31st July 2021

[redacted]

Environment Agency

Re: EPR/CB3308TD/V002

Dear Sir/Madam,

My expertise is in reactor design and process engineering of thermochemical energy from waste (EfW) systems, namely incineration, gasification and pyrolysis. I am a doctor of energy engineering: my PhD was awarded by the University of Leeds in 2011. I have worked on thermochemical EfW projects at Universities in the UK, Australia and Qatar, and in a private capacity on numerous full-scale commercial plants in the UK. I currently work freelance as a technical consultant on these systems. I am a member of the United Nations Basel Convention D10/R1 (incineration) inter-sessional working group. I am the author on one book and numerous academic journal papers, conference papers, and technical reports.

This submission contains my assessment of the proposed Britanniacrest Recycling Ltd, Wealden Works Facility, Horsham. It is made in response to the public consultation for Environment Agency (EA) permit application (EPR/CB3308TD/V002), following an appraisal of the application dossier. Prompting me to write this submission is the unacceptably large number of fires and explosions currently occurring at EfW plants in the UK and Europe. Fire and explosion incidents at EfW plants are now so frequent as to occur on at least a weekly basis.

The documents submitted by Britanniacrest Recycling Ltd evidence an ill thought through risk assessment and a lack of understanding of incineration plant best practice. Consequently the risk of environmental impact and in particular fire and explosion is high. Generally, the application dossier is very weak: crucial numbers that are quoted are frequently elsewhere contradicted, important parameters necessary to adequately define the technical and safe functioning of the proposed plant are often missing altogether, much of the information provided is too vague, and there is an overuse of meaningless catch-all phrases. My professional opinion is that the Environment Agency must reject this application.

I evidence this by reference to individual application documents, cited using italicised text. A number of independent references are also used to support my comments, and these are given in full at the end.

1. The plant proposes to use Refuse Derived Fuels (RDF) as a feedstock rather than raw municipal solid waste (MSW). This material (RDF) when in storage is known to release toxic gases, self-heat, and auto-ignite, a phenomenon that was first observed in August 2003 when the spontaneous ignition of RDF occurred in a cylindrical silo at an EfW plant in Mie Prefecture, Japan. It resulted in two explosions (on 14th and 19th). In the first, four workers were injured, while the second was fatal as it blew the roof off the site and killed two fire fighters (Goa et al., 2004, Hirano, 2006). Similar accidents involving spontaneous combustion of RDF then followed at EfW plants located in Ohmuta City in September 2003, followed by another accident in Ishikawa Prefecture in October 2003 (Matunga et al., 2008). The subsequent investigations found that **the critical ignition temperature was predicted to be as low as 40°C to 80°C for stacks of RDF in the 1m to 5m height range** (Gao and Hirano, 2006). Note above the pile height for ignition, the low temperatures, and crucially that auto-ignition can occur, in contrast to the following:

2. The '*Appendix D Environmental Risk Assessment, 8th October 2020'* inadequately addresses the risk of feedstock combustion and self-ignition on site. It incorrectly assumes that this can be mitigated by the feedstock '*not being near ignition sources*' and that it is covered by the *Fire Prevention Plan* [which is inadequate and will be discussed later], concluding that the '*Probability of Exposure is low, consequence is low/medium, and overall risk is low*'. This assessment is incorrect.

3. It is stated in *'Appendix H, Fire Prevention Plan'*, §7.1.1 that RDF will arrive in the '*Waste Processing Hall*' where it will be stacked at less than 4m. It will then be transferred to something called '*the bunker'*.

3.1. Bizarrely, the '*Waste Processing Hall'* is not shown on the site plan (titled '*The Process Flow Diagram'*). It may be the '*Tipping Area'* or the '*Sorting and Materials Recovery Area'* but this is just guesswork.

3.2. Risk of fire and explosion due to RDF storage in the '*Waste Processing Hall'* is missing from '*Appendix D Environmental Risk Assessment, 8th October 2020*'.

3.3. Due to the inadequate detail of this storage area, the site's capacity for storage here cannot be determined. If undersized this would lead to a backing-up of feedstock outside and inadequately managed storage.

3.4. Planned residence time of RDF in the '*Waste Processing Hall'* is not mentioned.

3.5. Monitoring of RDF self-heating to obviate fire and explosion while in the '*Waste Processing Hall'* is not mentioned.

4. From the '*Waste Processing Hall'* the main storage area for RDF is said to be another obscure building/vessel, titled '*the bunker'*. According to the Application dossier (*3Rs Planning Support Statement, update 140318, Table 3.1*), the bunker is 32.43m high x 59.30m wide x 24.15 m long. <u>Note the great height in comparison to the science of RDf self heating and auto-ignition.</u>

4.1. Yet, §7.1.1 of *'Appendix H, Fire Prevention Plan'* states that in *'the bunker...the waste is not stored in piles...so that pile management is not directly applicable'*. This is an incredible statement:

4.1.1. If not stored in piles, how is the RDF in the bunker to be stored?

4.1.2. What precisely does *'not directly applicable'* mean? Such language is inappropriate.

4.2. Information on the storage duration within *'the bunker'* is confused and contradictory: '*Appendix D of 3Rs Planning Support Statement Update 140318'* states that there is capacity for the storage of *'three days'*, while '*Appendix D Environmental Risk Assessment, 8th October 2020*, *Table 2.2'* states *'up to five days'*.

4.3. Insufficient detail is given as to how RDF in '*the bunker'* will be monitored and controlled. This is covered by the unsatisfactory statement that *'as far as practicable residual waste will be processed in rotation' (§6.2.7 Fire Prevention Plan).* This adds an unacceptable subjective caveat such that if it is deemed <u>*not*</u> practicable, then RDF may remain at the base of the bunker pile.

4.4. Further dangers are created by the '*Appendix D Environmental Risk Assessment, 8th October 2020*, since '*Crane operators will be trained to ensure that the waste materials in the bunker are well mixed and that incoming waste is not being left within the bunker for excessive periods' (Table 2.2*. Issues with this are:

4.4.1. '*Excessive periods*" is another unquantified catch-all statement, not backed up by robust assessment.

4.4.2. Leaving the matter to individual decision making by crane operators is not good practice .

4.5. There is insufficient detail in the *Appendix D Environmental Risk Assessment, 8th October 2020* on how the gaseous mixture and temperature of '*the bunker'* headspace will be monitored, how

high the stored piles of RDF will be allowed to attain, how the risk of self-heating, and auto-ignition of RDF in *'the bunker'* will be minimised during periods of Other Than Normal Operating Conditions (OTNOC).

4.5.1. It is not described whether '*the bunker'* has an enclosed headspace or whether it is an open vessel in an occupied, sealed building.

4.5.2. It is not stated where the thermocouples will be nor how many of them there will be to monitor temperature.

4.6. Risk of a self-igniting gaseous headspace developing in *'the bunker'* appear to be heightened by *Appendix D, point 5 of 3Rs Planning Support Statement Update 140318* stating that '*the bunker'* is to be a *'fully closed environment'* with a *'fast acting door which would remain closed during non-delivery periods'*.

5. It is good practice in plant risk assessments for there to be a detailed plan for OTNOC, but this is not provided. Periods of OTNOC are when major accidents are most likely to occur. The acknowledgement of these factors and the acceptance of the need for learning from historical antecedents should be paramount to avoid catastrophic accidents such as at Hicksons (Patterson, 2017), and Buncefield (Herbert, 2010). These case studies show that a process when operating outside of its operational norms, by staff not having a clear policy to follow has led to devastating consequences.

5.1. Periods of OTNOC are also known to be associated with significantly higher levels of airborne dioxin emissions which find their way into the neighbouring food chain (Arkenbout et al. 2018).

5.2. In this regard the application merely contains unsatisfactory cover-alls such as '*in the event of a total plant shutdown, waste volumes in the bunker and waste processing area will have been run down prior to the shutdown to minimise the amounts of material remaining'* (*Appendix D Environmental Risk Assessment, 8th October 2020,* Table 2.2.). OTNOCs cannot always be planned in the way described.

6. *Appendix H, Fire Prevention Plan* is woefully inadequate in its risk assessment:

6.1. The safety proposal appears to be again significantly reliant on visible observation, namely that *'the bunker and hopper can be observed from the control room and it is likely that any fire would be identified quickly'*. This is NOT good practice, not least because details of '*the bunker'* and therefore its capacity to permit visible observation to stop an early onset of fire cannot be gauged.

6.2. No description is given of whether *'the bunker'* is exposed to free oxygen ingress, or whether it could become pressurised. Consequently there is no discussion on whether explosive atmospheres could build up from the pyrolysis and fermentation of RDF.

6.3. Worryingly, *§5.10.2 of Appendix H Fire Protection Plan* states that *'the bunker'* is never to be emptied and cleaned.

7. Hot loads: Another vague, catch-all statement in *Appendix H, Fire Prevention Plan* is the statement that *'Waste acceptance procedures are in place and includes procedures for checking for and management of hot loads. These procedures will seek to avoid hot loads being deposited in the bunker'*. Yet, no detail is given as to what these procedures are.

8. In Appendix D of *3Rs Planning Support Statement Update 140318* it is stated that during waste acceptance, *'shredded material would be passed through a trommel or screen to remove fines'*. This is problematic for a number of reasons: Where these fines then go is a mystery. They constitute a substantial waste material, and one that when stored will have a greater propensity for compaction and self-heating when stored. Plus they have a tendency for airborne pollution, fugitive emissions, and groundwater leachate.

9. In reality, and in contrast to the *Environmental Risk Assessment, 8th October 2020*, should there be a fire and explosion in the RDF storage area 'the bunker' the hazard will in fact be high. This is because according to *The Process Flow Diagram* the offices abut the bunker to both south and easterly corners, while to the north east is the boiler and to the south west is the workshops. If there were to be a fire or explosion, the impact would in fact likely be fatal to the workers therein, due to the site arrangement.

10. Regarding the site's geography, it is not mentioned anywhere in the dossier's risk assessment that the site is directly adjacent to an anaerobic digestion facilitity with vessels containing large volumes of stored and pressurised, flammable CH_4. This is reciprocative and impacts on both plants. Anaerobic digestion facilities do explode: two men were seriously injured in a gas explosion at one such plant in Nottingham in 2017. But equally, should there be a fire or explosion at the proposed Britanniacrest plant, then a major large-scale conflagration involving both sites is highly likely. On these grounds alone, the permitting application should be rejected.

References

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