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## TECHNICAL NOTE

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Project **DUB098/108/601**

Subject **Review of Uncertainty**

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This memo is a review of how the assessment of the Proposed Development has taken into account the inherent uncertainty in line with the relevant guidance as follows:

- IEMA Guidance - *Assessing Greenhouse Gas Emissions and Evaluating their Significance 2<sup>nd</sup> Edition* (IEMA, 2022),
- *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment* (EU, 2013),
- *EU Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report* (EU, 2017).

Kind regards



**Dr. Edward Porter**  
AWN Consulting

## Uncertainty In Relation To Climate Assessment

The Coyne judgement sets out a methodology to assess uncertainty as outlined in paragraphs 125 - 127 of the judgment as shown below:

*“125. As to “Assessing Significant Effects” the 2013 Guidance [2013 Guidance on Climate Change] states that many assessment approaches used in EIA have the capacity to address climate change. “There are, however, three fundamental issues that you should consider when addressing climate change and biodiversity: the long-term and cumulative nature of effects, complexity of the issues and cause-effect relationships and uncertainty of projections.” There follows a consideration of all three issues, the premise of which is that EIA should address them. I would add that this premise must itself be premised on climate change having been scoped into the EIA as a likely significant effect.*

*126. The 2013 Guidance states that EIA, to properly address climate change, should take into account its complexity (including of causal relationships) and long-term direct and indirect impacts and consequences. EIA should describe the sources of, and characterise the nature of, uncertainty. Judging an impact’s magnitude and significance must be context-specific. The contribution of an individual project to GHGs may be insignificant on the global scale but may be significant on the local/regional scale, in terms of its contribution to set GHG-reduction targets.*

*127. Finally, it is worth noting some of the “bullet points” tabulated in 2013 Guidance as “Critical challenges for addressing climate change ... in EIA”:*

- Manage complexity. Consider the complex nature of climate change and biodiversity and the potential of projects to cause cumulative effects.*
- Be comfortable with uncertainty, because you can never be sure of the future. Use tools such as scenarios (for example, worst-case and best-case scenarios) to help handle the uncertainty inherent in complex systems and imperfect data. Think about risks when it is too difficult to predict impact.*
- Base your recommendations on the precautionary principle and acknowledge assumptions and the limitations of current knowledge.*
- Be practical and use your common sense!*

*The guidance also states that “considering a range of possible uncertain futures and understanding the uncertainties is part of good EIA practice and permits better and more flexible decisions.”*

*In other words, it is no error to acknowledge and assess uncertainty and risk as best you reasonably can. Error may well lie in ignoring them.”*

Chapter 9 of the Environmental Impact Assessment (EIAR) undertook a detailed assessment of the predicted climatic impact of the Proposed Development and of the Overall Project (i.e. the Proposed Development and existing / permitted / potential future development on the wider landholding) in the context of the EU ETS (Emission Trading System). The Addendum to Chapter 9 submitted as part of the further information response built on Chapter 9 of the EIAR and was updated to incorporate the new IEMA Guidance - *Assessing Greenhouse Gas Emissions and Evaluating their Significance 2<sup>nd</sup> Edition* (IEMA, 2022). The Addendum also framed the impact of the Proposed Development and Overall Project in the context of the Sectoral Emission Ceilings. Outlined below is a discussion of the uncertainty of the climate assessment in terms of the climate guidance and methodology, the baseline climatic environment, the impact of the proposed development and proposed mitigation.

## Climate Guidance & Methodology And Uncertainty

In terms of climate guidance and methodology, the IEMA Guidelines (IEMA, 2022) are recognised throughout Ireland and the UK as the authoritative guidance body on greenhouse gas (GHG) and climate impact assessment. As IEMA, and in particular IEMA (2022), offers a much more specific and robust assessment of current climate impacts, this guidance document was used in the Response to the 3<sup>rd</sup> Party Appeals (dated 6<sup>th</sup> November 2023).

The IEMA Guidelines outlines the approach to uncertainty in predicting climate impact. The IEMA Guidelines recommends that:

*“a relevant, complete, consistent, transparent and accurate assessment of the reasonable worst-case approach must be undertaken despite uncertainties”.*

The Guidelines outlines that uncertainty can be determined by:

- Testing upper and lower limits,
- Testing for different inclusions and exclusions,
- Modifying study periods.

Further guidance on uncertainty is available from the EU including the *“Guidance On Integrating Climate Change And Biodiversity Into EIA”* (EU, 2013). This guidance suggests the following approach to uncertainty:

- *“Use tools such as scenarios (for example, worst-case and best-case scenarios) to help handle uncertainty inherent in complex systems and imperfect data”*,
- *“Base your recommendations on the precautionary principle and acknowledge assumptions and the limitations of current knowledge”*,
- *“Working with uncertainty requires a qualitative approach, as quantitative data are often either unavailable or unreliable in predicting impact”*,
- *“The use of scenarios is a response to uncertainty”*.

Additional guidance on uncertainty is available from the EU publication *“EU Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report”* (EU, 2017). The guidance suggests the following approach to uncertainty:

- *“Predicting uncertain elements can be challenging, particularly concerning the availability of information, as well as ensuring that the assessment is carried out with reasonable effort”*,
- *“Environmental Impact Assessments consider the impacts that climate change may have on the Project itself – and the extent to which the Project will be able to adapt to possible changes in the climate over the course of its lifetime. This aspect of the issue of climate change can be challenging as”....“it involves a considerable degree of uncertainty, given that the actual climate change impacts, especially at local levels, are challenging to predict. To this end, the EIA analysis should take trends and risk assessment into consideration”*.

As outlined in Appendix 3 of the Response to the 3<sup>rd</sup> Party Appeals (dated 6<sup>th</sup> November 2023), the assessment of the Proposed Development has taken into account the inherent uncertainty of the assessment in line with the relevant guidance (IEMA (2022), EU (2013), EU (2017)) as outlined in Section 4.3. *“3. Emission Calculation Methodology & 4. Data Collection”*.

## Uncertainty In Relation To The Baseline Environment

Existing GHG baseline data is available from the Environmental Protection Agency (EPA). In their latest data, the EPA has reported that in the 2022 the energy industries GHG emissions decreased from 10.26 Mtonnes in 2021 to 10.08 Mtonnes in 2022<sup>1</sup>. This data is based on final figures based on the SEAI's energy balance provided in September 2023 and thus there is a high degree of confidence in these figures for 2022.

However, the baseline for the purposes of the EIAR is the year of opening which is projected to be 2025. As this is three years into the future from the most recent confirmed data, there will be uncertainty with the projected baseline figures. The EPA report<sup>2</sup> entitled "*Ireland's Greenhouse Gas Emissions Projections- 2023-2050*" (EPA, May 2024) suggests that the 2021 – 2025 and 2026 – 2030 Carbon budgets will be difficult to comply with. Likewise the report suggests that the 2021 – 2025 and 2026 – 2030 sectoral emission ceilings (including the electricity sector) will be difficult to comply with. The report outlined two scenarios to project into the future:

- With Existing Measures (WEM) - a projection of future emissions based on currently implemented measures and actions committed by Government which are in place by the end of 2022.
- With Additional Measures (WAM) - a projection of future emissions based on currently implemented measures and actions committed by Government including all WEM measures plus those included in Government plans but not yet implemented.

However, in relation to electricity, there are number of measures which have been excluded from the EPA WEM and WAM scenarios as discussed above. These excluded measures include:

- CAP24 has projected 9 GW onshore wind, 5 GW offshore wind and 8 GW solar PV whilst the EPA has assumed in their projections that in reality, by 2030, there will be 7.2 GW onshore wind, 3.5 GW offshore wind and 6 GW solar PV.
- New gas fired generation of 1.4GW was assumed by 2030 compared to 2 GW in CAP24
- The CAP24 policy of 2 GW offshore wind for green hydrogen post-2030 is also not included in the EPA projections.

Thus, in projecting forward to the opening year and to 2030 when compliance with the electricity emission ceiling is determined, there is a range of possible baseline GHG levels depending on whether some or all of the proposed measures are implemented in a timely manner. AWN Consulting have adopted a conservative approach to the assessment and potential uncertainty.

In terms of assessing the "*do nothing*" scenario, as a conservative approach, the GHG emissions in the assessment for the "*do nothing*" scenario has been assumed to be zero. This should be viewed as a very conservative assumption as, in reality, the operation of the Proposed Development (a data centre) will replace other existing and future computing and IT activities with greater GHG emissions as outlined in Section 6.3 "*A6.5 the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State*" in Appendix 3 of the Response to the 3<sup>rd</sup> Party Appeals (dated 6<sup>th</sup> November 2023):

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<sup>1</sup> <https://www.epa.ie/our-services/monitoring--assessment/climate-change/ghg/latest-emissions-data/#>

<sup>2</sup> <https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/irelands-greenhouse-gas-emissions-projections-2023-2050.php>

- Data Centre facilities such as the Proposed Development represent a significantly more efficient means of data storage when compared to the historic distributed model of on-site data storage by individuals and companies (or 'enterprise sites'). The GHG savings associated with this have conservatively not been quantified and are not included in the assessment. The results of a recent study of US enterprise data centres by 451 Research<sup>3</sup> found the Operator's data storage facilities to be 3.6 times more energy efficient than the traditional alternative and achieved an 88% reduction in carbon footprint for workloads that moved from on-premises data storage to the Operator's, helping the Operator's customers to become greener in the cloud.

## Uncertainty In Relation To The Proposed Development

The proposed development will have uncertainty associated with it which will impact on the calculated GHG emissions. The factors which will be important include:

- Year of opening,
- Phasing of operations,
- Operational load,
- Changes to the electricity grid.

The factors outlined above have been reviewed below to determine their underlying uncertainty into the future. As a general principle, a reasonable worst-case assessment has also been applied in the EIAR as shown by the following approaches below:

- Year of opening: This has been assumed to be 2025 as a conservative assumption. There is no possibility of an earlier operational date but a later date is possible. GHG emissions will be higher when an earlier operational date is assumed as later dates will have a high percentage of renewables in the national grid. Hence, an opening year of 2025 is conservative.
- Phasing of operations: The assessment assumed 100% operation of the entire Proposed Development in Year 2025. In reality, there will be a ramp-up period with 100% operation not occurring until mid-2027 on the basis that construction starts in 2024.
- The assessment assumed a continuous 100% operational load for the data centre development, however annual average load is likely to be closer to 80% (as outlined in the recent Department of Environment, Climate and Communications [DECC] publication "*Summary of Analysis to Support Preparation of the Sectoral Emissions Ceilings*" (DECC, 2022b)). Thus, the assumption of 100% operations will overestimate GHG emissions in the early years of the project particularly for Years 2025 and 2026. Secondly, the assumption of 100% operational load will likely overestimate GHG emissions by approximately 20% every year.
- It is acknowledged that due to delays in decision making and logistical delays that the opening year may move beyond Year 2025. However, by assuming Year 2025 as the opening year it will be a conservative assumption. Each year the percentage of renewables in the national grid is likely to increase in line with government policy. As a results, the GHG emissions associated with the use of electricity from the national grid are likely to decrease on a year by year basis.
- As the Sectoral Emission Ceilings and Carbon Budgets have targets set for 2030, the assessment has predicted future GHG emissions for this year. Information on future GHG emissions, beyond 2030, from electricity will be naturally uncertain as it will depend on many factors including the percentage of renewables in the grid, the

<sup>3</sup><https://assets.aboutamazon.com/b0/3e/b0fc6b8a4a85b38ac65a3fbc584c/11061-aws-451research-advisory-bw-cloudefficiency-eu-2021-r5-final-corrected-data.pdf>

- fossil fuel mix (gas, oil, coal) and the average wind speed. Thus, the assessment approach and the use of the 2030 target is conservative to allow for this uncertainty.
- a GHG emission rate of 100 gCO<sub>2</sub>/kWh has been conservatively assumed for the national grid in 2030 which is higher than the SEAI<sup>4</sup> predicted 92.9 gCO<sub>2</sub>/kWh for 2030,
  - the power generation mix in 2030 is forecast by EirGrid to be 83% renewable rather than the assumed 80% renewable generation which was conservatively used in the current assessment.

Looking further ahead to 2050 will lead to greater uncertainty in GHG emissions. It is projected that GHG emissions will reduce from 2030 onwards, hence the use of the 2030 figures is a conservative approach. The government in CAP24 has reiterated the goal of achieving net-zero GHG emissions by 2050:

*“Under the Climate Action and Low Carbon Development (Amendment) Act 2021, Ireland’s national climate objective requires the State to pursue and achieve, by no later than the end of the year 2050, the transition to a climate-resilient, biodiversity-rich, environmentally sustainable and climate-neutral economy.”*

Thus, the assessment of the Proposed Development was based on this legally binding target. However, this is likely to be conservative for the following reasons:

- It is assumed that net zero electricity would not be achieved until 2050, whereas recent data from the ESB and UCC/MaREI suggests that this is likely to be achieved by 2040 at the latest as outlined in “*Networks For Net Zero – Delivering the Electricity Network for Ireland’s Clean Electric Future*” (ESB Networks, 2023).
- UCC / MaREI have also separately published the report “*Our Climate Neutral Future – Zero by 50*” (UCC / MaREI, 2021) which details how the energy system can achieve net zero by 2050 by using technologies, concepts and interventions will already exist today. As shown in Figure 2, of the 122 TWh (1 TWh = 1000 GWh) of primary energy, 77 TWh will be derived from wind, 4 TWh will be derived from solar, 38 TWh will be derived from Bio and other renewables whilst only 1 TWh will be derived from oil. Thus, the report predicts that the energy system will be dominated by renewable energy in 2050.
- Although the pathway may vary somewhat depending on future policy decisions, it is likely that net zero electricity (shown in green below in Figure 1) will be achieved by 2040, given that Figure 1 shows net zero electricity being achieved by 2035, compared to the conservative assumption in the Addendum to Chapter 9 of the EIAR that net zero electricity would not be achieved until 2050. Thus, the GHG emissions in the Addendum to Chapter 9 of the EIAR should be viewed as a

<sup>4</sup> Private communication from SEAI- dated 12<sup>th</sup> October 2023

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**From:** [REDACTED]@seai.ie>  
**Sent:** Thursday, October 12, 2023 11:45 AM  
**To:** Avril [REDACTED] <[REDACTED]@awnconsulting.com>  
**Subject:** RE: Future Carbon Intensity for Grid Electricity

Dear Avril,

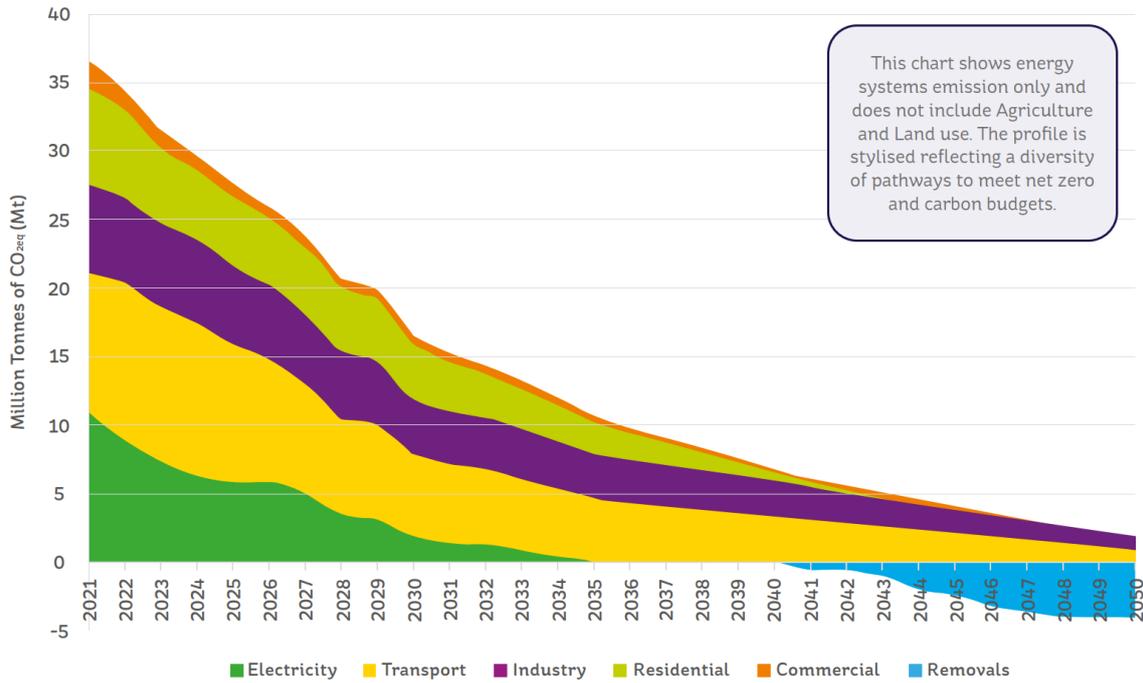
Thank you for your email. Please find attached spreadsheet with a projection of electricity carbon intensity out to 2050.

This projections is based on the WAM-CAP23 scenario from our latest set of projections. This broadly assumes that the targets set in the latest 2023 Climate Action Plan will be achieved. Because the current focus of government policy is on the period to 2030, there is less detail on policies and measures that will be adopted from 2030 to 2050. This is reflected in the scenario shown, where there are still emissions from electricity generation out to 2050. In reality we expect further policies and measures to be developed later in the decade that will provide a pathway to a zero carbon electricity system by 2050.

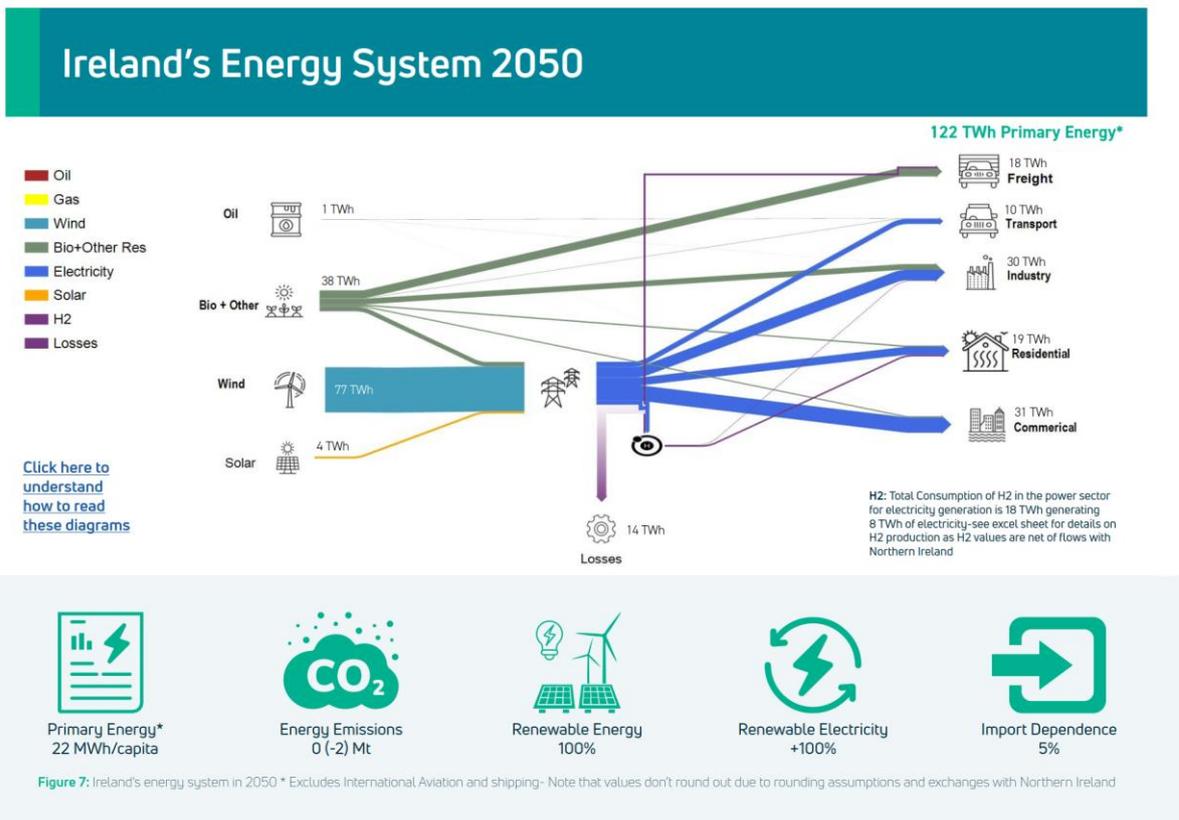
Regards,  
 Mary

reasonable worst-case assessment in line with the IEMA guidance (IEMA, 2022).

### 'Net Zero' Energy System Emissions Reduction Profile



**Figure 1** Net Zero Energy System Emissions Reduction Profile (UCC / MaREI) (ESB Networks, 2023)



**Figure 2** Ireland's Energy System 2050 (UCC / MaREI, 2021)  
**Uncertainty In Relation To Mitigation**

AWS are committed to implementing a range of mitigation measures which will be implemented in line with “best practice” as outlined in IEMA (IEMA, 2022). These measures can be viewed as allowing for the inherent uncertainty in future emissions as the CPPA will match the actual GHG emissions regardless of the quantity of emissions in any one year and the time period in which they occur whilst the operation of both indirect electricity and direct emissions will operate within the ETS which has committed to achieving net zero by 2050:

- A Corporate Purchase Power Agreement(s) will be entered into, as required by Condition 13, which demonstrates that the energy use of the development will be met by new renewable energy generation in line with the Government Statement on the Role of Data Centres in Ireland’s Enterprise Strategy (2022). The proposed development’s energy use will be met by the CPPA which will mitigate the actual GHG emissions in terms of quantity of emissions on an annualized basis.
- The indirect electricity emissions and the direct emissions from backup generators will both require greenhouse gas permits under the ETS in order to operate and thus the GHG emissions associated with the Proposed Development will be in line with CAP24 which stresses the importance of the EU ETS in reducing industry GHG emissions.
- Whether or not climate and greenhouse gas emission targets are varied due to changes to legislation and policy, the CPPAs and the operations of the EU ETS will ensure that GHG emissions from the facility will be fully mitigated throughout its lifetime.

## Summary

In summary, the climatic assessment of the Proposed Development has taken into account the inherent uncertainty of the assessment by taking a conservative approach in line with the relevant guidance (IEMA (2022), EU (2013), EU (2017)) as summarised below:

*Baseline Scenario* – this assessment has highlighted that uncertainty is inherent in predicting future GHG emissions both in terms of the overall national GHG emissions over the period 2023 – 2050 and in terms of the “*do nothing*” scenarios and the GHG emissions where the proposed data centre development is not available to store and process IT data.

*Proposed Scenario* - this assessment has highlighted that uncertainty is inherent in predicting future GHG emissions for the proposed scenario in terms of year of opening, phasing of operations, operational load and changes to the national grid.

*Mitigation* - this assessment has highlighted that uncertainty is inherent in predicting future mitigation requirements for the proposed scenario in terms of quantum of offsets required to fully mitigate the proposed development and in terms of the availability of renewable energy and variability in the GWh from these sources on an annual basis. However, AWS is committed to ensuring that the CPPA for the energy use of the proposed development will mitigate the actual GHG emissions in terms of quantity of emissions on an annualized basis.