Environmental Assessment Levels and Disclosure of Amine Species - CCSA position paper

9th October 2023

Following the CCSA 2nd Pathway to Permitting Workshop held on 19th July 2023, this paper sets out the draft industry position and suggested assessment protocol for the permitting of CCS plants, specifically with regards to the assessment of air impacts and use of Environmental Assessment Levels (EALs).

Many proprietary capture solvent vendors require commercial confidentiality in relation to their solvent composition in order to protect their intellectual property. If it is not possible to facilitate this confidentiality, this will restrict the availability of decarbonisation options in the UK, including options which may better represent BAT in terms of CO_2 capture rates and overall environmental impact.

The environmental permitting and regulation of full-scale carbon capture plants needs a risk-based protocol to allow for developments to proceed through the consenting process to a Financial Investment Decision, while still allowing the Regulator to set appropriate limits to prevent harm and to protect the environment and human health.

To enable adequate assessment of potential environmental effects from the use of a carbon capture plant, sufficient information needs to be disclosed to the Regulator and where required placed upon the public register, on the likely emissions from the process from the use of any solvent under consideration, adhering to the requirement under Schedule 27 and Article 51(3) of the Environmental Permitting (England and Wales) Regulations 2016 (as amended). However, it is also important that such information is disclosed only in so far that it is relevant and necessary for a meaningful assessment of potential impact.

It is agreed by all parties that the selection and use of EALs should be based on an approach which maximises the use of current knowledge regarding potential environmental impacts, to achieve a 'level playing field' between proposed installations and different carbon capture solvents. Industry considers that this should extend to international applications as well as those in England, Scotland, Wales and Northern Ireland.

It is clear from the detailed work undertaken by the Environment Agency (EA), Defra and their toxicological advisors, that derivation of EALs for different amine and amine degradation product (termed 'N-amine') species is potentially highly complex. The quantity and quality of published toxicological data on which to base EAL derivations is highly variable depending on species and limited in many cases. In particular, currently there is very limited data available for individual N-amine species on which to derive individual species EALs. It is also clear that the derivation of toxicology data to derive new EALs is a lengthy process, the sign off for which rests with the UK Health Security Agency (UKHSA).

In the CCSA workshop, the Environment Agency set out a hierarchical approach to the identification or derivation of EALs for using in the impact assessment process. The hierarchy reflects the data quality available:

1. Use of EAL published by the EA, Scottish Environment Protection Agency (SEPA), Natural Resources Wales (NRW), or Northern Ireland Environment Agency (NIEA);
2. Use of an EAL published by recognised international agency, including United States Environment Protection Agency (USEPA), Agency for Toxic Substances and Disease Registry (ATSDR), World Health Organisation, International Agency for Research on Cancer and other national environmental agencies;

3. Using an EAL derived from published occupational health data (ie EH40, MSDSs, scientific literature etc.) using the Environment Agency 2012 derivation methodology;
4. Use of an EAL derived from primary collected toxicology data provided by a carbon capture technology licensor;
5. Read across of toxicology data from appropriate surrogate species based on and health end points;
6. Use of appropriate surrogate species based on chemical structure similarities and properties.

This approach is entirely consistent with the approach adopted for other industries.

The EA directed that for amine species, a separate EAL should be derived for each amine species based on the above hierarchy, where possible. Where there is insufficient information, the grouped proxy approach below may be applied.

For N-amine species, the following approach should be applied:

- Where sufficient data is available, N-amines should be sub-divided into groups based on a hierarchy of toxicity; and
- a proxy should be used based on the most toxic chemical in each group of N-amines to be emitted, treating this as the toxicity of each group as a whole, as this provides the most realistic conservative assessment of impact.

In cases where there is insufficient information to sub-divide N-amines, a proxy for all N-Amines should be used; the EA recommend using the EAL published for NDMA. This proxy is based on the most toxic chemical within the group of N-amines to be emitted and should be considered representative of the toxicity of the entire N-amine group. This fallback approach is likely to provide an overly conservative assessment of the impact.

As an example, for the latter case, the air quality impacts of all directly emitted N-amine species, and those subsequently generated through atmospheric chemistry, could be calculated and assessed against the EAL for NDMA, given that NDMA is one of the most toxic N-amine species identified.

Industry supports this approach as it provides a transparent approach to assessment of impacts and allows comparison of different technologies and consideration of any potential cumulative effects from multiple installations in the same location.

Protocol For Assessment:

The suggested protocol for the assessment of effects of amine and amine degradation products is as follows:

1. Operators/developers to identify which amine species or degradation products could be emitted from their carbon capture plant, and which degradation products could be formed post release, based upon the best knowledge available at the time the application is made;
2. Operators/developers to identify which of the emitted species have published EALs available and to use those EALs in any assessment of impact;
3. Regulators or another suitable body (this could be the CCSA or possibly the Institute of Air Quality Management – IAQM for example) are required to maintain a database of accessible and non-confidential established and agreed EALs, to be made publicly available and able to be used by operators/developers;

4. For those species that do not have published EALs (or international equivalents), operators/ developers are to agree with their Regulator, suitable proxy or read-across species to be used based on structural similarities of the molecules and, for N-amines, deriving proxies for the toxicity of the emitted group of species as a whole, and in all cases applying conservative values by default. However, it is noted that EALs may still be subject to change at a later date;

5. Operators/developers to set out in writing at the pre-application stage (and within the application) to the Environmental Regulator and UKHSA, the EALs to be applied and justification for any proxies selected, providing sufficient evidence (ideally to a level of detail outlined in regulatory guidance) to the Regulator on the rationale for the EALs to be adopted, to enable the Regulator to audit the approach and decisions. It is considered that information relevant to the impact assessment will be disclosed. For example, the EAL has been derived by the operator, but where the EAL is derived from a read across or proxy then only information pertaining to the chemical similarity needs to be provided;

6. Operators/developers to undertake an impact assessment supported by detailed dispersion modelling based on the agreed EALs. Impacts are to be reported as a percentage of the EALs in the impact assessment, which will be used to support consenting and environmental permit application, and as part of any public consultation on the proposed use of the carbon capture plant. The assessment will also, as appropriate, consider potential cumulative effects with other publicly known, consented or developed carbon capture plants in the vicinity using publicly available data. The applicant will need to demonstrate that the facility meets Best Available Techniques (BAT) requirements, including the choice of solvents to be used. Furthermore, the applicant will also need to submit a comprehensive air quality impact assessment that demonstrates that the plant can operate without unacceptable impacts and;

7. As and when new EALs are derived and published by the licensors, UKHSA or Environmental Regulators, it will be the responsibility of the Regulators to identify any actions needed by operators to maintain compliance with the updated EALs, for example through the addition of an appropriately worded improvement condition to the permit where appropriate, but in the main through the established BREF review process. Typically, plants should be subject to the new standards when the sector in which the plant operates is subject to a review of its environmental performance. This is an opportunity for the Regulators to consider the techniques being used at the time of the review to ensure that BAT is adopted in order to minimise emissions and thereby protect the environment and human health.

The above approach meets best practice for assessment of impacts as identified by independent toxicologists. It also enables meaningful and conservative assessment of impact to be undertaken and communicated to the Regulators and public, while allowing the Regulators to audit and verify the data and assumptions that inform and underpin that assessment.

The above approach would allow the sharing of data relating to solvent composition with the regulator under a Schedule 5 Article 48 (1) of the Environmental permitting Regulations in order to derive a robust EAL for use in the impact assessment. All relevant information relating to the assessment of impacts – namely emission rates and concentrations and the corresponding EALs for assessment, linked to named representative toxic species, would then be made available on the public register without compromising confidentiality.