Notes from UKCCSRC-ESA-Environment Agency post-carbon capture evidence review kick-off meeting 18 November 2021

Attendees: Professor Jon Gibbins (UK Carbon Capture and Storage Research Centre - UKCCSRC), Ben Freeman (Environment Agency - EA), John Henderson (EA), Ena Bradley (Northern Ireland Environmental Agency - NIEA), Mark Broom (Natural Resources Wales - NRW), Jacqui Lang (Scottish Environmental Protection Agency - SEPA), Charlotte Rule (Environmental Services Association - ESA), Stuart Hayward-Higham (Suez/Chair of ESA CCS group), other ESA members (not listed), Nick Bevan (BEIS), Andy Cross (AECOM)

1. **Purpose of the review**

- Ben Freeman outlined the purpose of the evidence review i.e. to help inform the writing of BAT guidance for post-combustion capture (PCC) at EfW plants, which will form an addendum to the current BAT guidance on gov.uk for PCC at biomass and gas-fired power and CHP plants, taking into account the requirements of Article 14(6)/Annex III IED.
- Ben explained that the EA will work with other UK regulators on the evidence review where possible and that NRW and NIEA will be part of this and that SEPA are still considering whether they want to take part and are in a listening role only for today's meeting.
- Ben emphasised that the BAT guidance writing will be a separate step from the evidence review.

2. **Overview of previous power PCC BAT review**

- Professor Jon Gibbins gave a summary of the BAT Review for 'New-Build and Retrofit Post-Combustion Carbon Dioxide Capture Using Amine-Based Technologies for Power and CHP Plants Fuelled by Gas and Biomass as an Emerging Technology under the IED' for the UK (see slides).
- Jon emphasised that the only way to reliably predict the effects of EfW flue gas and PCC operating conditions on the solvents is through realistic long-term (i.e. one year) pilot testing on the actual flue gases with representative flue gas treatment and the full intended suite of solvent management arrangements. Performance guarantees are a contractual arrangement; penalties for underperformance may be relatively small compared to the total project cost.

3. **EfW BAT review proposed scope**

- Jon gave an overview of the methodology and proposed scope, based on previous experience.
- Jon emphasised that evidence for the review has to be publically available – it can't be confidential material or be transmitted privately. If information that organisations wish to contribute is not already publically available, then, if it would be helpful, arrangements can be made for companies to do a presentation at a public workshop, and this can then be made publically available via the UKCCSRC web site)
- There was a question around CHP EfW plants and whether enough heat would be available for solvent regeneration – Jon's view is that all of the available steam could be diverted to a new back-pressure turbine if required to maximise heat availability and/or that mechanical vapour compression, in effect a heat pump, might be used.
- There was some discussion around the extent to which EfW gasification plants should be included in the scope, with the example of the Biomass Infrastructure Group's (BIG) close-couple gasification plants provided (BIG's Ince waste wood gasification has a funding bid for

20 tonnes per day CO_2 capture pilot plant). But capture from such plants would be from the flue gas (i.e. not pre-combustion capture from a shifted syngas) so can be expected to be very similar to PCC capture from a conventional moving grate plant.

- The examples of the "waste to molecules" gasification plants proposed by Velocys and Fulcrum (and following the meeting, Enerkem) were also cited with a desire for them to be included in the review.
- It was agreed that post carbon capture gasification from the example discussed should be included in the scope of the review (including fluidised bed gasification) provided that information is in the public domain (or is made available in the public domain), but not pre-combustion carbon capture.

The scope of the evidence review is therefore currently as follows:

- PCC at EfW (i.e. waste incineration and co-incineration) plants which burn municipal waste including black bag waste, RDF and SRF, and those that burn waste wood.
- New EfW plants that will be fitted with PCC from the outset and retrofit of PCC at existing plants (but not PCC-readiness as this will be covered by other work)
- EfW plants based on conventional technology, as well as those which use gasification to produce power, and gasification plants which produce chemicals or fuels (including fluidised bed gasifiers) where a proportion of the syngas is burned, provided they are using post-combustion capture technology, and information is available in the public domain.
- PCC solvent technologies using amines and hot potassium carbonate
- Operating principles and, to the extent that public domain information is available, ranges of achievable performance and optimisation trade-offs that may be encountered (there is also the parallel BEIS study for evidence – see 5. below)
- Upstream flue gas treatments and trade-offs for particular solvents
- Degradation and atmospheric emissions characteristics and control measures for solvents (to the extent that public-domain information is available)
- Disposal of PCC system wastes, including any which can be burned within the plant and implications for discharges to sewer or water.
- Likely heat and electricity requirements for PCC and how this can be supplied in the most efficient way (including implications of retrofit steam take-off at existing plants for energy efficiency and ability to deliver heat for district heating).
- Raw materials usage including water
- Space requirements for additional equipment associated with PCC, where data is available
- Any other relevant factors listed under Annex III of the Industrial Emissions Directive.

4. EfW BAT review proposed method and timetable

- Jon outlined the proposed timetable – see slides.
- It was agreed that a meeting would be held to discuss the information required under the questionnaires (14:00-16:00 Tuesday 18 January)

5. BEIS Review of Next Generation Carbon Capture Technologies for Waste, Industry and Power

- Andy Cross of AECOM gave an overview of the study – see slides.

6. Actions/next steps

- Charlotte Rule to send out invitation for next meeting (done).
- Ben Freeman to circulate notes and slides from meeting to the group - presentations will also be uploaded to: https://ukccsrc.ac.uk/best-available-techniques-bat-information-for-ccs/
- Ben Freeman to circulate notes and slides to other interested trade associations and operator groups and invite their participation (= REA, CIWM, Source Testing Association, EA waste wood co-incinerator operator group) and to also invite participation from Velocys, Fulcrum and Enerkem.
- Supporting email for slides and notes to be accompanied by the following questions/points:
    - Will any other type of EfW plants not already covered by the scope use post-combustion carbon capture?
    - What will the size of these plants be?
    - What information is already available in the public domain on these plants?
    - If this is not already in the public domain, steps which can be taken to achieve this.