[redacted]

From: Steven Foster <Steven.Foster2@drax.com>
Sent: 18 May 2023 09:06
To: [redacted]
Cc: [redacted]
Subject: RE: Further information required for completion of Duly Making checks on application EPR-VP3530LS-V022

Morning [redacted]

The vent associated with the high-pressure compression is a common vent with a vent valve that will be operated both in a manual and automatic mode. The vent will function in three modes start-up, shutdown, and emergency relief.

During start-up operations the vent valve will be opened slightly ~5% to allow the compressors to build the pressure and achieve the required technical criteria for the transport system. Once the system achieves the required quality the vent will move to automatic and only open to relieve excess pressure (abnormal /emergency).

During shutdown, the vent will open to release pipe pressure as part of the normal shutdown process. This is expected to be very short duration event given the limited volume to be released to reduce the pressure to operational requirements.

Emergency release through the vent is again expected to be short but given the nature of emergency the factors dictating the use of the event could result in longer duration venting for the safety of those onsite.

In relation to the additional questions: -

- The release was modelled as a release from a fixed vent, a short vertical pip with fixed full-bore release from an infinite source (modelled as a vessel with a very large inventory $1x10^8$kg.
- Given the release is from an infinite inventory the 3600s was chosen as at that point the cloud is becomes stable and not changing.
- The release rate was fixed at 150kg/s with sensitivity analysis undertaken at different flows and durations, but 150kg/s was the worst-case flow rate.
- The modelling presented was the worst-case flow rate (150kg/s) and maximum pressure (bar), sensitivity work was undertaken but only the worst-case was provided.
- The internal pipe diameter of the vent is 1193.6mm

Should you have any further questions please do not hesitate to touch.

Best Regards

Steven Foster
Environmental Regulatory Manager

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drax

From: [redacted]
Sent: 11 May 2023 17:47
To: Steven Foster <Steven.Foster2@drax.com>
Cc: [redacted]
Subject: RE: Further information required for completion of Duly Making checks on application EPR-VP3530LS-V022

Hi Steven,

Thank you for providing the attached input data for the high pressure condensed phase CO2 vent modelling presented in the Second Stage Information Report V2.0.

Please can you confirm if this new data replaces or is in addition to the information provided in your emails of 24/04/2023 (attached).

I acknowledge this modelling is based on pre-FEED analysis work and subject to change however I need some additional information to clarify what is being modelled:

1. The new data shows a CO_2 mass in vessel of 1 x 10^8 kg and a mass in pipe of 25355.2 kg with the release rate modelled at 150 kg/s for a release duration of 3600 s.
    a. Is CO_2 release from the combined inventory in pipeline and the vessel or just from the pipeline?
    b. Assuming that the release is from the combined inventory, is there an assumption that it will be possible to end the release within the 3600 s time modelled?
    c. Is CO_2 release rate 150 kg/s throughout the modelling period?
    d. How much CO_2 is released for the four flow rate scenarios described in the report: 100%, 25%, 10% and 5%?
2. Is the modelling for a constant release pressure and temperature and is this the 'Stagnation data' (138 bar and 137 degC)?
3. Is the vent release point diameter the 'pipe internal diameter' and 'expanded diameter' of 1193.6 mm and 1.1936 m respectively?

Please provide the information to allow completion of the duly making checks for the CO_2 venting.

Best regards,
Gwenda

From: Steven Foster <Steven.Foster2@drax.com>
Sent: 11 May 2023 11:51
To: [redacted]
Subject: RE: Further information required for completion of Duly Making checks on application EPR-VP3530LS-V022

Morning [redacted]

Please find attached the CO_2 input data for perusal. Drax would like to emphasis that this is not based on the final design and was undertaken as part of our pre-FEED analysis work and would subject to change depending on the final transport and storage quality and operational requirements are once finalised as part of the current cluster development work.

Should you have any further question please do not hesitate to get in touch.

Best regards

Steven Foster

From: [redacted]
Sent: 26 April 2023 15:42
To: Steven Foster <Steven.Foster2@drax.com>
Cc: [redacted]
Subject: Further information required for completion of Duly Making checks on application EPR-VP3530LS-V022

Dear Steven,

Thank you for submitting your responses to my email of 20/04/2023 (attached) regarding further information and outstanding payments required for completion of Duly Making checks on application EPR-VP3530LS-V022.

We have reviewed the documents submitted and the updated air quality modelling has been checked for Duly Making completeness by our AQMAU.

We have not been able to find all the information required to accept the air quality modelling information for Duly Making.

We therefore require/still require the following information to Duly Make your application:

1. Provide the **modelling files** used in your risk assessment of CO_2 emissions and/or a table with the **inputs to the model** [2].
   The inputs data provided in your email of 24th April for the CO_2 vent modelling do not provide enough detail for us to be able to run our own modelling checks or see how you have dealt with uncertainty.
   At the very least for Duly Making we require the full inputs data for the Phast modelling plots shown in section 4.0 the report [2].
   As previously discussed, we normally require the Modelling Files for Duly Making. You have indicated that these are not available to you. If you cannot provide these files, we will require new modelling files to be submitted after Duly Making and before AQMAU can audit your AQ modelling.
   This new CO_2 venting modelling will need to be accompanied by a report that meets our guidance on AQ Modelling Reports: Environmental permitting: air dispersion modelling reports - GOV.UK (www.gov.uk).
   This new report must explain how you have developed your worst-case scenario to inform the modelling and how you have dealt with uncertainty (see further comment in the post Duly Making additional information requirements later in this email).

2. Provide the pollutant **mass emission rates** of the individual flues in table 8 [2] and the emission concentration and mass emission of the directly emitted nitrosamines [2].
   Table 8[2] (Updated Emission Parameters for the Baseline and With PCC Scenarios) includes the individual flue parameters for the baseline versus with PCC case. The table includes emission concentrations based on the annual average Emission Limit values for pollutants. It does not include the pollutant mass emission rates (in g/s) input to the modelling and does not include the input data for assessment of nitrosamines.

3. Provide an updated table 8 [2] with the **revised modelling [2] input data for assessment of short-term pollutant emissions**.
   Table 8 [2] (Updated Emission Parameters for the Baseline and With PCC Scenarios) relates only to the long term annual average emissions inputs parameters for the revised modelling. The revised modelling output

includes short-term emissions outputs. We need table 8[2] to include the relevant short term **mass emission rates** of the individual flues used in the revised modelling [2].

4. Provide an updated table 8 [2] with **the source term parameters and mass emission rates that represent the submitted modelling files and updated predictions presented in [2].**
   The modelling files represent a single site stack with combined flues, however, report [2] only depicts individual flues.

Notes

[1]. Variation to Operate Carbon Capture and Directly Associated Activities to on Unit 2 and/or Unit 1 at Drax Power Station (VP3530LS) – (first submission) Referred as [1]

[2]. Variation to Operate Carbon Capture and Directly Associated Activities to on Unit 2 and/or Unit 1 at Drax Power Station (VP3530LS) Supplemental Information Provision and Appendix B – (second submission) Referred as [2]

We require the above information to Duly Make your application. Please provide the outstanding information detailed above by the 11th of May 2023. If we do not receive the information by this date, we will not do any further work on your application.

We'll assess your claim for confidentiality once we have received all the staged application information and your application is duly made.

We will also require the following information before we can carry out our full review of the air emissions risk assessment.

The information is as follows and relates to the air dispersion modelling in submitted in both reports [1] and [2].

- Provide location and dimensions of all **buildings included in the model**, adding their National Grid reference, height, width and rotation. The modelling files include buildings, however, these are not presented in the reports.

- Please explain how you have worked out the **combined exhaust source term parameters** and justify the rationale and appropriateness of the combined exhaust temperatures, diameters and velocities.

- You must explain how you have worked out the **pollutant emission rates** used in your model. Please present a table of pollutant emission concentration (or ELVs), actual (and actual conditions) and normalised volume flows, and pollutant emission rates per individual flue to evidence the combined emission scenarios and consistency.

- Please provide the **input parameters used in the amines chemistry module** and a justification that they are robust and fit for purpose, including the amine-specific atmospheric reaction parameters and the ratio of NO_X to NO_2 at the stack. Please include the high and low range kinetic parameter values considered in your sensitivity analysis and their source of information.

- Please explain your **approach to estimate acid deposition impacts** at Thorne Moor (SAC, SSSI) and Lower Derwent Valley (SAC) and clarify whether all potential acidifying pollutants released have been included (i.e. HCl).

- Uncertainty (CO_2 modelling) [2]: **Your report must show that you have dealt with the uncertainty.** This can be shown by undertaking sensitivity analysis to deal with variability in your input data and consulting modelling software validation documents/field experiments on releases with similar characteristics. In this case, for example, you show that the vent openings (e.g. opening size, potential phase change through constriction and after expansion, etc.), mass emissions (peak), CO_2 physicochemical conditions and modelling software are not variable(s) that would affect conclusions based on the risk assessment criteria.

Please consider our modelling guidance at Environmental permitting: air dispersion modelling reports - GOV.UK (www.gov.uk) [Accessed Apr-23].

If you have any queries or would like to discuss the outstanding requirements please contact [redacted]

[redacted]

Do you operate a medium combustion plant or specified generator?
Click here to find out if you need to meet the regulations