	<b>Application</b>	<b>Unabated CCGT + ST1A</b>	<b>Application + ST1A</b>	<b>Unabated CCGT + ST1B</b>	<b>Application + ST1B</b>	<b>Application + ST2</b>
<b>Combustion</b>	146,925,347	6,648,512	146,925,347	6,648,512	146,925,347	6,648,512	41,873,724
<b>T&amp;S Unavailability</b>	-	7,346,267	-	7,346,267	-	7,346,267	7,346,267
<b>Other indirect</b>	4,417,134	4,417,134	4,417,134	4,417,134	4,417,134	4,417,134	4,417,134
<b>WTT</b>	24,242,682	24,242,682	130,233,559	130,233,559	249,025,106	249,025,106	249,025,106
<b>Total</b>	175,585,163	42,654,596	281,576,040	148,645,473	400,367,587	267,437,020	302,662,232
<b>Unabated net electrical output MWh : 415,043,353 **70</b>							
<b>Abated net electrical output MWh : 362,664,000 ****71</b>							
<b>Carbon intensities tCO<sub>2</sub>e/MWh</b>	<b>Unabated CCGT</b>	<b>Application</b>	<b>Unabated CCGT + ST1A</b>	<b>Application + ST1A</b>	<b>Unabated CCGT + ST1B</b>	<b>Application + ST1B</b>	<b>Application + ST2</b>
	<b>Existing CCGT</b>	<b>Existing CCGT +CCS</b>	<b>Existing CCGT – long-term CO<sub>2</sub> climate costs</b>	<b>Existing CCGT + CCS – long-term CO<sub>2</sub> climate costs</b>	<b>Existing CCGT - full climate costs</b>	<b>Existing CCGT +CCS - full climate costs</b>	<b>Existing CCGT +CCS - lower bound capture</b>
<b>Combustion</b>	0.354	0.016	0.354	0.016	0.354	0.016	0.101
<b>T&amp;S Unavailability</b>	-	0.018	-	0.018	-	0.018	0.018
<b>Other indirect</b>	0.011	0.011	0.011	0.011	0.011	0.011	0.011
<b>WTT</b>	0.058	0.058	0.314	0.314	0.600	0.600	0.600
<b>CCS Energy Penalty ***72</b>	-	0.015	-	0.052	-	0.093	0.105
<b>Total</b>	0.423	0.118	0.678	0.410	0.965	0.737	0.835

**Table 6: Data for abated versus unabated comparisons using ES data and indicative sensitivity tests**

<sup>70</sup> \*\* The emissions intensities for the application components for the abated cases are expressed on unabated-output equivalent basis

<sup>71</sup> \*\*\*\* The total emission intensity for the abated cases are expressed on an abated-output equivalent basis

<sup>72</sup> \*\*\* The CCS penalty is calculated as the increment from unabated-output equivalent intensity of each application to the actual total abated delivered intensity

F.7 (B) Comparison chart of Carbon Intensity of unabated vs abated with sensitivity testing

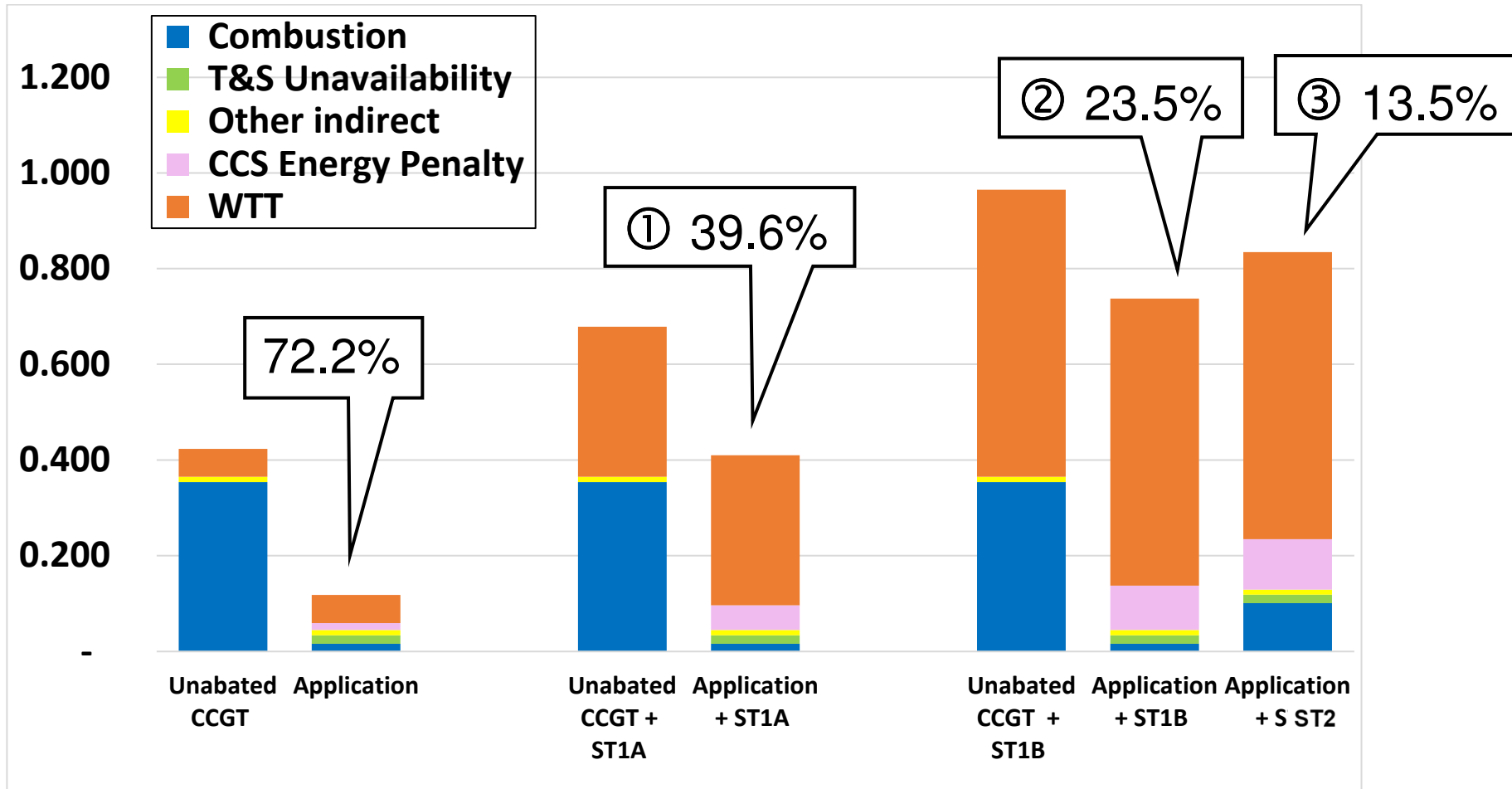


Figure 4: Comparison chart of Carbon Intensity of unabated vs abated with sensitivity testing

## **F.7 (C) Uncertainty bounded savings between abated and unabated**

202 The left hand comparison in Figure 4 above is the comparator to the data shown in Plate 20-2 [APP-058] (without the UK Grid Average). This shows on the slightly different assumptions in CESL's calculation method (e.g. that uses an unabated CQLCP as the comparison unabated plant), but with the default assumptions in the ES (ie DESNZ WTT factor at 95% capture) that the saving with the abated CQLCP is 72.2% (this is actually slightly better than the applicant's 71.4%).

203 When the indicative sensitivity test data for long-term CO2 effects only (ST1A) from [REP3-085], Table 5 is applied, the saving drops to 39.6% (① on Figure 4).

204 When the indicative sensitivity test data for short-term methane climate impacts are included (ST1B) from [REP3-085], Table 5, the saving drops to 23.5% (② on Figure 4).

205 When the indicative sensitivity test data for carbon capture rate (ST2) from [REP1-077], Table 2 is applied cumulatively (ie: on top of ST1B), the saving drops to 13.5% on (③ Figure 4).

206 These scenarios are illustrative of the uncertainty range of emissions savings in a full substitution analysis, just as CESL's indicative sensitivity tests, on which they are based, illustrate the uncertainty range in the absolute emissions from the development.

## **F.7 (D) Conclusion on savings between abated and unabated**

207 Analysis of this part of the ES shows that the CCS energy penalty, and its effects, had not been disclosed in the ES.

208 The applicant's example (ie Plate 20-2) is based on the DESNZ WTT factor for which CESL has provided significant evidence in this submission is not representative of foreseeable conditions of natural gas supply. Therefore the comparison and the figure of 71% saving of emissions between abated and unabated case can't be trusted. A consequence of this is that it can't be relied upon for contextualisation at the significance assessment stage.

209 When indicative sensitivity tests are applied for a reasonable worst case scenario, the savings in emissions falls to as little as 13.5%. The main reason for this is that the upstream emissions portion which cannot be captured become more dominant in both the abated and unabated lifecycles, and therefore less and less of the full lifecycle emissions can be saved from the unabated case.

210 The clear implication of this is that the carbon intensity based substitution analysis at paras 20.6.42 – 20.6.47 [APP-058], its conclusions on the "low carbon nature" and "future renewable support" of CQLCP (i.e. para 20.6.47), and the its inclusion in the significance assessment at 20.6.68 are all infected by the overall (technical and legal) issue of not identifying and described the uncertainty in EIA [REP4-092].

## **F.8 Legal issues for substitution**

### **F.8 (A) The Whitehaven case**

211 The case *Friends of the Earth Ltd v Secretary of State* [2024] EWHC 2349 (Admin) ("Whitehaven") clearly laid out the place of substitution arguments in planning decisions. It concerns a legal challenge to the grant of planning permission for a new underground

metallurgical coal mine in Whitehaven, Cumbria, where the High Court quashed the permission because the EIA had failed to assess the greenhouse gas emissions that would inevitably arise from the combustion of the extracted coal as an indirect significant effect of the development.

212 First, in *Whitehaven Holgate, J*, made the EIA obligation to assess absolute emissions absolutely clear<sup>73</sup>. The absolute GHG emissions from the project must be assessed as likely significant indirect effects — substitution/displacement arguments are entirely irrelevant to whether this obligation arises. The fact that CQLCP could displace an unabated CCGT (WCM's analogue: displacing US coal) cannot be used to avoid or minimise the assessment of the project's own absolute emissions.

213 The CQLCP ES does rely on EIA assessment of the absolute operational emissions in reaching a significance assessment at para 20.6.68: "... *But the contextualisation of emissions against the UK and Welsh carbon budgets and targets leads to an overall evaluation of significance for the Proposed Development's operational GHG impact of moderate adverse and significant (Ref 20-27).*"

214 CESL submits that presentation of this assessment, although it concludes with an absolute emissions assessment (following the word "But"), is made somewhat murky by presenting two competing earlier assessments at para 20.6.66 (the net CCGT comparison, the substitution argument "suggests a beneficial impact", while policy consistency "indicates a minor adverse impact."

215 CESL submits that, in line with *Whitehaven*, it would be preferable for the absolute emissions assessment based on the EIA regulations obligation, identified by *Finch and Whitehaven*, to be presented first and clearly identified as the legally obligated assessment.

216 Further, there is a concern which I respectfully point out to the ExA. While the significance rating (Moderate Adverse) is based on a comparison of absolute emissions against carbon budgets, para 20.6.66 explicitly states that the CCGT comparison "suggests a beneficial impact." That conclusion — which appears in the "Overall Evaluation of Significance" section — is then contradicted by the Moderate Adverse finding (following the "But"). The internal tension is never resolved: the ES simultaneously tells the decision maker that the project is "beneficial" on a substitution argument and "Moderate Adverse / Significant" in absolute terms, without explaining which the decision-maker should rely on. The ES should make it completely clear to the decision maker that the absolute emissions comparison is the primary EIA obligation; substitution arguments are secondary, post hoc and non-determinative.

217 All of the above is caveated, that CESL has submitted [REP4-092] that the identification and description of the climate impacts of CQLCP is inadequate meeting the EIA Regulations. And, as evidenced, this also infects the substitution analysis. Until this is rectified, CESL cannot submit comments on the significance assessment outcome which can only follow the full knowledge description and identification of likely significant effects of the project. As such, the comments above therefore relate to the presentation of the significance assessment, and the legal status within it of any substitution analysis which

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<sup>73</sup> *Whitehaven* [101] "Taking into account the common ground that the burning of the Whitehaven coal is an inevitable consequence of its extraction from the mine, in my judgment it is plain, following the decision of the Supreme Court in *Finch*, that the GHG emissions from that combustion are significant likely indirect effects of the project the subject of the planning application. Accordingly, the 2011 Regulations required WCM's ES and the EIA process to assess those emissions and their implications. The Secretary of State was obliged to take into account that environmental information (including the GHG emissions from combustion of the Whitehaven coal) before deciding whether or not to grant planning permission on the application."

might be done. As submitted elsewhere, the benchmark of the UK territorial carbon budgets is also inadequate for lifecycle emissions covering both UK and ex-UK territory emissions.

**F.8 (B) OPRED guidance**

Please note the principle in the OPRED guidance of an assumption that substitution will not occur when considering Scope 3 emissions as described under section E.5 (B).

**D5 / Section G      Response to ISH4: climate benefits of CQLCP**

218 At item 4.2 of the ISH4 agenda, the ExA tabled “The proposed development’s potential contribution to mitigating for climate change effects resulting from its operation and replacement of other technologies”. CESL was directly asked this by the ExA, and the applicant summarised this part of the ISH4 in [REP4-084] which CESL now reproduces and some pointers can be made to responses in this document.

From [REP4-084]	CESL Comments
<p>1.5.40 Dr Boswell referred to Plate 20-2 of <b>Chapter 20: Climate Change [APP-058]</b>. When you apply the data in that chart, Dr Boswell considers you actually get much smaller gains in terms of carbon capture and storage against unabated.</p>	<p>This refers to applying the uncertainty identified in the EIA description to the substitution analysis and is evidenced in this submission at sections F.5, F.6 and F.7.</p>
<p>1.5.41 The ExA asked if this plant will have a wider mitigating impact on climate change.</p>	
<p>1.5.42 Dr Boswell stated that he can reply to that in writing as it is getting into policy areas. So far, everything submitted has been on EIA elements. What the Applicant has said about Plate 20-2 of <b>Chapter 20: Climate Change [APP-058]</b>, at paragraph 20.6.43, talks about contextualising against unabated CCGT and grid average. Once uncertainties are applied, the number is different to what the Applicant is presenting. In terms of Dr Boswell's submissions on a similar exercise for Net Zero Teesside, the ExA said they did not consider it viable to use unmitigated emissions as a baseline any longer and the Secretary of State agreed.</p>	<p>CESL’s submissions and legal submission [REP4-092] relates to the EIA, and does not extend into policy matter.</p> <p>Referring to “.. <i>the number[s] is different to what the Applicant is presenting</i>”. This is evidenced in this submission at sections F.5, F.6 and F.7.</p> <p>CESL has submitted additional information on the Whitehaven case and substitution at section F.8 of this document.</p>

1.5.43 The ExA is interested in whether there is anything this site does to reduce the risk of future climate change	
1.5.44 Dr Boswell responded that, taken in the round, no, he considers it is not a benefit in the current situation to progress fossil fuel based carbon capture and storage. To clarify, in the Net Zero Teesside decision, the Secretary of State did not accept the approach as an appropriate comparator or baseline. There is a precedent that this whole approach is not viable or valid in the EIA discussion.	CESL respond to the issue of fossil fuel based carbon capture and storage below.  On substitution (referred to under Net Zero Teesside), CESL has submitted additional information on the Whitehaven case and substitution at section F.8 of this document.
1.5.45 The ExA noted that one would think the fact that this plant is next to an existing unabated CCGT would form an appropriate comparator	

**Table 7: CESL responses to ISH4 points, Item 4.2**

### **G.1 The Climate benefit of CQLCP**

219 This section comments on “1.5.44 Dr Boswell responded that, taken in the round, no, he considers it is not a benefit in the current situation to progress fossil fuel based carbon capture and storage”.

220 CESL submissions are tightly around the EIA of the CQLCP. In that context, CESL has already provided evidence that the EIA assessment based on absolute carbon emissions (Whitehaven, see section F.8) is the primary concern for significance. In section F, CESL has also provided evidence that there are methodological issues with the applicant’s substitution analysis ([APP-058], 20.6.42 - 20.6.47), that a simple two technology framing of abated and unabated gas is not representative of the post-2035 energy system, and that when the uncertainties identified in the EIA [REP4-092] are taken into account the emissions savings made by substitution are drastically reduced.

221 In the examination, CESL<sup>74</sup> relies on this evidential base, and the evidential base that CESL has presented with each submission, to argue that (1) the description and identification of the GHGs is revised with uncertainty analysis and sensitivity testing (as per the legal submission [REP4-092]). A natural consequence of (1) is that (2) the significance assessment will need to be revised too, although respond to the submissions on benchmarks and significance assessment made in this document. It is only then that (3) a reasoned conclusion may be formulated by the decision maker.

222 However, CESL respectfully considers that it is appropriate to give the ExA a further brief answer to the question posed at the ISH4. CESL has shown that the EIA evidence does not demonstrate a net climate benefit from the development.

(A) On CESL’s indicative sensitivity tests, which although only being indicative, are grounded in scientific and empirical evidence and show that CQLCP could emit significant upstream emissions (potentially in the range of 250 million tonnes CO<sub>2</sub>e

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<sup>74</sup> CESL has sought to avoid straying into other areas such as commenting on policy, which are not relevant to the above.

over 30 years, Table 6 in this submission). These emissions cannot be captured or mitigated, and in the case of methane, they have a short-term heating impact on the climate system. This is the primary evidenced reason for CQLCP posing a climate harm rather than climate benefit.

- (B) Whilst acknowledging that the Government currently proposes implementing Power CCS (including gas fired CCS) as dispatchable power to 2050 (Figure 3 in this submission shows the Government projections in the Clean Flexibility Roadmap (2025)), CESL posits that reducing costs in other flexible technologies such as energy storage and in renewables has the potential for less Power CCS to be required, and more other flexible technologies to be implemented to 2050. The key climate argument which pertains here is that for every MW of flexible supply delivered by other means than with Power CCS, the upstream emissions and short-term climate heating penalty of Power CCS is avoided. CESL posits that investment in Power CCS may prevent investing in other flexible technologies, faster and at greater scale.
- (C) Beyond, the infrastructure costs of Power CCS, CESL has presented evidence on the fuel costs involved at section F.3 of this submission. The conservative estimate for natural gas fuel supply CQLCP operating in its central operating scenario (Dispatchable High, 50% CF) is £278 million per year. Recent geopolitical events would suggest that this conservative calculation based on the pre-Iran war situation is not risked against future geopolitics, and actually may be optimistically biased. This impacts UK energy security and well as the country's finances – other flexible technologies do not have this risk.

**D5 / Section H      SUMMARY / INVENTORY OF KEY SUBMISSIONS / REQUESTS**  
**MADE BY CESL**

**H.1 1. Requests to the ExA (procedural / evidential actions)**

**H.1 (A) Admit new evidence**

223 Treat latest DESNZ Energy Trends (April 2026) as material post-ISH4 evidence  
→ Section B.1

224 Treat DESNZ EIR response on WTT methodology as material post-ISH4 evidence  
→ Section B.2

**H.1 (B) Update the evidential baseline**

225 Recognise that UK gas supply is now materially dominated by US LNG in marginal conditions → Section B.1

226 Recognise that DESNZ WTT factor does not reflect current or foreseeable supply conditions → Section B.2

Core EIA adequacy submissions

**H.1 (C) Identification and description of effects (Reg 5(2))**

227 CESL submits that the ES fails to identify and describe likely significant effects because:  
(A) WTT factor is based on outdated (2015) intensity data  
(B) LNG provenance is misrepresented (Qatar proxy for all LNG)  
(C) Supply weighting frozen at 2021  
→ Section B.2

**H.1 (D) Status of WTT factor**

228 CESL submits that the DESNZ WTT factor is not fit for purpose for EIA  
→ Section B.2(D), B.3

229 CESL submits that the WTT factor cannot be relied upon even as a lower-bound estimate  
→ Section B.2(C), B.3

230 CESL submits (updated D5 position) that WTT cannot safely be used, without correction or sensitivity analysis, as the baseline descriptor for significance assessment → Section B.3

**H.1 (E) Consequence for significance assessment**

231 CESL submits that the significance assessment is unsafe because:  
(A) it is built on a flawed emissions description  
(B) therefore cannot support a lawful reasoned conclusion → Section B.3(A)

**H.2 Required methodological corrections**

## **H.2 (A) Upstream emissions treatment**

232 Applicant must model upstream emissions using realistic and current supply conditions  
→ Section B.2, B.3

233 Applicant must account for LNG-dominated marginal supply conditions  
→ Section B.2(C)

## **H.2 (B) Sensitivity analysis (central remedy)**

234 ExA should require sensitivity testing of upstream emissions  
→ Section B.3(A), D.5, E (holding statement)

235 Sensitivity testing must include:  
(A) higher-intensity upstream emissions scenarios  
(B) LNG-dominated marginal supply  
→ Section B.3(A)

## **H.2 (C) Methane metric**

236 Applicant should assess both GWP100 and GWP20  
→ Section C.1–C.4

237 CESL submits that GWP100-only assessment fails to capture short-term impacts  
→ Section C.2

## **H.2 (D) Uncertainty disclosure**

238 Applicant must explicitly describe uncertainties and difficulties  
→ Section D.4 (link to Schedule 4 para 6)

## **H.2 (E) CCS energy penalty**

239 Applicant must disclose and test CCS energy penalty  
→ Section F.6(B)

240 CESL submits omission of energy penalty is a failure under Rochdale Envelope  
→ Section F.6(B)

## ***H.3 Submissions on LADACAN / non-CO<sub>2</sub> argument***

### **H.3 (A) Rejection of Applicant analogy**

241 CESL submits LADACAN is not applicable because:  
(A) upstream emissions already quantified  
(B) benchmark already used  
→ Section D.2–D.3

### **H.3 (B) Benchmark not legally required**

242 CESL submits significance assessment does not require a benchmark  
→ Section D.3(A)  
(via R (Boswell) v Secretary of State for Energy Security and Net Zero)

### **H.3 (C) Upstream variability is not speculation**

243 CESL submits upstream methane variability is well-established and quantifiable  
→ Section D.4

## ***H.4 Submissions on benchmarking and significance***

### **H.4 (A) Carbon budget comparison**

244 CESL submits UK/Welsh carbon budgets are not a valid benchmark because:  
territorial mismatch (exclude ex-UK emissions) methodological mismatch (NAEI vs WTT)  
→ Section E.1

### **H.4 (B) ES comparison is incoherent**

245 CESL submits ES comparison is “apples to oranges” and cannot support conclusions  
→ Section E.1–E.2

### **H.4 (C) Need for revised significance framework**

246 CESL submits significance must be reassessed using:  
(A) corrected emissions  
(B) separated territorial / ex-territorial components  
→ Section E (holding statement)

### **H.4 (D) Ex-UK emissions gap**

247 CESL submits there is no policy framework constraining ex-UK upstream emissions  
→ Section E.4

248 Therefore EIA assessment is critical and cannot rely on policy control  
→ Section E.4

### **H.4 (E) OPRED principles**

249 CESL submits ExA should apply OPRED/IEMA principles:  
(A) absolute emissions first  
(B) no substitution assumption  
(C) global emissions relevant  
→ Section E.5

## ***H.5 Substitution and climate benefit***

### **H.5 (A) Substitution claim not evidenced**

250 CESL submits assumption of 1:1 displacement of unabated CCGT is unproven  
→ Section F.4(A), F.4(E)

### **H.5 (B) Merit-order critique**

251 CESL submits future dispatch will include multiple competing technologies  
→ Section F.4(B–D)

252 Therefore CQLCP will not necessarily displace unabated gas  
→ Section F.4

### **H.5 (C) Substitution analysis flawed**

253 CESL submits applicant's substitution calculations are methodologically flawed  
→ Section F.1

### **H.5 (D) Sensitivity impact on substitution**

254 CESL submits emissions savings may reduce to ~13.5% under reasonable worst case  
→ Section F.7

### **H.5 (E) Legal status of substitution**

255 CESL submits substitution is secondary and cannot displace absolute emissions assessment→ Section F.8  
(via Friends of the Earth Ltd v Secretary of State for Levelling Up Housing and Communities)

## ***H.6 Overall remedy sought***

### **H.6 (A) Core remedy**

256 ExA should require additional information under EIA Regulations:  
(A) upstream emissions sensitivity analysis  
(B) GWP20 assessment  
(C) corrected lifecycle emissions  
→ Section B.3(A), D.5, E

### **H.6 (B) Consequence if not addressed**

257 CESL submits that without correction:  
(A) ES is legally deficient  
(B) significance assessment unreliable  
(C) no lawful reasoned conclusion possible  
→ Section B.3(A), E

**D5 / Section I**      **Statement on the use of Artificial Intelligence**

258 This statement is made in accordance with PINS guidance on “*Use of artificial intelligence in casework evidence*”, 6 September 2024 and its update of 20 February 2026.

259 I have used standard commercially available artificial intelligence tools (OpenAI ChatGPT v5.2, and Anthropic Claude Sonnet 4.6) to assist with researching issues, and drafting and refining textual content for clarity, structure, and readability.

260 AI was used solely in response to prompts provided by me and drew on publicly available information and the content of documents and material supplied by me; it was not used to generate original evidence or data.

261 The text in this submission may therefore have been influenced by the use of AI for research support and proof-reading during the drafting process.

262 I submit that any use of AI in preparing this submission has been responsible and lawful, and has been directed to clarifying and structuring the issues presented.

263 I am responsible for the factual accuracy of this submission. All information has been reviewed and checked by me and, to the best of my knowledge and understanding, is true and accurate.

264 Numerical work, including any tables of figures or graphs in this document, is usually my own work, but may be assisted by AI in which case it is always thoroughly checked to my own standards.

265 No images, video, or visual material have been created, altered, or enhanced using artificial intelligence in this submission.

266 This submission does not contain any personal data, and no personal information has been disclosed or processed using AI. Any use of AI complies with data protection, confidentiality, and copyright requirements.

**Appendix A: DESNZ EIR response: DESNZ WTT factor methodology**

Received 27 March 2026

Stand-alone version also supplied to examination library



Department for  
Energy Security  
& Net Zero

Science and Innovation for Climate and  
Energy  
Department for Energy Security & Net  
Zero  
3 - 8 Whitehall Place  
London  
SW1A 2AW

foi.requests@energysecurity.gov.uk

www.gov.uk/desnz

Our ref: EIR2026/02883

27 March 2026

Thank you for your email of 2 March where you requested the following information:

*"I write under the Environmental Information Regulations 2004 ("EIR").*

*This request concerns the Natural Gas Well-to-Tank (WTT) emission factor published in the annual DESNZ Greenhouse Gas Conversion Factors (advanced user datasets), specifically for the publication years 2019–2025 inclusive.*

*The requested information constitutes "environmental information" within the meaning of Regulation 2(1)(b) and (c), as it relates directly to greenhouse gas emissions, lifecycle carbon intensity of fossil fuels, and factors used in public environmental assessment and policy.*

---

#### *1. Information Requested*

*I request disclosure of the following:*

##### *(A) Full calculation methodology*

*A complete, step-by-step description of the methodology used to derive the Natural Gas WTT emission factor for each publication year 2019–2025, including:*

- 1. Identification of the exact Exergias (2015) tables and stage boundaries used;*
- 2. Clarification of which lifecycle stages are included within the WTT-fuels boundary (including explicit confirmation of the treatment of:*

- o extraction,*
- o processing,*
- o liquefaction,*
- o shipping,*
- o gas transmission,*

- o gas distribution,
- o storage,
- o dispensing);

3. Confirmation of whether the Exergia “Gas distribution, transmission and storage” stage is:

- o included,
- o excluded,
- o or replaced with a UK-specific estimate;

4. A precise description of how DUKES data are used in weighting, including:

- o which DUKES edition corresponds to each publication year,
- o the data year used in each calculation,
- o treatment of interconnector imports,
- o treatment of LNG provenance (e.g. whether Qatar, USA and other sources are differentiated or blended);

5. Confirmation of whether upstream production and LNG intensities have been updated since Exergia (2015), and if so, how.

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*(B) Working calculation files*

*All working spreadsheets, internal models, scripts, intermediate calculation sheets, or other computational artefacts used to derive the published Natural Gas WTT values for 2019–2025.*

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*(C) Documentation relating to the 2021 methodology revision*

*The 2021 Methodology Report states:*

*“The methodology for calculating the indirect/WTT emission factors for natural gas and CNG have been improved to utilise updated DUKES data on leakage and energy use in transmission and distribution.”*

*Please provide:*

1. Any internal documentation explaining this revision;
  2. Any comparison of pre-2021 and post-2021 calculation methods;
  3. Any decision records describing boundary changes or reallocation of transmission/distribution emissions;
  4. Any assessment undertaken of the impact of the revision on published values.
- 

*(D) Post-2021 recalculation practice*

*For publication years 2023–2025, the Natural Gas WTT factor remains constant at 9.30 kgCO<sub>2</sub>e/GJ (Net CV).*

*Please provide:*

1. Confirmation of whether the factor was recalculated annually for 2023–2025 using updated DUKES data;
  2. If recalculated, the working demonstrating how updated supply shares produced identical values;
  3. If not recalculated, documentation explaining the decision not to update;
  4. Any internal discussion of smoothing, averaging, or freezing of the Natural Gas WTT factor post-2021.
- 

## 2. Public Interest and Transparency

The Natural Gas WTT factor is relied upon in:

- Environmental Impact Assessments,
- Planning decisions,
- Infrastructure appraisals,
- Carbon accounting frameworks.

There is a clear and substantial public interest in ensuring:

- The factor is transparently derived,
- The boundary definition is explicit,
- The calculation is independently reproducible,
- The upstream methane assumptions are scientifically current.

Given the presumption in favour of disclosure under Regulation 12(2), any exceptions relied upon must be interpreted restrictively.

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## 3. Anticipated Exceptions

If DESNZ considers that any exception under Regulation 12 applies, please:

- Specify the exact Regulation relied upon;
- Explain why the exception applies;
- Provide the public interest balancing assessment;
- Confirm whether partial disclosure is possible;
- Confirm whether redacted versions of working files can be provided.

Please note that working calculation spreadsheets and methodological documentation relating to emission factor construction are prima facie environmental information and disclosure is strongly favoured.

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## 4. Format

Please provide the requested information electronically in original file format where possible (e.g. Excel workbooks, calculation models).

If any requested information is not held, please confirm explicitly.

## 5. Note

The annual DESNZ Greenhouse Gas Conversion Factors spreadsheet says "For technical queries, please contact Greenhouse Gas Statistics at [greenhousegas.statistics@energysecurity.gov.uk](mailto:greenhousegas.statistics@energysecurity.gov.uk)".

This FOI/EIR request follows two attempts to acquire information relating to the above by email from the DESNZ Statistic team at the above address.

(1) Email subject "Question: Scope 3 emissions for Natural Gas", Date: 11 Jan 2024, 22:27 from my email, address.

- follow up "nudge" email: 19 Jan 2024, 17:32

Outcome: no response

(2) Email subject " Clarification request – Methodology and calculation steps for Natural Gas WTT factor", Date: Sat 21 Feb 2026, 21:00

Outcome: no response"

We have considered your request in accordance with the Environmental Information Regulations 2004 ('the EIRs') as the information you request falls within the definition of 'environmental information' in the EIRs.

Calculation of the UK greenhouse gas conversion factors is conducted by a contractor (the Inventory Agency). This response includes information held by DESNZ, as well as information held on behalf of DESNZ by the Inventory Agency.

Please see responses to your requests below:

### A). Full calculation methodology

The well-to-tank (WTT) factor for natural gas supply is calculated from two main sources:

1. Emissions associated with upstream and midstream stages (extraction, processing, liquefaction, shipping) are based on data from Exergia et al. (2015)<sup>1</sup>. This is combined with data on sources of gas supply from UK energy statistics.
2. Emissions associated with downstream stages (transmission, distribution and storage) are based on data from UK energy statistics on leakage and own gas use in the gas industry, and an estimate of electricity use in transmission activities from Exergia et al. (2015).

More detail on the methodology and specific sources for emissions factors is given below.

#### 1). Calculation of emission factors for upstream and mid-stream stages

Data from the upstream and mid-stream stages for gas supplied from UK, Norway, Netherlands and Qatar liquefied natural gas (LNG) are taken from *Table 5-23 Carbon Intensity of Natural Gas streams arriving to North EU*. Values which are used are shown in Table 1. These are the most up to date values as an updated version of the report has not been published since they were introduced into the methodology.

<sup>1</sup> Exergia et al. (2015). Study on actual GHG data for diesel, petrol, kerosene and natural gas. A study by Exergia, E3 Modelling and COWI for the European Commission, DG ENER. Retrieved from [https://energy.ec.europa.eu/publications/study-actual-ghg-data-diesel-petrol-kerosene-and-natural-gas\\_en](https://energy.ec.europa.eu/publications/study-actual-ghg-data-diesel-petrol-kerosene-and-natural-gas_en)

**Table 1 Emissions factors for upstream and midstream stages of gas supply**

Step in pathway	GHG emitted (g CO <sub>2</sub> eq/MJ)			
	UK	Norway	Qatar LNG	Netherlands
Fuel production and recovery	5.949	2.203	11.272	1.300
CO <sub>2</sub> , H <sub>2</sub> S removed from NG (gas processing)	0.026	0.113	1.380	0.001
Feedstock transportation (pipeline and LNG)	0.802	2.403	4.383	0.684

These country specific emissions factors are combined with data on the quantities and sources of natural gas supplied to the UK from the Digest of UK Energy Statistics (DUKES)<sup>2</sup> for the relevant year. Data for imports and exports is taken from *Table 4.5 Natural gas imports and exports (GWh)* in DUKES and total supply from *Table 4.1 in DUKES (Commodity balances)*. This allows the calculation of UK supply. As the Exergia report only supplies data for pipeline supply from the UK, Norway, and Netherlands, pipeline imports from Belgium are assumed to have the same emissions factor as pipeline imports from the Netherlands. In the case of LNG, as only a factor for Qatar LNG is available this is used for all LNG imports. There is some re-export of LNG so data from *Tables 4.5 and 4.1 in DUKES* are used to determine net imports. Quantities of gas supplied from each source are then combined with the emissions factors from Exergia for mid-stream and upstream stages (reproduced as *Table 1* here) to produce a weighted average emission factor for supply to the UK. The year of the DUKES publication used for each year of the conversion factors publication is shown in *Table 2*.

**Table 2 DUKES edition corresponding to each publication year of conversion factors**

Publication year for Conversion Factors	2019	2020	2021	2022	2023	2024	2025
Year of DUKES publication	2018	2019	2020	2021	2022	2022	2022
Year for which energy data relevant	2017	2018	2019	2020	2021	2021	2021

## 2). Calculation of emission factors for downstream stages

In the case of compressed natural gas (CNG) supplied for use in vehicles, emissions from dispensing are estimated based on estimates of electricity required for dispensing and fugitive emissions of natural gas from dispensing, both of which are derived from Exergia et al. (2015).

An estimate of emissions from downstream stages, gas distribution, transmission and storage, activities which occur in the UK, is made based on data in *Table 4.3 UK continental shelf and onshore natural gas production and supply* in DUKES. An estimate of the electricity use in transmission activities is taken from *Table 3-54 UK Downstream Gas Data UK* in Exergia et al. (2015). Data in *Table 3.4 in DUKES* is used to calculate own use of natural gas in the industry, which is assumed to be combusted and to produce CO<sub>2</sub> emissions; these are calculated using the emission factor for natural gas combustion. *Table 3.4 in DUKES* is also used to calculate the percentage of gas transported which is fugitively emitted (leakage). The methane content of natural gas and its net calorific value are then used to convert the natural gas leakage rate to a methane emission. Emissions associated with electricity use in transmission activities are

<sup>2</sup> DESNZ (2025). [Digest of UK Energy Statistics \(DUKES\) - GOV.UK](#)

calculated using the estimate of electricity use from Exergias et al. (2015), and the emission factor for UK electricity as calculated elsewhere in the UK GHG Conversion Factors.

Fugitive emissions from dispensing of natural gas are estimated as 0.34% based on *Table 5-21 Average Carbon Intensities of Natural Gas for the considered EU Regions* in Exergias et al. (2015). These are converted into methane emissions per MJ CNG by taking into account the proportion of methane in natural gas and the density and net calorific value of natural gas. Electricity consumption in dispensing is derived from the overall emissions factor for CNG fuel dispensing given in *Table 5-23 Carbon Intensity of Natural Gas streams arriving to North EU* in Exergias et al. (2015) by subtracting emissions associated with fugitive emissions during dispensing and dividing the remaining emissions by the carbon intensity of electricity given in Exergias et al. (2015) in *Table 3-139 Carbon Intensities of Member States' electric power systems*. A time series is then created by multiplying the electricity consumption by the electricity emission factor for the appropriate year as published in the UK GHG Conversion Factors and adding it to the fugitive emissions.

#### Total well-to-tank emission factor for natural gas supply

The total WTT emission factor is calculated by summing the above components and then applying two corrections.

The first is an adjustment downwards of 3%. This is applied as the result of a comparison between the value produced by the methodology in 2012, with that reported in Exergias et al. (2015) for UK supply in 2012, which showed a small discrepancy. The comparison of values was completed when the methodology was first developed and was done using the same IEA gas supply data for the UK for 2012 that the Exergias study reported it had used. The second is a correction to convert the Exergias values which are only reported in gCO<sub>2</sub>e (CO<sub>2</sub> equivalent) from AR4 GWPs to AR5 GWPs. As the Exergias report does not separate out the contribution of individual GWPs, an estimate was made of the contribution of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O to the overall gCO<sub>2</sub>e value based on data from the JEC well-to-wheel analysis of the CNG fuel cycle which separately identifies the contribution of each gas (2020)<sup>3</sup>.

#### *B). Working calculation files*

The calculation of the natural gas WTT conversion factors is embedded in a workbook which calculates many other Scope 1 and Scope 3 WTT conversion factors for fuels. There are no separate calculation files for producing the natural gas WTT conversion factors that can be shared.

#### *C). Documentation relating to the 2021 methodology revision.*

Pre-2021 emissions from gas distribution, transmission and storage in the UK were taken from *Table 5-23 Carbon Intensity of Natural Gas streams arriving to North EU* in Exergias (2015) and were 1.114 g CO<sub>2</sub>e/MJ. Post-2021 the calculation method is as described in the response to (A) and are calculated annually based on UK specific data on the gas industry from UK energy statistics. There is no change to the boundary of the assessment. The impact of the revision in 2021 was to increase the published values for 2019 by 0.68 gCO<sub>2</sub>e/MJ and the value for 2020 by 0.52 gCO<sub>2</sub>e/MJ.

<sup>3</sup> JEC WTW v5. (2020). JEC Well-to-Tank report v5. Luxembourg: By European Commission, JRC-EUCAR-CONCAWE. Prussi, M., Yugo, M., De Prada, L., Padella, M., Edwards, R. and Lonza, L. doi:10.2760/959137

DESNZ does not hold any internal documentation or decision records which describe or directly lay out this revision.

*D). Post-2021 recalculation practice*

The calculation of the emissions factors was updated using data for the most recent year available for sources of gas supply for the 2019, 2020, 2021, 2022 and 2023 publications of the GHG conversion factors. Since 2023, annual updates of the WTT factors, including that for natural gas, were ceased. The value supplied in 2024 and 2025 publications is therefore the value published in 2023. DESNZ does not hold any internal documentation which describe or directly lay out this particular decision.

Not all factors in the publication are updated every year. Annual improvements to the Conversion Factors are prioritised and implemented through established governance processes, including a steering group and expert peer review. The primary purpose of the UK GHG Conversion Factors is to support company reporting under the UK's Environmental Reporting Guidelines, including Streamlined Carbon and Energy Reporting regulations (SECR). A risk-based approach is adopted to updating the factors which focuses on high-emitting or variable sources which are key sources for most companies, with priority given to those relevant to SECR. Reporting of well-to-tank emissions is voluntary under SECR and so these factors have been deprioritised in recent updates to focus on delivering robust and accurate Scope 1 and 2 factors.

DESNZ intend to review the well-to-tank factors for fuels, including those for LNG and natural gas, ahead of next year's publication of the UK GHG Conversion Factors 2027.

**Appeals Procedure**

If you are dissatisfied with the handling of your request, you have the right to ask for an internal review. Internal review requests should be submitted within two months of the date of receipt of the response to your original request and should be addressed to the Information Rights Team. It would be helpful if you can tell us why you are dissatisfied with the response to your request so we may address this during the internal review.

Information Rights Team  
Department for Energy Security & Net Zero  
3 - 8 Whitehall Place  
London  
SW1A 2AW  
Email: [FOI.Requests@energysecurity.gov.uk](mailto:FOI.Requests@energysecurity.gov.uk)

Please remember to quote the reference number above in any future communications.

If you are not content with the outcome of the internal review, you have the right to apply directly to the Information Commissioner for a decision. Complaints can be made to the Information Commissioner via their website at: <https://ico.org.uk/make-a-complaint/foi-and-eir-complaints/foi-and-eir-complaints/>.

Yours sincerely,

Science and Innovation for Climate and Energy Directorate

## **Appendix B: The Embedding of GWP20 into International Marine Fuel Regulation**

The story unfolds across four key IMO Marine Environment Protection Committee (MEPC) sessions over three years grappling with the issue of LNG methane slip.

### **B.1 The Background Problem**

268 LNG was being promoted across the shipping industry as a "clean" transition fuel because it produces around 25-30% less CO<sub>2</sub> on combustion than heavy fuel oil. But LNG is almost entirely methane, and methane slips unburned through engines — particularly in older two-stroke engines — and leaks throughout the upstream supply chain. When those upstream and engine methane emissions are calculated using GWP100, LNG often looks acceptable or even beneficial. When calculated using GWP20, the picture can reverse entirely, with some LNG pathways appearing worse than diesel based fuels they replace.

### **B.2 The IMO Process**

#### **B.2 (A) Stage 1: MEPC 78, June 2022**

269 At MEPC 78 in June 2022, the Clean Arctic Alliance submitted document MEPC 78/7/19<sup>75</sup>, a concrete proposal for how to calculate well-to-wake CO<sub>2</sub> equivalent emissions from marine fuels using both GWP100 and GWP20 for comparative purposes as part of the IMO LCA guidelines.

270 This was the first formal submission to the IMO arguing for dual GWP reporting. MEPC 78 noted the progress made in developing draft LCA guidelines and established a correspondence group on marine fuel lifecycle GHG analysis to further the work, with the correspondence group to submit an interim report to MEPC 79 and final draft guidelines to be adopted by MEPC 80.

#### **B.2 (B) Stage 2: MEPC 80, July 2023**

271 GWP20 first entered the adopted IMO guidelines. MEPC 80 adopted by Resolution MEPC.376(80) the Guidelines on Life Cycle GHG Intensity of Marine Fuels (LCA Guidelines), which set out methods for calculating well-to-wake and tank-to-wake GHG emissions for all fuels and other energy carriers used on board a ship<sup>76</sup>.

<https://www.imo.org/en/ourwork/environment/pages/2023-imo-strategy-on-reduction-of-ghg-emissions-from-ships.aspx>

272 The actual text of those guidelines<sup>77</sup> states explicitly that GHG intensity must be reported in two ways:

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<sup>75</sup> <https://cleanarctic.org/2022/04/01/proposal-for-how-to-calculate-well-to-wake-carbon-dioxide-equivalent-emissions-using-both-gwp100-and-gwp20-for-comparative-purposes-as-part-of-the-lca-guidelines/>

<sup>76</sup> <https://www.imo.org/en/ourwork/environment/pages/2023-imo-strategy-on-reduction-of-ghg-emissions-from-ships.aspx>

<sup>77</sup> Annex 14 of MEPC 80/17/Add.1 provided as a stand-alone appendix

(A) The sustainability theme for greenhouse gases requires: GHG intensity in gCO<sub>2</sub>eq/MJ (GWP100); and GHG intensity in gCO<sub>2</sub>eq/MJ (GWP20) for comparative purposes.

(B) The mathematical formulae for both calculations were set out directly in the guidelines text, with GWP values of CH<sub>4</sub> at 28 (GWP100) and 84 (GWP20) based on IPCC AR5.

273 The primary document is Resolution MEPC.376(80)<sup>78</sup>.

#### **B.2 (C) Stage 3: MEPC 81, March 2024**

274 MEPC 81, held 18-22 March 2024, adopted revised Guidelines on Life Cycle GHG Intensity of Marine Fuels by Resolution MEPC.391(81). The updated guidelines included revised calculations for default emission factors, updated appendix 4 on template for well-to-tank default emission factor submission, and a new appendix 5 template for tank-to-wake emission factors.

<https://www.imo.org/en/mediacentre/meetingsummaries/pages/mepc-81.aspx>

275 The 2024 revision retained and reinforced the dual GWP reporting requirement. The 2024 guidelines formally specify that GWP100 values should be used for the purpose of quantifying GHG intensity in accordance with the guidelines, while a calculation using GWP20 may be provided as information for comparative purposes, using CH<sub>4</sub> values of 84 (GWP20) and 28 (GWP100).

[https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.391\(81\).pdf](https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.391(81).pdf)

276 This is the current operative document is available at<sup>79</sup> and the MEPC 81 meeting summary is at<sup>80</sup>. By the MEPC 81 meeting decision, the GWP20 dual reporting requirement is now adopted international regulatory guidance.

#### **B.2 (D) Stage 4: MEPC 83, April 2025**

277 MEPC 81 also established a new Correspondence Group on measurement and verification of non-CO<sub>2</sub> GHG emissions and onboard carbon capture, tasked with developing a framework for actual measurement of tank-to-wake methane and nitrous oxide emission factors — a direct response to concerns about methane slip being understated by default factors.

278 MEPC 83 noted the GESAMP-LCA Working Group's review of well-to-tank and tank-to-wake default GHG emission factors for fuel production and onboard technologies, with all LCA-related matters handled ahead of consideration at MEPC 84 provisionally scheduled for April 2026. <https://www.liscr.com/marketing/liscr/media/liscr/online/library/maritime/mepc-83-meeting-summary.pdf>

#### **B.2 (E) Stage 5: MEPC 84, April - May 2026**

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<sup>78</sup> [https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/MEPC.376\(80\).pdf](https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/MEPC.376(80).pdf)

<sup>79</sup> [https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.391\(81\).pdf](https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.391(81).pdf)

<sup>80</sup> <https://www.imo.org/en/mediacentre/meetingsummaries/pages/mepc-81.aspx>

279 MEPC 84, scheduled 27 April to 1 May 2026, has the ISWG-GHG meeting the week before to further develop the LCA framework, and is expected to further develop guidelines to support implementation of the IMO Net-Zero Framework<sup>81</sup>

280 The methane accounting issue has intensified in the lead-up to MEPC 84. The ICCT has highlighted that IMO's LCA Guidelines underestimate methane slip from LNG-fuelled ships using the most common LNG engine technology, noting that methane has a 100-year GWP nearly 30 times higher than CO<sub>2</sub> and a 20-year GWP more than 80 times higher. Real-world measurements of methane slip from the most common LNG engine type averaged 6.4%, much higher than IMO's assumed 3.5%, with the result that using the higher figure would result in lifecycle GHG emissions nearly 20% higher than conventional marine fuels<sup>82</sup>.

281 The GWP20 dual reporting requirement established at MEPC 80 and reinforced at MEPC 81 remains firmly embedded in the LCA framework. MEPC 84 is expected to adopt a revised version of those guidelines — almost certainly retaining and potentially strengthening the dual GWP requirement, given the scientific pressure from the ICCT and others showing that methane slip is being systematically underestimated.

282 The debate has shifted from whether GWP20 should be reported at all — that is now settled — to whether the default methane emission factors themselves are accurate. The ICCT has shown that the standard assumed methane slip rate for the most common LNG engine is nearly half the measured real-world figure.

### **B.3 The UK Government position**

283 The UK has been consistently in the high ambition coalition on shipping decarbonisation. The UK Government also stated it will seek to increase the stringency of the IMO's 2023 GHG Strategy when revised in 2028 to align with domestic ambitions and keep the 1.5-degree Paris temperature goal within reach<sup>83</sup>.

284 At MEPC 83, 63 countries voted in favour of the Net-Zero Framework<sup>84</sup>, including China, Brazil, the EU27, South Korea and India, versus a minority opposition of 16. The UK was among the 63 in favour, having been publicly committed to the high ambition coalition.

285 This means the UK cannot credibly argue in a domestic planning context that the IMO's GWP20 requirement is irrelevant or excessive — the UK government has been one of the strongest advocates for decarbonisation of global shipping as promoted at MEPC 81 and MEPC 83, and in its resolutions including the dual use of GWP20 and GWP100.

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<sup>81</sup> <https://www.imo.org/en/mediacentre/meetingsummaries/pages/preview-mepc-84.aspx>

<sup>82</sup> <https://theicct.org/four-changes-would-make-the-imo-net-zero-framework-more-effective-apr25/>

<sup>83</sup> <https://publications.parliament.uk/pa/cm5901/cmselect/cmenvaud/705/report.html>

<sup>84</sup> This has been subsequently delayed, see <https://www.hilldickinson.com/our-view/articles/imo-s-net-zero-framework-adoption-adjourned-and-consensus-building-continues/>. However, the 2024 LCA Guidelines themselves (MEPC.391(81)) were adopted at MEPC 81 as a standalone resolution and remain in force regardless of the Net-Zero Framework adjournment. The GWP20 dual reporting requirement is already adopted international regulatory guidance — it does not depend on the Net-Zero Framework for its validity.

**Appendix C: Reproduction of the substitution calculations from paras 20.6.42 – 20.6.47 [APP-058]**

**C.1 Applicant’s Method (Reconstructed) and Targeted Critique**

**C.1 (A) Applicant comparator approach (APP-058 20.6.42–20.6.47)**

286 The applicant states that an existing unabated CCGT has a direct carbon intensity of 0.354 tCO<sub>2</sub>e/MWh (direct emissions only) .

287 The applicant compares this to a UK grid average carbon intensity of 0.177 tCO<sub>2</sub>e/MWh (direct emissions basis).

288 The applicant then “uplifts” the grid intensity to account for upstream emissions 0.227 tCO<sub>2</sub>e/MWh (grid intensity including upstream emissions)

289 This implies an uplift factor of  $(0.227 - 0.177) \div 0.177 = 0.282 \approx 28.2\%$  uplift or expressed as a ratio  $0.227 \div 0.177 = 1.282$ .

290 The applicant states that the Proposed Development has an operational carbon intensity of 0.118 tCO<sub>2</sub>e/MWh (including upstream emissions)

291 The applicant then compares the project to an unabated CCGT  $0.118 \text{ tCO}_2\text{e/MWh} \div 0.354 \text{ tCO}_2\text{e/MWh} = 0.333$ . So the project is  $1 - 0.333 = 66.7\%$  lower than unabated CCGT (on direct-only basis).

292 However, the applicant also uses the uplifted comparator and presents a higher reduction claim  $0.118 \text{ tCO}_2\text{e/MWh} \div 0.227 \text{ tCO}_2\text{e/MWh} = 0.520$ . So the project is:  $1 - 0.520 = 48.0\%$  lower than grid intensity (including upstream).

293 The applicant then states: “approximately 75% lower than existing unabated CCGTs” (APP-058/20.6.47). This figure does not directly arise from the above arithmetic.

**C.1 (B) Structured Critique (A)–(E)**

**294 (A) Energy losses not transparently disclosed (corresponding to section F.1(A) in main text)**

295 The applicant’s method is entirely based on carbon intensity ratios, not on energy flows. There is no disclosure of:

- (A) fuel energy input (MWh Net CV)
- (B) gross electrical output (pre-CCS)
- (C) auxiliary/parasitic loads (capture, compression, cooling)

296 Therefore:

- (A) net electrical efficiency is not stated
- (B) CCS energy penalty is not stated

297 By contrast, CESL calculation (at section F.2(A)) calculates:

- (A) 57.26% implied unabated efficiency
- (B) 50.03% implied abated efficiency

(C) 7.23 percentage point penalty

298 These are functionally determinative engineering parameters, yet the applicant presents only intensity ratios, and avoids disclosing the underlying energy penalty of CCS indicating a clear lack of transparency in a core performance parameter, directly relevant to fuel use and emissions.

**299 (B) Inconsistent treatment of upstream emissions (corresponding to section F.1(B) in main text)**

300 There are two different upstream treatments in the same section:

- (1) The DESNZ WTT factor (as used elsewhere in the ES) which is the 0.165 ratio applied to unabated combustion emissions. Implied uplift = 16.5% ;
- (2) A grid intensity uplift (introduced in para. 20.6.45) of 0.177 → 0.227 tCO<sub>2</sub>e/MWh with an Implied uplift of  $(0.227 - 0.177) \div 0.177 = 28.2\%$

301 The key issue is that there is no explanation of the methodological basis for the different data sources, scope differences or technology weighting. The consequence is that the applicant is applying one upstream factor (0.165) to the project emissions, but a different, larger uplift (~0.28) to the comparator. This systematically biases the comparison against the project baseline, but without disclosure. This is a clear inconsistency in system boundary treatment, and a material methodological flaw.

**302 (C) Possible inclusion of grid losses (boundary inconsistency) (corresponding to section F.1(C) in main text)**

303 The grid intensity 0.177 tCO<sub>2</sub>e/MWh (para 20.6.45) is a delivered electricity metric, which typically includes generation mix, and may implicitly reflect transmission/distribution losses. By contrast, the project's 1,380 MWe output is clearly a plant-level net output. This risks comparing system-level (grid) vs plant-level (project) level where the boundaries may be non-equivalent, leading to a distortion of relative performance. This is not clarified in the ES.

**304 (D) Overstatement of effects (“75% lower”) (corresponding to section F.1(D) in main text)**

305 Two figures may be calculated for the reduction of emissions from substituting CQLCP for unabated supply.

- (A) Using the applicant's own numbers with a direct comparison:  $0.118 \div 0.354 = 0.333 \rightarrow 66.7\%$  reduction;
- (B) However, if upstream emissions are consistently included which is possible with CESL's reconstructed unabated intensity  $\approx 0.412$  tCO<sub>2</sub>e/MWh, then  $0.118 \div 0.412 = 0.286 \rightarrow 71.4\%$  reduction.

306 Therefore the claimed “approximately 75% lower” is therefore not supported by either calculation, based on the applicant's methodology, and is numerically overstated.

307 Note, when CESL calculates this based from data in the ES, and in a methodologically self-consistent way, the figure is 72.2%, see section F.7 (C).

**308 (E) Mixing plant-specific modelling with generic statistical comparators  
(corresponding to section F.1(E) in main text)**

309 The applicant combines project side data (detailed plant-specific modelling and explicit assumptions on capture rate, fuel use etc and compares to generic statistical averages eg: 0.354 tCO<sub>2</sub>e/MWh unabated CCGT and 0.177 tCO<sub>2</sub>e/MW / 0.227 tCO<sub>2</sub>e/MW for grid averages (the upstream uplift itself flawed for these figure).

310 This is a core methodological flaw. The problem is that these are not the same plant, not the same time period, not the same system boundary, not derived from the same modelling framework. The consequence is that this is not like-for-like, and not a controlled counterfactual.

311 CESL calculation (section F.6 (A)) by contrast uses same emissions base, derives both cases consistently, and reveals hidden parameters of electrical efficiency and CCS energy penalty.

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