

Planning Application Representation:  
Written Representation from Biofuelwatch

Proposed Development:  
Drax Bioenergy with Carbon Capture and  
Storage Project

Proposed Location:  
Drax Power Station, North Yorkshire

Applicant:  
WSP UK Limited

Examining Authority Ref:  
EN010120

Registration Identification Ref:  
20032287  
February 2023

# Table of Contents

<b>SUMMARY</b>	<b>4</b>
Conformity with Government policy	4
Air Quality and Emissions	4
Biodiversity and Ecology	5
Climate Change impacts	5
Burning Trees to Generate Electricity is Not Sustainable Development	5
<b>Introduction</b>	<b>6</b>
About Biofuelwatch	6
Biofuelwatch's Written Representation	6
Burning Trees to Generate Electricity is Not Sustainable	7
<b>Conformity with Government Policy</b>	<b>12</b>
<b>Air Quality and Emissions</b>	<b>13</b>
Air Quality as an Examining Authority Consideration	13
Incorrect Figures?	15
Deterioration of Air Quality	16
Important Air Quality Considerations	17
Limited Modelled Area	20
Cumulative Impacts	20
Modelling Prediction Uncertainties	24
ADMLC Guidance and Air Dispersion Modelling System Uncertainties	26
Technology Uncertainties	31
Measurement Uncertainties	32
Assumed Emissions Rates and Parameters	33
Amine and Nitrosamine Environment Assessment Levels	34
Nitrosamine Uncertainties	37
Nitrosamine Dispersion Modelling to Protect Human Health and the Environment	44
Lack of Environmental Monitoring	46
Dioxin Emissions	47

Fugitive Emissions	48
UKHSA	48
Can the Deterioration in Air Quality be Mitigated or Avoided?	49
<b>Biodiversity and Ecology</b>	<b>51</b>
Risk of Amine Deposition on Ecology	51
Risk of Cooling Water Contamination	52
Deposition Impacts and Uncertainties	54
River Derwent and River Ouse Acid Impacts	59
Non-Statutory Designated Sites	60
Risk of Harm to Protected and Notable Species	62
Other	65
<b>Climate Change</b>	<b>68</b>
Policy Framework	68
Emissions Trading Scheme	71
Carbon Capture at Boundary Dam and Shute Creek	72
Lack of Evidence to Support CO2 Removal Performance using BECCS	74
Calculation of Emissions Associated with Production of Chemicals	77
Greenhouse Gas Emissions - Inaccuracies and Omissions in the Application	78
Importance of Other Sustainability Factors	81
Summary of Greenhouse Gas Impacts	85
<b>Flood Risk and Water Environment</b>	<b>85</b>
<b>Accidents and Natural Disasters</b>	<b>87</b>
<b>Do the Benefits of the Proposal Outweigh the Risk of Adverse Impacts?</b>	<b>91</b>
<b>Appendix 1: Written Responses from Drax's Consultation Team Between 17th and 23rd December 2021</b>	<b>93</b>
<b>Appendix 2: References from APIS (Air Pollution Information System) Website</b>	<b>95</b>
<b>Annex 1: Information Response EIR NR253625 Request and Notification of Delay Emails</b>	<b>97</b>
<b>Annex 2: EIR NR253625 Response</b>	<b>100</b>
<b>Annex 3: Information Response EIR NR281128</b>	<b>101</b>

## SUMMARY

### Conformity with Government policy

The proposal is contrary to policies EN-1 and EN-3 in that it reduces UK electrical generating capacity and energy security.

The proposal is premature because the UK has not completed and assessed four pilot demonstration CCS projects to the extent set out in EN-1.

The examination has wrongly excluded consideration of the environmental impacts of the full carbon capture system comprising capture, transport and storage, contrary to the BEIS Biomass Policy Statement.

The examination is premature because the Government's Net Zero Policy is currently being revised.

The examination is premature because the specific sustainability requirements for BECCS referred to in the BEIS Biomass Policy Statement have not been published and therefore the application cannot be assessed against them.

The examination is premature because the specific air pollution standards and regulations for emissions from BECCS systems called for in the BEIS Biomass Policy Statement have not been set, and therefore the application cannot be assessed against them.

### Air Quality and Emissions

Human health is already being harmed by air pollution in the vicinity of the facility. The proposal will add to pollution and increase harm. Emissions of pollutants currently released by Drax will increase, and new pollutants will be released by the PCC. There is very limited understanding of the behaviour of the new air pollutants and their effect on human health. Recently introduced Environmental Assessment Levels for the new releases (amines and nitrosamines) are unproven and are not sufficiently conservative given the paucity of evidence.

The decision by UKHSA not to comment on the impacts to human health from the novel air pollutants is very concerning, particularly as there are no real world examples on which to assess the release of amine degradation products from BECCS with woody biomass.

The Applicant is intending to use a proprietary amine mixture in the PCC, and has declined to provide full details of the compounds and mixture. As a result, the human health risks from nitrosamines, and other amine breakdown products, cannot be fully and adequately assessed.

There is inadequate provision for monitoring emissions from the PCC in operation. Neither the standards nor the technology currently exist to support continuous monitoring of nitrosamine emissions and the amine precursors to nitrosamines.

## Biodiversity and Ecology

The Environmental Statement provides an incomplete and inadequate assessment of the impacts on wildlife and natural habitats of the deposition of air and water pollutants from the PCC system itself, and from the increased burning of woodfuel at the power station. The assessment of the impacts of those depositions is also inadequate.

Deposition modelling is an inexact science, and consequently any predictions are likely to have a considerable margin of error. The uncertainties are likely to be greater with the unproven system forming this proposal (large scale BECCS and novel amines). The Applicant must ensure sources of uncertainty are listed and quantified to support a quantified estimate of the cumulative uncertainty of the modelling predictions. Currently, the Applicant's air quality predictions are not sufficiently precautionary for compliance with the Habitats Directive.

## Climate Change impacts

The intended purpose of the development is to capture carbon dioxide from the combustion emissions produced by the Drax power station. The Applicant has stated that the development is conditional on it reaching a satisfactory financial agreement with the government on funding. Government is developing a 'business model' to provide financial support to operators of BECCS. Because the development will be partially (and probably significantly) supported by public funding, its performance in capturing carbon dioxide is a matter of great public interest and must therefore be thoroughly scrutinised by the examination.

The Applicant has put forward projections of performance for the PCC. Its document submitted following the Issue Specific Hearing 1 and Open Floor Hearing 1 estimates that 9.2m tonnes (gross) of carbon dioxide would be captured per year, with a net figure for 'negative emissions' of 6.6m tonnes. These figures are based a) on a wholly implausible assumption of carbon capture efficiency which conflates best practice requirement with likely real-world performance, and b) on a very unrealistic expectation that the two biomass units to be equipped with BECCS will run continuously 8760 hours per year, and c) on ignoring fossil fuel emissions that are likely to arise to meet the energy shortfall caused by the drop in efficiency. The Applicant has provided no evidence to support the assumptions, and Biofuelwatch invites the Examining Authority to request the projections are revised to provide a more realistic estimate of overall performance.

## Burning Trees to Generate Electricity is Not Sustainable Development

Burning millions of tonnes of imported wood to generate electricity is wasteful, inefficient, harms biodiversity and human health, and accelerates climate change. Production of woodfuel in the USA for the Drax power station adversely affects people there with noise and air pollution. The proposed development extends the previously expected life of the Drax power station by many years and there is evidence contained within the application that the proposed development will significantly increase the amount of wood to be burnt at Drax,

due to the proposal to operate continuously in order to maximise carbon capture. As a result the existing harms will be worsened and perpetuated for decades, and the proposal is not therefore sustainable development.

The signatories to the Leaders Declaration on Deforestation at COP26 committed to slow deforestation, recognising the negative impacts caused to nature, the climate, human health and society. The proposed development will increase deforestation in countries producing woodfuel for Drax, and is contrary to the Declaration.

## Introduction

### About Biofuelwatch

1. Biofuelwatch provides information and undertakes advocacy and campaigning in relation to the climate, biodiversity, land and human rights and public health impacts of large-scale industrial bioenergy.
2. Biofuelwatch's aims include promoting environmental decision making in relation to bioenergy and other bio-based products which prioritise the protection of the climate and environment, social justice and public health and promoting active citizenship in this respect.
3. Together with many other climate and environmental justice NGOs, conservation NGOs, academics and policy think tanks, Biofuelwatch believes the practice of burning massive quantities of wood to generate electricity is a deeply flawed response to the climate emergency. Drax's power station burns more wood each year than the UK produces, and is totally reliant on imported wood fuel, and is only financially sustainable because of government subsidies levied on UK energy bill payers. Biofuelwatch has led opposition to Drax and the government policies that sustain it for over a decade.
4. The proposal to add PCC to two of the biomass units at Drax is projected to increase the amount of wood burnt by nearly 50% to over 19m tonnes per year, putting additional pressure on forests and ecosystems in supplying countries and further harming local communities in the vicinity of the plants used to process trees into wood pellets.

### Biofuelwatch's Written Representation

5. This representation covers the following broad areas:
  - a. Conformity with Government policy
  - b. Air Quality and Emissions
  - c. Biodiversity and Ecology
  - d. Climate Change
  - e. Flood Risk and Water Environment

- f. Accidents and Natural Disasters
- 6. A lack of comment from Biofuelwatch on other aspects/impacts of the proposal should not be understood to mean that Biofuelwatch considers those other aspects to be acceptable. Restricted time has made it impossible to comment on every aspect of the application.
- 7. This document details Biofuelwatch's most concerning issues with the proposal, but these specific concerns are within the wider context that burning of trees by Drax to generate electricity is unsustainable. By way of introduction and background, this is explained further below.

## Burning Trees to Generate Electricity is Not Sustainable

- 8. In summary there are four main problems:
  - a. It takes huge areas of land and huge quantities of wood to supply a tiny fraction of the energy we use.
  - b. Burning biomass emits CO<sub>2</sub> to the atmosphere, just as burning fossil fuels does. Those emissions are ignored in governments', and thus energy companies', carbon accounting – yet the science increasingly shows that this is a dangerous omission and that cutting down trees and burning them for energy raises carbon in the atmosphere precisely when we need to rapidly reduce it to have any hope of keeping global warming to 1.5 degrees.
  - c. Burning biomass causes significant harmful air pollution - more than burning fossil fuel gas.
  - d. Fuelling large scale biomass power generation drives faster consumption of timber. It provides an economic incentive to clear and convert old-growth forests to plantation forests releasing centuries old stored carbon and causing devastating impacts on biodiversity
- 9. Evidence to support these claims can be found on the Biofuelwatch website<sup>1</sup> along with much other additional information and evidence. Biofuelwatch refers the Examining Authority to our website and encourages consideration of whether the scale of Drax's consumption of biomass can be considered consistent with the biodiversity and climate emergencies. This introductory section does not repeat the information on our website and instead shows there is widespread agreement that the felling of trees to burn at Drax is causing much environmental harm.
- 10. In 2018, Channel 4 Dispatches uncovered "reckless deforestation being used to feed Drax"<sup>2</sup>. In 2021, Channel 4 News reported that Drax could be fuelling habitat loss. In

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<sup>1</sup> "Biomass Basics" and "Resources" pages on the Biofuelwatch's website list numerous scientific and other references:

<sup>2</sup> "Channel 4 Dispatches seemingly uncovers reckless deforestation being used to feed Drax", 17 April 2018, Envirotech Magazine, downloaded from the envirotechmagazine website on 22

2022, A BBC Panorama programme regarded the wood burning at Drax to be an “environmental scandal”<sup>3</sup>. In 2021, CNN exposed the impacts on economically disadvantaged people in the USA whose lives are blighted by the massive processing plants used to create wood pellet fuel for biomass power stations in the UK<sup>4</sup>. Greenpeace has reported a pay out of a further \$3.2m to settle air pollution claims against wood pellet factories in the United States’ deep south<sup>5</sup>. Drax denies allegations of unsustainable wood harvesting but Client Earth have exposed Drax’s claims to be Greenwashing<sup>6</sup> and extensive science<sup>7,8</sup>, policy<sup>9,10,11</sup>, media reports<sup>12</sup> and

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February 2023:

[REDACTED] [17/channel-4-dispatches-seemingly-uncovers-reckles](#)

<sup>3</sup> BBC Panorama “The Green Energy Scandal Exposed” “The wood-burning Drax power station in Yorkshire provides 12 per cent of the UK’s renewable energy. It has already received £6 billion in green energy subsidies from the government. But are the wood pellets the power station burns really as sustainable as the company claims? Reporter Joe Crowley investigates where the wood comes from and uncovers an environmental scandal. He reveals how Drax is chopping down trees and taking logs from some of the world’s most precious forests.”

<sup>4</sup> Mijilie de Puy Kamp, CNN, “How Marginalized Communities in the South are paying the price for ‘Green Energy’ in Europe”, 9 July 2021 downloaded 22 February 2023:

<sup>5</sup> Sam Quashie-Idun Christopher Deane, “Drax accused of driving ‘environmental racism’ after further pollution claims against wood pellet mills in US deep south”, 26 September 2022, Greenpeace Unearthed

<sup>6</sup> ClientEarth environmental law charity, “Greenwashing Files: Drax” available from ClientEarth website with the information reported to be as of 25 March 2021. Webpage downloaded 22 February 2023.

<sup>7</sup> Many references to scientific papers on combustion of biomass, paper on biomass with carbon capture, can be found on the resources page of Biofuelwatch’s website at:

<sup>8</sup> Camia, A., Giuntoli, J., Jonsson, K., Robert, N., Cazzaniga, N., Jasinevičius, G., Avitabile, V., Grassi, G., Barredo Cano, J.I. and Mubareka, S., The use of woody biomass for energy production in the EU, EUR 30548 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-27867-2, doi:10.2760/831621, JRC122719.

<sup>9</sup> Phil MacDonald, “The Burning Question. A new report from climate change think tank Ember reveals the cost of burning wood for power, with UK energy billpayers committed to subsidies of more than £13 billion”, Ember, 14 June 2020, downloaded 22 February 2023: <https://ember-climate.org/insights/research/the-burning-question/>

<sup>10</sup> Duncan Brack, Woody Biomass for Power and Heat Impacts on the Global Climate, Chatham House research paper ISBN: 978 1 78413 190 6:

<sup>11</sup> Davine Janssen, The Dutch have decided: Burning biomass is not sustainable, 21 July 2020, downloaded from Euractiv website on 22 February 2023;

<sup>12</sup> Robin McKie, Burning wood for power is ‘misguided’ say climate experts, 31 December 2017, The Guardian, downloaded from the Guardian website on 22 February 2023:



environmental groups<sup>13,14,15</sup> (too numerous to exhaustively reference) consider the burning of such biomass for energy production unsustainable.

11. The practice of felling trees and shipping them around the world to burn the wood pellets at Drax has been heavily criticised in parliament<sup>16</sup>.
12. The UK is a signatory to the COP26 Glasgow Leaders' Declaration on Forest and Land Use, which calls for a rapid end to deforestation to help reduce climate change. It is Biofuelwatch's view that the supply of wood fuel to Drax amounts to deforestation and is therefore inconsistent with the Leaders' Declaration. The proposed development perpetuates deforestation and exacerbates it because woodfuel consumption is increased.
13. The continued use of forest bioenergy for electricity has been condemned by more than 600 scientists<sup>17,18</sup> who wrote to the Prime Minister in December 2022<sup>19</sup>. The letter explicitly mentions Drax twice, refers to BECCS, the ecological destruction, the climate consequences and calls for an end to reliance on biomass energy. Given the scientific support for the letter, we reproduce it in full:

*Dear President Xi, President Biden, Prime Minister Trudeau, Prime Minister Rishi Sunak, President von der Leyen, President Yoon Suk-yeol, and Prime Minister Fumio Kishida,*

*We, the undersigned scientists, recognize the work that has been done over recent years towards developing a new Global Biodiversity Framework.*

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<sup>13</sup> Katja Garson, Dangerous delusions: biomass is not a renewable energy source, 21 January 2022, OneEarth, downloaded from the OneEarth website on 22 February 2023:

<sup>14</sup> Sasha Stashwick, How the Biomass Industry Sent "Sustainability" Up in Smoke, 25 July 2019, NRDC, downloaded from the NRDC website on 22 February 2023:

<sup>15</sup> Simon Evans, CCC: UK should 'move away' from large-scale biomass burning, 15 November 2018, downloaded from the carbon brief website on 22 February 2023:

<sup>16</sup> Commons Debate: Sustainable Energy Generation: Burning Trees Volume 724: debated on Tuesday 6 December 2022:

<sup>17</sup> Victoria Seabrook, Rishi Sunak lambasted by scientists for UK's 'disturbing' energy source, Saturday 3 December 2022, downloaded from Sky News website 22 February 2023:

<sup>18</sup> Nicholas Earl, Scientists urge world leaders to stop burning trees to generate energy, Monday 5 December 2022, accessed on Cityam website 22 February 2023:

<sup>19</sup> Cut Carbon Not Forests Letter Signed by Scientists, Scientists urge end to burning forest biomass for energy for sake of nature and biodiversity, 773 signatories as of 30 January 2023, accessed 22 February 2023:

*We are writing to express our concern regarding an emerging and growing threat to biodiversity that threatens to undermine these commitments: the large-scale use of forest bioenergy to generate electricity and heat.*

*We ask you and your countries to end all reliance on forest bioenergy and, over time, to replace it entirely with alternative renewable energy sources like wind and solar.*

*Up to one million species are at risk of extinction by the end of the century, primarily due to habitat fragmentation and loss. Forests are among the most biodiverse places on the planet, providing habitat for countless species. They are also often referred to as the “lungs of the earth” due to their capacity to absorb nearly a third of all the emissions released by burning fossil fuels.*

*Troublingly, because it has wrongly been deemed “carbon neutral,” many countries are increasingly relying on forest biomass to meet net zero goals. This is harming our world’s forests when we need them most. Many of the wood pellets burned at power stations for bioenergy are coming from whole trees — not wastes and residues from logging, as the industry claims. For example, nearly half of all biomass burned at the UK’s Drax Power Station comes from whole trees.*

*Also disturbing is the fact that many of these trees are coming from old, biodiverse and/or climate-critical forests. For example, we know that wood pellets burned in the UK come from clearcuts of mature hardwood forests in the U.S. Southeast’s North American Coastal Plain Biodiversity Hotspot; protected forest ecosystems in the Baltics that are critical habitats for imperilled birds and mammals; and primary forests in Canada, including the boreal forest, one of the world’s last remaining intact forests and a stronghold for global bird populations. Rare species such as the prothonotary warbler, the boreal woodland caribou, and the black stork, are already declining due to the loss and degradation of these forests. Forests will become even more important for biodiversity in the future as vital havens for species impacted by climate change, especially if these species’ ranges shift due to a changing climate.*

*Wood used for biomass energy is routinely logged using harmful practices like clearcutting. On-the-ground investigations show that two of the world’s largest pellet manufacturers — Enviva and Drax — make pellets from wood clearcut from forests. Clearcutting to provide timber for wood pellets in the EU and UK is even occurring in reserves designed to protect forests and rare and threatened species (e.g. European Union’s Natura 2000 network). Studies in tropical forests have shown that once a forest has been clearcut, it takes decades, if not centuries, before it can regrow to recover its original level of ecosystem productivity and biodiversity. While trees may be replanted after logging for bioenergy, they are sometimes replaced with monoculture plantations, which are not nearly as valuable when it comes to biodiversity or ecosystem productivity. In some places — such as Brazil’s Rio Grande do Sul*

*region — monoculture tree plantations have completely taken over existing, natural ecosystems, leading to local extinction of species and other environmental impacts.*

*The scale of this logging is alarming. For example, in 2019, approximately 5.7 million metric tons of wood pellets were exported from the United States to the UK, requiring the clearing of an area larger than the UK's New Forest. And between 2001 and 2019, Estonia's Natura 2000 areas lost an area more than twice the size of Manhattan, due in part to biomass production.*

*“Unfortunately, these devastating impacts are only projected to increase as many countries plan to scale up bioenergy use by adding carbon capture and storage or “BECCS” to meet net zero goals. This is despite the serious questions over whether BECCS power would even remove carbon dioxide from the atmosphere by 2050 and high risks that all the supply chain emissions and efficiency losses would merely make matters worse. If BECCS did become widely subsidised, countries would have to significantly ramp up planting of bioenergy crops, which would diminish the land available for wildlife and natural ecosystems, and jeopardize global food security. Indeed, some projections estimate that worldwide use of BECCS to achieve net zero would require up to 1.2 billion hectares of land — the equivalent of about 80% of all current global cropland. Converting this much of the world's land to bioenergy crops would leave little room for wildlife, preventing us from halting and reversing biodiversity loss (and risking global food and water security).*

*“In addition to its impacts on wildlife, the Intergovernmental Panel on Climate Change (IPCC) recently noted the critical role that forests play in keeping their stored carbon out of the atmosphere. Harvesting for bioenergy seriously harms forests and their ability to sequester and store carbon.*

*“In sum, the goal to halt and reverse the global loss of nature could fail due to the growing pressure on forests from this industry. Logging for bioenergy is accelerating the threat to forests and wildlife while scientists are calling for “transformative change” — not business as usual — if we hope to avert climate disaster and biodiversity collapse. If the global community endeavours to protect 30% of land and seas for nature by 2030, it must also commit to ending reliance on biomass energy. The best thing for the climate and biodiversity is to leave forests standing — and biomass energy does the opposite.”*

*Sincerely,*

14. Biofuelwatch respectfully asks the Examining Authority to note that this proposal will increase the already significant and unacceptable environmental impacts of Drax's operation by increasing wood fuel consumption. By extending the life of the biomass units at Drax, these damaging effects will continue for decades longer than had been hoped.

## Conformity with Government Policy

15. The BEIS Biomass Statement of November 2021 recognised that there are concerns about the sustainability and efficacy of BECCs. It responded to these concerns saying that:

*"When undertaken sustainably, BECCS can deliver negative emissions because carbon sequestered in biogenic material is captured and stored after combustion, resulting in a net decrease in atmospheric CO<sub>2</sub> overall. Some organisations including trade associations, university researchers and NGOs raised concerns over the net negativity of BECCS in the biomass call for evidence<sup>63</sup> and asked how the Government might support BECCS to deliver negative emissions. To ensure that BECCS delivers genuine negative emissions, strict biomass sustainability criteria will be developed for BECCS. These criteria will build on the existing sustainability criteria for biomass that are being reviewed as part of the Biomass Strategy. Research and updated regulation will also be required to understand and address any air quality impacts from BECCS, including emissions associated with carbon capture solvents."*

63 BEIS (2021) Role of biomass in achieving net zero: call for evidence

<https://www.gov.uk/government/consultations/role-of-biomass-in-achieving-net-zero-call-for-evidence>

Biofuelwatch understands that neither the "strict biomass sustainability criteria for BECCS" referred to here, nor the "updated regulation to address air quality impacts" have been developed. Until these are available, it is premature for the ExA to make a recommendation on this proposed development.

16. The BEIS Biomass Policy Statement makes it clear that the proposed use of BECCS must be thoroughly assessed, stating:

*"The Government is clear that any BECCS deployment must be genuinely and credibly 'net negative', meaning it must remove more GHG emissions from the atmosphere than it creates, and store them in long-term geological storage. This assessment would include all GHGs (including methane and nitrous oxide) from the whole BECCS supply chain, including carbon capture at the capture plant and eventual store."*

17. The examination of the proposed development at Drax must therefore include an assessment of the GHG emissions from the whole BECCS supply chain, including the transport and storage components. The decision by the ExA to scope out consideration of the climate and other environmental impacts of the pipeline etc beyond the site boundary is contrary to this policy.
18. The proposed development will lead to a reduction in net electricity generation capacity in the UK, contrary to established and emerging Government policies, and contrary to the urgent need to maintain and improve UK energy security: a)

Overarching National Policy Statement on Energy (EN-1), 2011 and b) Draft Overarching National Policy Statement for Energy (EN-3), 2021.

19. The designated policy EN-1 of 2011 was clear that the technology of carbon capture and storage had not reached a sufficient level of maturity for deployment due to commercial considerations, stating at 3.6.4 that

*“There is therefore uncertainty about the future deployment of CCS in the economy, which in the Government’s view cannot be resolved without first demonstrating CCS at commercial scale. “*

20. And at 3.6.5 of EN-1, the need for representative scale demonstration projects was confirmed:

*“The Government is leading international efforts to develop CCS. This includes supporting the cost of four commercial scale demonstration projects at UK power stations. The intention is that each of the projects will demonstrate the full chain of CCS involving the capture, transport and storage of carbon dioxide in the UK. These demonstration projects are therefore a priority for UK energy policy. The demonstration programme will also require the construction of essential infrastructure (such as pipelines and storage sites) that are sized and located both for the purpose of the demonstration programme and to take account of future demand beyond the demonstration phase. The IPC should take account of the importance the Government places on demonstrating CCS, and the potential deployment of this technology beyond the demonstration stage, in considering applications for consent of CCS projects and associated infrastructure ”*

21. Biofuelwatch considers that the CCS demonstration programme outlined in EN-1 has not been completed. Construction of “essential infrastructure” (such as pipelines and storage sites) has not taken place. It is therefore premature for the ExA to make a recommendation on the proposed full scale BECCS development at Drax.

## Air Quality and Emissions

### Air Quality as an Examining Authority Consideration

22. Paragraph 5.2.9 of EN-1 says:

*“The IPC should generally give air quality considerations substantial weight where a project would lead to a deterioration in air quality in an area, or leads to a new area where air quality breaches any national air quality limits. However air quality considerations will also be important where substantial changes in air quality levels are expected, even if this does not lead to any breaches of national air quality limits.”*

23. Paragraph 5.2.10 of EN-1 considers that

*“In all cases the IPC must take account of any relevant statutory air quality limits”*

24. This does not, however, say that the Examining Authority’s consideration should be *limited* to relevant statutory air quality limits and, indeed, the preceding paragraph shows a deterioration in air quality in an area should be given “substantial weight”.

25. Paragraph 4.10.2 of EN-1 says:

*“The planning and pollution control systems are separate but complementary. The planning system controls the development and use of land in the public interest. It plays a key role in protecting and improving the natural environment, public health and safety, and amenity, for example by attaching conditions to allow developments which would otherwise not be environmentally acceptable to proceed, and preventing harmful development which cannot be made acceptable even through conditions.”*

26. Paragraph 4.10.4 of EN-1 says:

*“In considering an application for development consent, the IPC should focus on whether the development itself is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves. The IPC should work on the assumption that the relevant pollution control regime and other environmental regulatory regimes, including those on land drainage, water abstraction and biodiversity, will be properly applied and enforced by the relevant regulator. It should act to complement but not seek to duplicate them.”*

27. Paragraph 5.3.1 of EN-1 says:

*“Infrastructure development can have adverse effects on air quality. The construction, operation and decommissioning phases can involve emissions to air which could lead to adverse impacts on health, on protected species and habitats, or on the wider countryside. Impacts on protected species and habitats are covered in Section 5.3. Air emissions include particulate matter (for example dust) up to a diameter of ten microns ( $PM_{10}$ ) as well as gases such as sulphur dioxide, carbon monoxide and nitrogen oxides (NOx).”*

28. Subsequent paragraphs list other impacts of emissions including impacts on biodiversity including adverse impacts on plants and fish.

29. The 2021 draft EN-1, however, recognises the importance of not just protecting the environment but restoring the natural environment:

*“due to the possibility of enhancement of the natural environment and biodiversity net gains, there is also potential for minor positive effects in the medium to long term”*

30. The applicant, in paragraph 6.2.30 of the Environmental Statement [APP-042] quotes National Policy Statement for Renewable Energy Infrastructure (EN-3) (BEIS, 2011):

*“...where a proposed biomass combustion generating station meets the requirements of LCPD and will not exceed the local air Air Quality quality standards, the [SoS] should not regard the proposed biomass infrastructure as having adverse impacts on health.”*

31. However, as considered earlier, paragraph 2.5.13 of EN-3 shows that a deterioration in air quality is an important consideration in the assessment of a proposal. EN-3 also makes it clear that air emissions impacts other than CO<sub>2</sub> are covered by EN-1 and therefore important considerations.
32. There is therefore some tension between paragraph 6.2.30 of EN-3 that is quoted by the applicant and both paragraph 2.5.13 of EN-3 and the statement in EN-1 that requires substantial planning weight to be given where a project would lead to a deterioration in air quality in an area. This tension is, however, lessened by paragraph 6.2.30 of EN-3 which qualifies the last part of the sentence regarding health by its reference to compliance with the LCPD. Directive 2010/75/EU on industrial emissions (IED) replaced the LCPD. The IED's consideration of health impacts is broad and not limited to compliance with thresholds. Article 11 of the IED requires the necessary measures to ensure "no significant pollution". The IED does not define "no significant pollution" but it is reasonable to consider that "no significant pollution" requires "no significant deterioration in air quality". This reduces any potential conflict between these paragraphs and reinforces the significant weight given by EN-1 to whether the proposal may result in a deterioration of local air quality.

## Incorrect Figures?

33. Paragraph 6.5.55 of Chapter 6 of the Environmental Statement [APP-042] says:

*“The operational phase air quality assessment has, where possible, adopted a conservative approach by applying the following assumptions to the atmospheric dispersion modelling study: In the core mode scenarios, the non-BECCS Biomass Units at Drax Power Station are assumed to operate at full load for up to 4,000 hours per annum (i.e., a ‘mid-merit’ operating regime), representing a robust and realistic projection for future baseline operation. The BECCS units are assumed to operate continuously at baseload for all hours of the year. However, further sensitivity model scenarios have been completed, as reported in Appendix 6.3, whereby the non-BECCS units also operate continuously at baseload for all hours of the year. This provides an assessment of the ‘worst case’ emissions profile from the Proposed Scheme;”*

34. Biofuelwatch therefore understands table 1.3 of Appendix 6.4 of the Environmental Statement (revision 02) [AS-014] should show the “proposed scheme” of the non-BECCS Biomass Units operating at 4,000 hours per annum and table 1.15 should show the “worst case” emissions profile with these units operating continuously. However, tables 1.3 and 1.15 appear to have the same values. Biofuelwatch requests the applicant be asked to explain why the predicted environmental levels would be exactly the same under these two scenarios

especially when tables 1.2 and 1.14 show increased impact under the “worst case” scenario.

35. Similarly tables 1.3 and 1.16 (also of Appendix 6.4 [AS-014]) appear identical as do table 1.7 and 1.19.
36. A comparison of aldehyde concentrations between the proposed scenario and the “worst case” scenario shows that the “worst case” scenario is actually predicted to *reduce* aldehyde concentration. This can be seen from the Annual PC (Process Contribution) of the “Receptor Grid Max” lines on table 1.8 and 1.20. Presumably this is because the continuous operation of the additional biomass units creates additional buoyancy of the plume thereby increasing dispersion and reducing air pollution levels. The predicted concentration of nitrosamines is similarly diminished by continuous operation of the non-BECCS units as can be seen from tables 1.10 and 1.22. This is assumed to be correct and the implications are considered further in a later subsection.
37. It is therefore very surprising to find that no similar effect is shown in tables 1.9 and 1.21 for Amine concentrations. These two tables appear identical and this also requires explanation.

## Deterioration of Air Quality

38. In order to inform the considerations that should be given to air quality in the following subsection, it is necessary to determine whether the proposal will result in a deterioration of air quality and its impacts. This short subsection considers the applicant’s information to show that the proposal is indeed expected to result in a deterioration of air quality. The nature and impact of the deterioration is considered later in this representation
39. Appendix 6.4 [AS-014] of the Environmental Statement shows the applicant’s modelling predictions. Biofuelwatch considers the applicant’s predictions are insufficiently robust for the reasons given in a later subsection, but, taking the applicant’s figures as stated shows that Drax already causes a deterioration in air quality. For example, the applicant’s modelling predictions<sup>20</sup> show the 99.79<sup>h</sup> %ile hourly mean NO<sub>2</sub> concentration at Willitoft as 3.41 µg/m<sup>3</sup> which is 21% of the current total maximum hourly mean NO<sub>2</sub> concentration at this location of 15.94 µg/m<sup>3</sup>. According to the applicant’s modelling, Drax already makes a significant contribution to local peak NO<sub>2</sub> air pollution. This contribution rises from 3.41 µg/m<sup>3</sup> to 3.67 µg/m<sup>3</sup> under the “proposed scheme” and would be expected to rise still further under the “worst case” scheme (but for the reasons shown in the previous section, Biofuelwatch consider the “worst case” figures in Appendix 6.4 [AS-014] of the Environment Statement require explanation). Drax makes a significant contribution to local peak NO<sub>2</sub> air pollution and the proposal would increase peak NO<sub>2</sub> air pollution at all the receptor locations studied. The predicted increase from the proposal at Willitoft in short-term NO<sub>2</sub> concentrations is far from a worst-case. The proposal

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<sup>20</sup> Table 1.3 (page 10) of Appendix 6.4 of the Environmental Statement [AS-014].



more than doubles the existing peak short-term contributions to NO<sub>2</sub> at many of the studied locations<sup>21</sup>:

- a. Foreman's Cottage
  - b. East Yorkshire Carav
  - c. Drax S&C Club
  - d. Wren Hall
  - e. 3 Pear Tree Ave
  - f. Crange Cottages
  - g. Drax Abbey Farm
  - h. Read School
  - i. Old Lodge
  - j. Rawcliffe
  - k. Snaith
  - l. Barlow
  - m. Long Drax
  - n. Drax
  - o. Newland
  - p. Carlton
  - q. Camblesforth
  - r. Burn.
40. Table 1.3 appears to show the applicant considers such impacts to be “negligible”. Biofuelwatch disagrees and considers Drax makes a significant degradation of local air quality which will be made worse by the proposal.
41. Further evidence of this worsened air quality is shown by the additional amine and nitrosamine pollution that the proposal will cause. Table 1.10 of Appendix 6.4 [AS-014] shows the applicant considers this impact to be “slight adverse”. Biofuelwatch considers the impact may be much greater than “slight adverse” (this is explained later in this document) but it is sufficient here to note that even a “slight adverse” change is still clearly a prediction of air quality deterioration.

## Important Air Quality Considerations

42. Given this predicted deterioration in air quality, Biofuelwatch considers the important matters for consideration to be:
- a. What is the potential consequence of the deterioration of air quality around the proposed site (so the appropriateness of the land use can be determined)
  - b. To what extent can this deterioration in air quality be mitigated or avoided
  - c. Do the benefits of the proposal outweigh the adverse impacts.

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<sup>21</sup> Table 1.3 of Appendix 6.4 of the Environmental Statement [AS-014].

43. Amines and their degradation products are known to be toxic to human health, capable of increasing the risk of cancer and disrupting endocrine systems.<sup>22 23 24</sup> These air pollutants have no known safe level.

44. The plant also releases other pollutants that have no known safe level such as particulates and NOx. Public Health England states that<sup>25</sup>:

*“Currently, there is no clear evidence of a safe level of exposure below which there is no risk of adverse health effects. Therefore, further reduction of PM or NO<sub>2</sub> concentrations below air quality standards is likely to bring additional health benefits.”*

45. DEFRA states that<sup>26</sup>:

*“There is no safe level for particulate matter (PM<sub>10</sub>, PM<sub>2.5</sub>), while NO<sub>2</sub> is associated with adverse health effects at concentrations at and below the legal limits”*

46. The World Health Organisation (WHO) states that<sup>27</sup>:

*“The health effects of PM<sub>10</sub> and PM<sub>2.5</sub> are well documented. There is no evidence of a safe level of exposure or a threshold below which no adverse health effects occur. Since even at relatively low concentrations the burden of air pollution on health is significant, effective management of air quality aiming to achieve WHO AQG [World Health Organisation Air Quality Guidelines] levels is necessary to reduce health risks to a minimum.”*

47. The 2022 Defra “Air quality PM<sub>2.5</sub> targets Detailed evidence report”<sup>28</sup> says:

*“Existing Air Quality Standards Regulations 2010 set out legally binding standards for a range of pollutants including PM<sub>2.5</sub>, yet despite those standards not being exceeded, ambient PM<sub>2.5</sub> generates a significant burden on the health of the country’s population.”*

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<sup>22</sup> Research Progress of the Endocrine-Disrupting Effects of Disinfection Byproducts, [REDACTED], PubMed, 28 June 2022 (amines, nitramines and nitrosamines listed as disinfectant by-products all with endocrine disrupting data available on them)

<sup>23</sup> Barseghian G, Zak I, Hwang DL, Roitman A, Lev-Ran A. 1986. In vitro effects of ethanolamine on insulin secretion. Life Sci 38(7):645-651. (ethanolamine is another name for monoethanol amine - this study showed effects on insulin secretion)

<sup>24</sup> Toxicological Profile for N-Nitrosodimethylamine (NDMA) Draft for public comment January, 2022 ATSDR (Agency for Toxic Substances and Disease Registry - U.S. Department for Health and Human Services) The profile includes endocrine disruption as an effect of NDMA.

<sup>25</sup> <https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution>

<sup>26</sup> Air Quality: A Briefing for Directors of Public Health (DEFRA, March 2017)

<sup>27</sup> Health effects of particulate matter. Policy implications for countries in eastern Europe, Caucasus and central Asia (World Health Organisation / WHO, 2013)

<sup>28</sup> [https://consult.defra.gov.uk/natural-environment-policy/consultation-on-environmental-targets/supporting\\_documents/Air%20quality%20targets%20%20Detailed%20Evidence%20report.pdf](https://consult.defra.gov.uk/natural-environment-policy/consultation-on-environmental-targets/supporting_documents/Air%20quality%20targets%20%20Detailed%20Evidence%20report.pdf)

48. The “burden” to public health being referred to is the harm to public health caused by PM<sub>2.5</sub>. There is no other “burden” to public health from PM<sub>2.5</sub> other than the harm that PM<sub>2.5</sub> causes.
49. The applicant shows Defra’s estimate of the background pollution levels of PM<sub>2.5</sub> to be as high as 10.6 µg/m<sup>3</sup> in the vicinity of the plant<sup>29</sup>. The WHO Air Quality Guideline level<sup>30</sup> for PM<sub>2.5</sub> is 5 µg/m<sup>3</sup>. Even the lowest Defra estimated level reported by the applicant is in excess of the WHO Air Quality Guideline level. Health is therefore already being harmed by particulate pollution in the vicinity of the facility - pollution that Drax is contributing to.
50. Other pollutants, such as NOx, also generate a significant burden on the health of the country’s population with evidence of harm for other air pollutants at levels below air quality standards. It follows that existing air quality standards are unable to prevent significant pollution from other air pollutants too.
51. Pollution that causes “a significant burden” and harm to public health should be considered to be significant pollution. It is therefore clear that current regulations and air quality standards, as currently implemented, do not prevent harm to health and have not prevented Drax from contributing to that harm over a large area (because of its high stack).
52. The proposal increases air pollutants that are known to harm human health with pollution from Drax including arsenic, copper, nickel, nitrous oxide, chlorine and inorganic chlorine compounds, particulate matter, naphthalene, mercury, benzo(a)pyrene, polychlorinated biphenyls, fluorine and inorganic fluorine compounds, zinc, nitrous oxide and cadmium - all of which were emitted to air above the reporting threshold<sup>31</sup>.
53. Since existing regulation has not prevented the harm to health that is already occurring, there can be no confidence that the regulations would prevent increased harm to public health.
54. Biofuelwatch request the Examining Authority to give consideration to the government-recognised Air Quality Health Emergency<sup>32</sup>.
55. Before the potential impact of the deterioration on air quality can be considered in more detail (point a above), it is necessary to give consideration to the adequacy of the data provided and the uncertainties that exist regarding the predicted pollution levels. The uncertainties need to be known to determine the level of confidence that can be ascribed to the applicant’s predictions. This is necessary in order to

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<sup>29</sup> Table 6.10 in paragraph 6.7.8 of the chapter 6 of the applicant’s Environmental Statement [APP-042].

<sup>30</sup> World Health Organization. (2021). WHO global air quality guidelines: particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. World Health Organization. Licence: CC BY-NC-SA 3.0 IGO, accessed 22 February 2023: [REDACTED]

<sup>31</sup> Table 6.1 of Appendix 11.1 Phase 1 Preliminary Risk Assessment (Part 1 of 2) [APP-156].

<sup>32</sup> <https://www.gov.uk/government/speeches/air-pollution-is-a-health-emergency>

determine the level of risk in order for an assessment to be made of the appropriateness of the proposal in land-use terms.

56. The potential for mitigation (point b above) is considered later in this section, and a consideration of the benefits of the proposal against the risk of adverse impacts (point c) is at the end of the document.

## Limited Modelled Area

57. As noted by AQ.1.4 of ExQ1 [PD-011], figure 6.8 [APP-075] of the Environmental Statement shows a large area exposed to nitrosamine. It is possible that the location with the largest nitrosamine concentrations may not even be on figure 6.8 [APP-075]. Biofuelwatch therefore considers that the study area must be expanded to show the full area exposed to elevated nitrosamine concentrations.
58. Biofuelwatch also requests that figures be provided to show the sensitivity analysis results for nitrosamine and the cumulative nitrosamine concentrations.

## Cumulative Impacts

59. The combustion of wood can create nitrosamines<sup>33</sup>. Biofuelwatch has found no record of the plant's current nitrosamines emissions. Biofuelwatch requests measurements of any current nitrosamine and nitramine emissions arising from the combustion of wood and requests that these emissions are considered in the assessment of the impact of the proposal.
60. Biofuelwatch understands that the levels of current emissions may be below the sensitivity of existing monitors. If more sensitive monitors cannot be used, Biofuelwatch asks that, as a precautionary approach, the modelling assumes that emissions are already at the maximum level that may go undetected with existing monitoring equipment.
61. There appears to have been no assessment of cumulative short-term air quality impacts (paragraph 6.5.29 [APP-042]) because of what the applicant considers to be "the extremely low likelihood of peak operating conditions coinciding across all different emissions sources at any given time". Even if two or three emissions sources combine, there can be a significant impact on short-term air quality. Biofuelwatch considers such an assessment should be made of cumulative short-term air quality impacts.
62. The cumulative impacts considered in tables 1.11 to 1.13 of Appendix 6.4 (version 02) [AS-014] do not include cumulative impacts on nitrosamines and nitramines. The applicant has said<sup>34</sup>:

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<sup>33</sup> Jennica Kjallstrand, Methoxyphenols in smoke from biomass burning, 2000, accessed 22 February 2023; j [REDACTED]

<sup>34</sup> Paragraph 6.5.31 of Chapter 6 of the Environmental Statement [APP-042].

*“... for the purposes of providing a qualitative judgement on potential cumulative impacts, a conservative approach was taken whereby the maximum predicted amine (MEA) and nitrosamine (NDMA) concentrations from both the Proposed Scheme and Keadby 3 assessments were summed and compared to the respective EALs.”*

63. Biofuelwatch does not consider a “qualitative judgement adequate” nor does Biofuelwatch consider the applicant’s approach necessarily “conservative”. Annual average environmental concentrations from just Keadby 3 are predicted to be up to 54% of the EAL<sup>35</sup>, with 47% of the EAL at one of the studied sensitive receptors<sup>36</sup>. Uncertainties make these figures even higher with the Keadby 3 applicant showing exceedances of the EAL by a factor of 5 in some scenarios<sup>37</sup>.
64. The applicant’s revised wording for paragraph 6.12.12 [AS-019] says:
- “However, given the conservatism applicable to the above values, including the worst case assumption that maximum concentrations from both schemes would occur at the same location and time anywhere within the operational phase study area, and that values from both schemes represent the sum of nitramine and nitrosamine concentrations (see paragraph 6.5.54), the cumulative impact on amines and nitrosamines is considered to be not significant.”*
65. The applicant has provided insufficient evidence that what the applicant considers to be “conservative” assumptions are sufficient to outweigh the non-conservative assumption implicit in the applicant’s approach that the increased air pollutants (such as NOx and ozone) from multiple sources will not increase the reaction rate of nitrosamine production. The applicant has not shown that the resulting environment levels cannot exceed the sum of the predicted nitrosamine levels modelled from each independent pollution source.
66. Biofuelwatch considers that predictions should be made of the cumulative harmful amine breakdown products (such as nitrosamines) to account for:

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<sup>35</sup> Table 6 of Document Ref. 6.3, Environmental Statement - Volume II, Appendix 8C: Air Quality Assessment of Amine Degradation Products for Keadby 3:  
<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010114/EN010114-000282-K3%20-%20Document%206.3.7%20-%20ES%20Appendix%208C%20Air%20Quality%20Assessment%20of%20Amine%20Degradation%20Products.pdf>

<sup>36</sup> Paragraph 5.2.4 of Environmental Statement - Volume II, Appendix 8C: Air Quality Assessment of Amine Degradation Products for Keadby 3:  
<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010114/EN010114-000282-K3%20-%20Document%206.3.7%20-%20ES%20Appendix%208C%20Air%20Quality%20Assessment%20of%20Amine%20Degradation%20Products.pdf>

<sup>37</sup> Table A1 of Document Ref. 6.3 Environmental Statement - Volume II, Appendix 8C: Air Quality Assessment of Amine, Degradation Products for Keadby 3:  
<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010114/EN010114-000282-K3%20-%20Document%206.3.7%20-%20ES%20Appendix%208C%20Air%20Quality%20Assessment%20of%20Amine%20Degradation%20Products.pdf>

- a. Emissions of amines (and derivatives) from any other consented plants with carbon capture (over a large area because such emissions clearly travel long distances - see below)
  - b. Emissions of air pollutants from other plants that may affect the breakdown of amines such as NOx
  - c. Emissions of nitrosamines from woody-biomass combustion at the plant
  - d. Emissions of nitrosamines from domestic wood combustion
  - e. Any naturally occurring amine and nitrosamines
  - f. Amine breakdown chemistry (and uncertainties of that chemistry). Elevated air pollutants from one source may interact with elevated air pollutants from another source potentially resulting in concentrations of amine breakdown products that exceed the concentrations of each plant calculated separately and added together
  - g. A sufficiently large study area to show all potential impacts (with consideration given to more sensitive receptors if they may be adversely affected by cumulative impacts)
67. Aldehydes are an amine breakdown product<sup>38</sup> so Biofuelwatch considers they should be assessed as above. It is unclear whether the applicant's model considers the atmospheric formation of aldehydes or just aldehyde emissions from the stack. The applicant's Air Quality Technical Note 1 [AS-019] suggests it is just the stack emissions that are being modelled. This may very significantly underestimate actual environmental aldehyde concentrations. Biofuelwatch requests that the Examining Authority asks the applicant whether the predictions of aldehyde concentrations include atmospheric formation of aldehydes and, if not, why they are confident that any atmospheric formation of aldehydes will be much less than the aldehydes emitted from the stack.
68. The applicant for the current proposal has made predictions showing elevated nitrosamines over a very considerable area extending beyond the area modelled.<sup>39</sup> Impacts over considerable distances are consistent with the findings of the Norwegian Institute for Air Research and the Norwegian Institute for Water Research in collaboration with the Norwegian Institute of Health and others (Karl 2009, considered by the applicant to be appropriate authority for the setting of deposition velocities for amines, MEA and NDMA). The report found maximum hourly nitrosamines concentrations decline only slightly at distances of 10 km (the maximum distance the report considered).<sup>40</sup>

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<sup>38</sup> Review of amine emissions from carbon capture systems, version 2.01, SEPA, August 2015

<sup>39</sup> Figure 6.8 of the Environmental Statement [APP-075].

<sup>40</sup> Section 7.2 of "Amines Worst Case Studies: Worst Case Studies on Amine Emissions from CO<sub>2</sub> Capture Plants (Task 6)", 2009, Matthias Karl, Steve Brooks, Richard Wright and Svein Knudsen, Norwegian Institute for Air research (NILU) and Norwegian Institute for Water

69. The applicant's ecology report also considered that the modelled air quality impacts are predicted to lead to impacts that are long-term and "significant at up to an international geographical scale"<sup>41</sup>.
70. More recent research in 2022 by Imperial College and the Norwegian Institute for Public Health<sup>42</sup>. The report says:

*"The safety distance of exposure to the atmosphere for a 1 Mt CO<sub>2</sub> per year PCC plant has been estimated to be less than 5,700 m for the direction with low wind velocity (Chen et al., 2018). However, building another PCC plant within a distance of 100 – 200 Km downwind of an existing PCC plant will cause interferences, and amine emissions released from the neighbouring PCC plant will add to the already chemically produced N-nitrosamines and N-nitramines and so will be continuously accumulated in the surrounding environment and endanger human health."*

71. The proposed plant is ~9 Mt CO<sub>2</sub> per year, so much larger than considered by the research quoted above yet sensitive receptors are much less than 5,700 m away. The Keadby 3 plant is only ~22 km from the proposed plant so much less than the 100 - 200 km distances of concern considered.

72. The research also says:

*"... the biodegradation rate of N-nitramines is very low, as they are considered more stable compounds in the atmosphere, and generally have a lifetime of more than 2 days. It can be expected that nitramines are transported over and deposited at longer distances from the plant"*

73. It can be expected that modelling of cumulative impacts will show overlap of the high environmental levels of nitrosamines predicted from Keadby 3 and those from the proposal. With such high predicted levels from already consented development, and with amine degradation pollutants impacting such a large area, and with such considerable uncertainties, the risks of a second plant in the area appear too great.
74. However, should the Examining Authority consider that all the numerous uncertainties and risks can be reduced or are acceptable, Biofuelwatch requests that the Examining Authority gives consideration to the very limited number of such plants that the area will be able to support if pollution is not to exceed safe levels. This very limited capacity for the local area to support carbon capture plants should be seen as a valuable resource, especially with the proposed pipeline in the area and the considerable pipeline extension costs that would be incurred if plants were to be located further away. Efficient use of limited resources is an important planning consideration<sup>43</sup> so Biofuelwatch requests consideration<sup>43</sup> be given as to whether this

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Research (NIVA), reference: NILU OR 78/2008

<sup>41</sup> Paragraph 8.9.103 of Chapter 8 of the Environmental Statement [APP-044].

<sup>42</sup> Section 5.2.1 of "Human Health hazard assessment strategy for amine emissions around PCC facilities", Maria Lathouri, Anna Korre, Maria Dusinska, Sevket Durucan, 2022.

<sup>43</sup> The importance of efficient use of resources is considered in EN-1 and EN-3.

proposal, with its many other negative impacts and risks, is the best way to use the limited ability of the area to support carbon capture plants. As part of its consideration, Biofuelwatch requests the Examining Authority gives consideration to the proven and economic alternative ways to generate electricity without the environmental and climate impacts of woody biomass, and the presence of other industries in the area for which there may be no obvious alternative to carbon capture (except carbon offsetting).

## Modelling Prediction Uncertainties

75. The applicant's assessment of air quality impacts (excluding Greenhouse Gas emissions) are based on modelling predictions developed using the ADMS modelling software system<sup>44</sup>. The applicant's assessment of both health impacts and ecological impacts relies on these modelling predictions.
76. The predictions made using the software models are approximations and subject to inaccuracy. The inaccuracy arises for a number of reasons:
  - a. the equations describing air dispersion are only an approximation of the complex atmospheric physics and chemistry;
  - b. the modelled environment is only an approximation to the actual environment; the modelled emissions only an approximation to the actual emissions;
  - c. the modelled weather conditions only an approximation of what the actual weather conditions will be; and so on.
77. An assessment of whether the operator's assessment of the risk is sufficiently robust to inform the assessment requires:
  - a. an assessment of the assumptions that have been used to make the predictions; and
  - b. an assessment of the cumulative impact that all the potentially inaccurate assumptions may have on the predicted results.
78. Some of the input parameters to the modelling represent information that is known. For example, in the air dispersion model, the grid reference location of the source of the emissions is known. For this there is no uncertainty. However, many of the other assumptions are simply impossible to know or subject to scientific or measurement uncertainty. For example, weather conditions have a very significant impact on air dispersions but it is impossible to know what the future weather will be over the lifetime of the facility. It is therefore necessary to make assumptions about the future weather conditions. Typically, this is done by assuming future weather patterns will be similar to previous weather patterns. Where there is uncertainty regarding a particular assumption, sensitivity analysis can be carried out. Such analysis makes various

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<sup>44</sup> Paragraph 6.5.11 of the Environmental Statement [APP-042].



predictions using different assumptions to determine the degree that the model predictions are affected by the uncertain assumption.

79. As identified earlier, uncertainties exist from the nature of the modelling itself as well as the uncertainties in the inputs. Uncertainty is cumulative. The larger the number of uncertain inputs/processes there are, the larger the cumulative uncertainty.
80. Scientific uncertainty is typically specified by providing lower and upper bounds of a value together with a percentage, e.g. 95%. The meaning is that there is an estimated 95% probability that the value will be between the lower and upper bounds. Without such an assessment, there may be insufficient information to apply the predictions.
81. As an example, it may be known that it is necessary to keep the concentration of a particular pollutant below a certain value for environmental reasons. Let us say that the threshold is 100. If the predicted value of the pollutant is 80, an assessment based purely on the predicted value is likely to say it is less than the threshold so acceptable. However, if the 95% uncertainty bounds of the pollutant show the lower and upper bounds to be 50 and 200, the predicted level of 80 is not sufficient to ensure the limit will not be exceeded because the level could be as high as 200. In this example, an assessment based purely on the predicted level of 80 should not be considered sufficiently robust to make the assessment. However, if the limit for environmental reasons was 1000, a 95% confidence that the uncertainty of the pollutant level would be between 50 and 200 would probably be considered sufficient. The level of uncertainty hasn't changed, but the assessment of robustness of risk has. This shows the importance of estimating cumulative uncertainty and its impact on the robustness of the assessment.
82. The following sections consider important contributing uncertainties. Some of these uncertainties arise from the nature of software modelling of complex systems. Some arise from the assumptions made. It should not be assumed that the following paragraphs consider all unjustified assumptions and unquantified risks. There has been insufficient time to go through all of the applicant's assumptions.
83. The operator has carried out a sensitivity analysis of two aspects:
  - a. That the biomass plants may operate "assuming that all four biomass units in the Baseline scenario and non-CCS Units 3 & 4 in the 'With Proposed Scheme' scenario would be operating at full load for all hours of the year (8,760 hours)"<sup>45</sup>
  - b. Some limited sensitivity testing regarding important reaction coefficients regarding amines<sup>46</sup>
84. Such an assessment of uncertainties is very limited. This document has already shown that the applicant predicts aldehyde and nitrosamine concentrations from the

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<sup>45</sup> Paragraph 6.5.16 of the Environmental Statement [APP-042].

<sup>46</sup> Paragraph 6.5.22 of the Environmental Statement [APP-042].

BECCS units would *decrease* when the non-BECCS units operate continuously. This strongly suggests that aldehyde and nitrosamine concentrations will *increase* if the non-BECCS units were not to operate at all, yet no modelling predictions appear to have been carried out of a scenario where only the BECCS units are operational.

**For this one source of uncertainty alone, nitrosamine concentrations may be significantly higher than predicted**, but there are many other sources of uncertainties as the following sections show.

## ADMLC Guidance and Air Dispersion Modelling System Uncertainties

85. As explained earlier, the models created using computer modelling software tools only provide estimated predictions that are subject to uncertainty. Such uncertainties are an important planning consideration.
86. There is a lack of independent validation from which to reliably and accurately estimate the uncertainty arising from these modelling tools. The validation done by the developers uses scenarios known to the developers when the modelling tools were created, so it is not surprising that the tools have been created to perform well for the validation scenarios. It can be expected that errors in other situations will exceed those used for validation.
87. It is unclear which version(s) of ADMS the applicant has used because references are made to both version 5.2<sup>47</sup> and version 5.2.4<sup>48</sup>.
88. Appendix F of the ADMS 5.2 User Guide<sup>49</sup> states:

*“ADMS 5 has been validated against a number of data sets in order to assess various configurations of the model such as flat or complex terrain, line/area/volume sources, buildings, dry deposition and visible plumes. The model results have been compared to observational data or other model results if available. Document or presentations containing results of ADMS 5 validation can be found on the CERC website [cerc.co.uk](http://cerc.co.uk)”*

89. The above refers to ADMS 5 and not ADMS 5.2 nor ADMS 5.2.4. The model validation page on the ADMS developer’s website<sup>50</sup> lists a number of 2016 validation studies for ADMS 5:

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<sup>47</sup> Paragraph 6.5.10 of Chapter 6 of the Environmental Statement [APP-042].

<sup>48</sup> Paragraph 1.2.19 of Appendix 6.3 of the Environmental Statement [APP-127].

<sup>49</sup> Available from the Cambridge Environmental Research Consultants (CERC) website (downloaded 22 Feb 2022):

[REDACTED]

<sup>50</sup> Available from the Cambridge Environmental Research Consultants (CERC) website (image copied 22 Feb 2022):

[REDACTED]

## ADMS 5

### General model validation

- Buildings
  - CERC, 2016: *AGA experiment*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *Alaska North Slope tracer study*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *Bowline point site*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *EQCR study*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *Lee power plant wind tunnel study*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *Millstone nuclear power plant*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *Robins and Castro wind tunnel experiments*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *Snyder wind tunnel experiments*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *Warehouse fires wind tunnel experiments*. [📄 \(.pdf, <1MB\)](#)
- Buildings & complex terrain
  - CERC, 2016: *Baldwin power plant*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *Martins Creek steam electric station*. [📄 \(.pdf, <1MB\)](#)
- Complex terrain
  - CERC, 2016: *Clifty Creek power plant*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *Hogback Ridge tracer experiments*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *Lovett power plant*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *Tracy power plant*. [📄 \(.pdf, 1MB\)](#)
  - CERC, 2016: *Westvaco corporation*. [📄 \(.pdf, <1MB\)](#)
- Flat terrain
  - CERC, 2016: *Kincaid, Indianapolis and Prairie Grass experiments*. [📄 \(.pdf, <1MB\)](#)
- Flowfield
  - CERC, 2016: *ADMS 5.2 Complex Terrain Flowfield Validation: Askervein Hill*. [📄 \(.pdf, <1MB\)](#)
  - CERC, 2016: *ADMS 5.2 Complex Terrain Flowfield Validation: Blashaval*. [📄 \(.pdf, <1MB\)](#)
- NO<sub>x</sub> chemistry
  - Smith, S. et al., 2017: *Model inter-comparison and validation of ADMS plume chemistry schemes*. [📄 Article online](#)

90. The page only refers to ADMS 5 and so there is a lack of information to show whether ADMS 5.2 and ADMS 5.2.4 have been validated and, if they have, what the results were. ADMS 5.2.4 was released in November 2018<sup>51</sup> so it appears unlikely.

91. The Atmospheric Dispersion Modelling Liaison Committee, whose members include Defra, the EA, the FSA and PHE<sup>52</sup> published “Guidelines for the Preparation of Short Range Dispersion Modelling Assessments for Compliance with Regulatory Requirements”<sup>53</sup>. This document has subsequently been updated most recently in 2021. This guidance is referred to later in this document as ADMLC 2021. Section 1 of ADMLC 2021 describes the document’s purpose which includes air quality

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<sup>51</sup> The current software versions and their release dates are available from the Cambridge Environmental Research Consultants (CERC) website. The current software version for ADMS 5 is listed as ADMS 5.2.4 and the release date as “November 2018” (webpage downloaded 22 Feb 2022):

<sup>52</sup> Membership of the committee is shown on the “about” page of the ADMLC website:

<sup>53</sup> ADMLC, Guidelines for the Preparation of Short Range Dispersion Modelling Assessments for Compliance with Regulatory Requirements – An Update to the ADMLC 2004 Guidance, accessed 22 February 2023 on ADMLC website:

assessments undertaken for the purposes of an environmental impact assessment as part of a planning application:

*“This guidance primarily relates to air quality assessments undertaken for the purposes of an environmental impact assessment, for example as part of a planning application or, for the purposes of securing a permit in accordance with environmental permitting regulations, or for local air quality management purposes.”*

92. Section 5.6 of the ADMLC 2021 guidelines say:

*“The extent to which the software developer’s quality assurance may be applicable should be discussed in the report.”*

93. The applicant’s Air Quality Assessment<sup>54</sup> says:

*“The assessment of point source emissions from the Proposed Scheme is based on a dispersion modelling exercise undertaken using the ADMS model (v5.2) published by Cambridge Environmental Research Consultants (CERC). The model has been validated against both field studies and wind tunnel studies of dispersion and is widely used for air quality impact assessment in the UK.”*

94. It is difficult to see how such a limited one sentence consideration of validation can be considered to be in accordance with the ADMLC guidelines.

95. It is not disputed that the modelling software system is widely used for air quality impact assessment in the UK, but it is still important to assess the implications of the validation scenarios being known to the developer and therefore the extent to which the validation scenarios provide an accurate understanding of the particular situation.

96. It is also important to differentiate between the modelling software system (ADMS) and any model created using this modelling software system. The applicant has created a model using ADMS to consider the predicted air pollution concentrations arising from the proposal. Such a model has all the uncertainties of the modelling software system *and* uncertainties arising from the approximations and assumptions made by the applicant in the model made with the modelling software system. It is therefore Biofuelwatch’s view that the applicant is incorrect to say that the model has been validated against field studies and wind tunnel studies of dispersion. The modelling software system had been validated by the software developer but the applicant’s model has had no such independent validation. There has also been little or no truly independent validation of the modelling software system.

97. Biofuelwatch does not question the appropriateness of the software used by the applicant for pollutants such as NO<sub>x</sub>, SO<sub>2</sub> and particulates, but does question the appropriateness of the software for the modelling of nitrosamines (considered later).

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<sup>54</sup> Paragraph 6.5.11 of chapter 6 of the Environmental Statement [APP-042].

Biofuelwatch also considers the applicant's assessment of uncertainty arising from the software for pollutants such as NO<sub>x</sub>, SO<sub>2</sub> and particulates to be inadequate and that such uncertainties may be considerable. This is not a criticism of the software nor the software developers nor the decision to use the software for predicting environmental levels of NO<sub>x</sub>, SO<sub>2</sub> etc. It is purely recognising the limitations of dispersion modelling techniques and dispersion modelling software which is developed against a limited set of test scenarios.

98. The validation scenarios which are known and used by the developer to test their software should not be seen as a good measure of how the software will perform in other situations. Unfortunately, there is very little to no truly independent validation of these tools using scenarios and data unknown to the developer. The validation scenarios should therefore be considered to provide an estimate of the *best* accuracy that it is possible to obtain with these tools rather than an estimate of the *typical* accuracy. They should not be considered to be *worst-case* or *precautionary*. The applicant, however, has not provided an estimate of uncertainty even from a consideration of the validation scenarios used by the developer of the modelling software system.
99. As an example of how significant modelling uncertainties can be, peer-reviewed research by M. Theobald et al<sup>55</sup> has shown that the two most widely used software modelling software systems, ADMS and AERMOD, can produce dramatically different results even when the same inputs are used. These two systems produced peak hourly average concentrations differing by greater than a factor of 18. This shows that the predictions can be subject to considerable uncertainty just from the software systems themselves. Even if these widely-used tools were to show similar results, that does not necessarily mean that there is no uncertainty because the two tools may both be similarly inaccurate (not least because they are both tested against the same limited set of validation scenarios). The primary cause of the differences considered by M. Theobald et al's paper considered the impact of calm conditions. The paper says:

*"... the default versions of the models cannot simulate 'calm' periods when the wind speed in the meteorological data record is zero and so these periods are removed from the model calculations. These are periods when the actual wind speed is less than the anemometer stalling speed but not necessarily zero. This is problematic because high concentrations may occur during these periods as a result of low dispersion rates."*

100. No consideration appears to have been given by the applicant of the impact of calm conditions on the modelling predictions. Without a detailed assessment of calm conditions, it is possible that the results may be subject to errors of a similar magnitude as those found by M. Theobald et al.

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<sup>55</sup> Mark R. Theobald, Alberto Sanz-Cobena, Antonio Vallejo and Mark A. Sutton. 2015 "Suitability and uncertainty of two models for the simulation of ammonia dispersion from a pig farm located in an area with frequent calm conditions"

101. ADMLC says an extended section on modelling input data, possibly with many sub-sections should be provided and lists many matters that should be provided. ADMLC guidance says the model will be sensitive to mass emission rates, efflux velocity, efflux temperature, terrain, buildings - but it is unclear whether these uncertainties have been considered and how they may affect the results. There are also important modelling parameters used by ADMS such as “surface roughness”, modelling grid size and others which can impact the results. To consider just one such parameter, “surface roughness”, the applicant has selected a “surface roughness” value of 0.2<sup>56</sup> that corresponds to a minimum surface roughness for agricultural use<sup>57</sup>. Agricultural land can, however, have a higher surface roughness<sup>58</sup>. The immediate vicinity of the emissions is also far from purely agricultural. The site itself is a large and complex industrial site and the surrounding area has trees and other buildings. Biofuelwatch has not found an assessment of the uncertainties arising from the applicant’s selection of “surface roughness” in the applicant’s Environment Statement.

102. Uncertainties of cumulative impacts are further increased by the lack of building modelling in relation to the Kirk Sandall EfW plant apparently because of “the maximum number of buildings allowed in ADMS v5.2.4 being reached”<sup>59</sup> but there has been no quantification of the impact this may have on the predictions. Building downwash effects can impact air dispersion modelling results very significantly but no assessment appears to have been made of the potential impact on the cumulative uncertainty arising from this modelling software system limitation and other uncertainties.

103. The applicant’s assessment is not to the standard required by the EA which says:<sup>60</sup>

*“You must show that you have estimated the level of uncertainty in your predictions.”*

104. Whilst that is an EA requirement and not a planning requirement, an estimate of the uncertainty of prediction should be considered essential for any application of predictions for the assessment of health or ecological risk.

105. With regard to uncertainty, section 4.6 of the ADMLC 2021 Guidelines says:

*“Failure to address the issues discussed here may result in a loss of credibility in the use of dispersion modelling as an aid in decision-making where, for example, unresolved differences consume a disproportionate*

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<sup>56</sup> Paragraph 1.2.13 of Appendix 6.3 of the Environmental Statement [APP-127].

<sup>57</sup> Section 3.3.1 of the ADMS User Guide, accessed 22 February 2023:

<sup>58</sup> Section 3.3.1 of the ADMS User Guide shows a surface of 0.3 may be appropriate for agricultural areas.

<sup>59</sup> Paragraph 1.2.19 of Appendix 6.3 of the Environmental Statement [APP-127].

<sup>60</sup> <https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports/#estimate-model-uncertainty>

*amount of time in a public inquiry. Modellers and model users have a responsibility to ensure that these issues are addressed so that they do not become sources of confusion in the decision-making process. Where this happens, the result is often that the assessment as a whole is discredited, and the potential usefulness of the information lost."*

106. Biofuelwatch considers that the applicant's Air Quality Assessment has not been carried out in accordance with ADMLC 2021 Guidelines particularly regarding the consideration of uncertainties and the lack of evidence of source parameters. According to ADMLC 2021 Guidelines, the result is often a discrediting of the assessment. Until the applicant provides estimates of the uncertainties in their assessment, Biofuelwatch considers the assessment is not credible.

## Technology Uncertainties

107. It is appreciated that the Environment Agency has a duty to ensure Best Available Techniques are applied. Some BAT aspects do, however, also have important planning implications not least because they will affect emissions, the extent of air quality impacts and so also the potential risk to health and the environment (assuming, of course, Environment Control regulation).

108. Paragraph 6.5.20 of the EIA [APP-042] says:

*"Given that there will be multiple flues within the Main Stack (i.e. one flue per two biomass units) in both the Baseline and With Proposed Scheme scenarios, emissions from these flues will in effect act as a single plume with combined source characteristics."*

109. This assumes that complete mixing of the gases from these two plumes will occur. Evidence should be provided to support this assumption. If there is a possibility that the two plumes will not be completely mixed at their release from the top of the stack, this could significantly affect the predicted environmental concentrations. Biofuelwatch requests that the applicant explain why it considers complete mixing of the multiple flues will occur.
110. Concerns have been raised by another interested party about the measures in place to mitigate sulphur given the flue gas desulphurisation plant is being demolished. Biofuelwatch understands it is the applicant's position that flue gas desulphurisation (FGD) is not required due to lower sulphur content. The flue gases arising from woody biomass CCS are different to those of fossil fuel CCS. The flue gas emissions are expected to be at a greater level than with desulphurised fossil emissions, which will lead to different, and potentially significantly increased, degradation products within the carbon capture system.

111. Biofuelwatch note that research carried out by the University of Sheffield and funded by the Engineering and Physical Sciences Research Council and the UK CCS Research Centre<sup>61</sup> says:

*Biomass retrofits and new-build also face additional challenges because of the impurities in the flue gas. While these will be at acceptable levels for emission to atmosphere, they may cause unacceptable consequences in the PCC unit, i.e. from particulates, SOx and NOx.*

112. In report says Flue Gas Desulphurisation (FGD) “is obviously an option, prior to the PCC plant, if fuel compositions and PCC system sensitivities merit it.” An earlier version of the report mentioned the possibility of reinstatement, for coal-to-biomass conversions, of a Flue Gas Desulphurisation (FGD) to remove SOx as well as other alternatives.
113. The applicant considered it necessary to apply SO<sub>2</sub> reductions to predictions to mitigate impacts at sensitive habitats<sup>62</sup> but it is unclear how these reductions will be delivered or whether they will be sufficient to mitigate all potential impacts of the SO<sub>2</sub> emissions.
114. Biofuelwatch are concerned that Drax are removing FGD when SOx removal may be necessary to prevent “unacceptable consequences”. These “unacceptable consequences” may include higher levels of toxic nitrosamines.
115. As a result of the technology uncertainties, and the increased sulphur and particles, there are also very significant uncertainties regarding the emissions of the plant especially with regard to nitrosamines (considered further later in this document). As a result, the modelling predictions may significantly underestimate environmental levels.

## Measurement Uncertainties

116. Measurement uncertainties may result in actual emissions significantly exceeding those modelled. Dr Mark Broomfield of Ricardo-AEA Ltd said on behalf of Carlisle City Council in relation to permit application for a permit application for a different regulated facility (permit application EPR/SP3609BX/A001)<sup>63</sup> :

*“Because of measurement uncertainties, emissions could under some circumstances be close to double the emission limits without triggering regulatory intervention. The potential impacts of this should be assessed. The air quality study has been carried out on the basis that emissions will comply*

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<sup>61</sup> 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 and for Post-Combustion Capture Using Amine-Based and Hot Potassium Carbonate Technologies, on EfW Plants as Emerging Technologies under the IED for the UK, Ver.2.0, December 2022 Jon Gibbins and Mathieu Lucquiaud, University of Sheffield.

<sup>62</sup> Paragraph 1.2.10 of appendix 6.3 of the Environmental Statement [APP-127].

<sup>63</sup> Submission to the Environment Agency (ED11464135 | Issue number 1 | 27 October 2020)



*with the limits set out in the Waste Incineration BAT Reference document. It is anticipated that emissions limits will be set on this basis. However, emissions measurements have an associated uncertainty which can be up to 30%. In order to accommodate this, the Environment Agency does not take regulatory action unless measured emissions exceed the emissions limit by more than the uncertainty. For a measurement with an uncertainty of  $\pm 30\%$ , this would mean that no action would be taken unless the measured emission was 130% or more of the limit. However, it is equally possible that the measurement system could be under-reading by up to the uncertainty range (in this example, 30%). As a result, a measurement of 130% of the limit could represent an emission concentration of up to 169% of the limit value. This could occur with no regulatory action taken by the Environment Agency."*

117. Biofuelwatch understands this to be normal EA practice and also understands that the EA does not require modelling of emissions at emissions levels that account for this measurement uncertainty. Whilst the above text was written in relation to a municipal waste incinerator, the measurement/modelling issue also applies to large plants that burn biomass.
118. Biofuelwatch considers modelling based on levels that may be exceeded without regulatory intervention to be inadequate for the protection of human health and the environment. For planning purposes, and to reduce risks of the predictions underestimating environment levels, Biofuelwatch requests that the modelling be amended so that any exceedance of the level used for the modelling predictions would definitely invoke regulatory intervention. (This measure would address this measurement uncertainty issue, but not other uncertainties, of course.)

## Assumed Emissions Rates and Parameters

119. For the scenario with the proposed scheme, the amine 1 and amine 2 emissions concentrations are stated as  $0.5 \text{ mg/Nm}^3$  and  $0.3 \text{ mg/Nm}^3$  respectively with a normalised flow rate of  $444.5 \text{ Nm}^3/\text{s}$ .<sup>64</sup> Summing these two amines and multiplying by the flow rate, gives an emissions rate of amines of  $0.36 \text{ g/s}$ . For Keadby 3 the amines emissions rate is stated to be  $5.9 \text{ g/s}$ .<sup>65</sup> Keadby 3 has 910 megawatts electrical output which is less than the combined electrical output of units 1 and 2 of Drax so it is difficult to understand why capturing more carbon dioxide will result in just 6% of the amine emissions.
120. Even the total of the amine sensitivity analysis modelling figures<sup>66</sup> used by the applicant is far less than the emissions rate assumed for Keadby 3.

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<sup>64</sup> Table 1.1 of Appendix 6.3 of the Environmental Statement [APP-127].

<sup>65</sup> Table 3 of "Environmental Statement Volume II - Appendix 8B: Air Quality - Operational Phase" for Keadby 3, <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010114/EN010114-000281-K3%20-%20Document%206.3.6%20-%20ES%20Appendix%208B%20Air%20Quality%20Operational%20Phase.pdf>

<sup>66</sup> Shown in table 1.8 of Appendix 6.3 of the Environmental Statement [APP-127].

121. The applicant says concerning these amine emission figures<sup>67</sup>:

*“Representative of proposed yearly average ELVs (values in parentheses represent proposed daily average ELVs for ‘Amine 1’ and ‘Amine 2’). The proposed ELVs exceed the reasonable worst-case design emissions concentrations provided by the technology supplier (MHI).”*

122. Biofuelwatch requests that the Examining Authority asks the Environment Agency to:

- a. confirm that it will regulate emissions to ensure that amine emissions rates will be no worse than assumed by the applicant in the application (including after taking measurement uncertainties into account - see previous subsection)
- b. Confirm that it will regulate the emissions temperature to ensure that the temperature will be no less than modelled by the applicant (because the temperature will impact buoyancy and dispersion)
- c. Confirm that it will regulate flow velocity to ensure that the velocity can be no less than modelled by the applicant (because the velocity will impact dispersion)

123. If the Environment Agency is unable to provide such reassurances, the Examining Authority has no assurance that the applicant’s modelling predictions will be representative of actual environmental concentrations. If there can be no confidence that environmental concentrations will be no worse than predicted, there is insufficient information on which to assess the proposal, insufficient information to determine whether the proposal is appropriate at the location, and insufficient information to determine what conditions may be necessary to control the development.

## Amine and Nitrosamine Environment Assessment Levels

124. The Environment Agency set Environmental Assessment Levels (EALs) for Mono-ethanolamine (MEA) and Nitrosodimethylamine (NDMA) following a consultation in 2020.

125. There was very little information available on which to base the EAL. There is a paucity of research on the health impacts of amines and their degradation products when released into the environment. Furthermore, given their limited use and monitoring there is a total lack of epidemiological data. Absence of evidence is not evidence of absence so there is a significant risk that long-term adverse health impacts may occur at levels below the EAL.

126. As part of the consultation that determined these EALs, the EA also consulted on a revision to the Excess Life-time Cancer Risk (ELCR) used to derive the EALs<sup>68</sup> to

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<sup>67</sup> Footnote 4 of Table 1.1 of Appendix 6.3 of the Environmental Statement [APP-127].

<sup>68</sup> Environment Agency, Consultation on new Environmental Assessment Levels used in air emissions risk assessments, closed 2 February 2021, accessed 22 February 2022:

allow a ten fold increase in ELCR<sup>69</sup>. The EA has said this change was “more appropriate for the chemicals being considered”<sup>70</sup>. Despite receiving mixed consultation representations, including some concerns that the ELCR should not be relaxed<sup>71</sup>, the EA revised the ELCR increasing it by a factor of ten.

127. These new EALs for MEA and NDMA were therefore set based on very little health evidence and using a criterion that had just been relaxed by a factor of ten. This is an important consideration because the applicant has assessed the nitrosamine impacts of the proposal against this new EAL.

128. Research in 2022 by Imperial College and the Norwegian Institute for Health said<sup>72</sup>:

*“Special attention should be given to sensitive populations. Infants and children can be more susceptible than adults to the mutagenic effects of the nitrosamines, as they have a higher uptake from both oral and airway exposure per kg body weight due to a higher metabolic rate per body unit for children compared to adult. Children, compared to adults, were shown to be more likely to develop diseases when they were exposed to hazardous substances, especially carcinogenic chemicals.*

*“Because chemicals with mutagenic potential can cause cancer by a mutagenic mode of action (MOA), they can therefore pose a higher risk of cancer to humans when exposure occurs during early life. Therefore, it is important to apply age-dependent adjustment factors (ADAFs) for different age stages to the estimated lifetime cancer risk.”*

129. The EA considered 2012 research when setting the EAL and said<sup>73</sup>:

*“They concluded that no adjustment factor for toxicokinetic age differences was required”*

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<https://consult.environment-agency.gov.uk/environment-and-business/new-air-environmental-assessment-levels/>

69 [https://consult.environment-agency.gov.uk/environment-and-business/new-air-environmental-assessment-levels/supporting\\_documents/Consultation%20document.pdf](https://consult.environment-agency.gov.uk/environment-and-business/new-air-environmental-assessment-levels/supporting_documents/Consultation%20document.pdf)

70 Approx. 14:00 of “IAQM Webinar: Environment Agency air emissions risk assessment EAL updates” available on YouTube and uploaded by The Institution of Environmental Sciences On 2 Feb 2022. The webinar presentation by Environment Agency Senior Advisor Alun Roberts-Jones is dated 31 January 2022.

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Maria Lathouri, Anna Korre, Maria Dusinska, Sevket Durucan 2022, accessed 22 February 2023:

<https://static1.squarespace.com/static/61a4d2a041902b6d99f6407d/t/6398474ee4765d458f4237a4/1670924112327/SCOPE+D3.3+Human+Health+hazard+assessment+strategy.pdf>

73 <https://www.gov.uk/government/consultations/environmental-assessment-levels-eals-used-in-air-emissions-risk-assessments/public-feedback/appendix-c-summary-of-toxicological-evidence-for-mea-and-ndma>

130. With so little health evidence<sup>74</sup>, and with no clear application of age-dependent adjustment factors, the more relaxed approach to lifetime cancer risk used to determine the EAL, there are questions over whether this EAL, and therefore also the applicant's assessment, can be considered sufficiently precautionary.
131. The applicant considered Karl 2009<sup>75</sup> to be an appropriate authority for the setting of deposition velocities for amines, MEA and NDMA<sup>76</sup>. Based on the level set by the Norwegian Institute of Public Health, Karl 2009 considers the long-term safe level of amines in air for human health to be 10 µg/m<sup>3</sup>, a level which is ten times lower than the 100 µg/m<sup>3</sup> long-term threshold for amines set by the Environment Agency<sup>77</sup>. If the applicant considers Karl 2009 authoritative for the consideration of deposition, it appears inconsistent to use an alternative threshold level for human health.
132. This setting of Environmental Assessment Levels (EALs) for Mono-ethanolamine (MEA) and Nitrosodimethylamine (NDMA) following a consultation in 2020 was only the first of 3 phases of EAL revision planned by the EA with the third phase providing<sup>78</sup>:
- “Further EALs to support assessment of CCS nitrosamine emissions”*
133. It is Biofuelwatch's understanding that the EA is still carrying out phase 2 of its EAL revision and has not carried out phase 3 which includes this further EAL support for CCS nitrosamine emission assessment.
134. Since the EALs are due to be revised to provide this additional support, there is a significant concern that the current EALs are inadequate to properly assess the likely impacts of the nitrosamines.
135. The BEIS Biomass Policy Statement says<sup>79</sup>:

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<sup>74</sup> The “overall toxicological database is small” and “There are few authoritative reviews on the adverse effects from exposure to MEA”:  
<https://www.gov.uk/government/consultations/environmental-assessment-levels-eals-used-in-air-emissions-risk-assessments/public-feedback/appendix-c-summary-of-toxicological-evidence-for-mea-and-ndma>

<sup>75</sup> “Amines Worst Case Studies: Worst Case Studies on Amine Emissions from CO<sub>2</sub> Capture Plants (Task 6)”, 2009, Matthias Karl, Steve Brooks, Richard Wright and Svein Knudsen, Norwegian Institute for Air research (NILU) and Norwegian Institute for Water Research (NIVA), reference: NILU OR 78/2008

<sup>76</sup> Paragraph 6.5.55 point f of the Environmental Statement [APP-042].

<sup>77</sup> <https://www.gov.uk/government/consultations/environmental-assessment-levels-eals-used-in-air-emissions-risk-assessments/public-feedback/consultation-response-document-new-eals-for-emissions-to-air>

<sup>78</sup> Slide 19 of presentation “IAQM Webinar: Environment Agency air emissions risk assessment EAL updates” available on YouTube and uploaded by The Institution of Environmental Sciences on 2 Feb 2022. The webinar presentation by Environment Agency Senior Advisor

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*“Research and updated regulation will also be required to understand and address any air quality impacts from BECCS, including emissions associated with carbon capture solvents.”*

136. This BEIS statement was published 4 November 2021, so after the publication of the EALs for MEA and NDMA in September 2021. The BEIS statement is therefore understood to support the need for further EAL support and shows that existing regulation of emissions associated with carbon capture solvents is inadequate.

137. The applicant’s Air Quality Technical Note 1 [AS-019] says:

*“EALs were proposed by the Environment Agency for monoethanolamine (MEA) at hourly and daily averaging periods. Subsequent to the publication of the ES, the supplier (MHI) provided EALs that were specific to the process amines rather than MEA. The process specific amine compounds were assessed in the ‘core model scenarios’, as reported in Chapter 6 (Air Quality) (APP-042) of the ES. As such, the revised EALs provided by the supplier were applied to the assessment. ...*

*“Error! Reference source not found. shows the original (June 2022 ES) and revised EALs and how they were applied in the ES and permit application.*

*“The EALs provided by the supplier were higher than the equivalent MEA values for the primary amine, but lower than MEA for the secondary amine.”*

138. Biofuelwatch requests the correct source reference to the application of revised EALs in the ES.

139. Given the very significant uncertainties in the EALs set by the EA, Biofuelwatch considers the use of supplier-derived EALs for undisclosed chemicals to be unacceptable. Such crucial information must be disclosed so there is an opportunity to comment on the toxicity data used to inform the EALs. Without this it is impossible to properly comment on and assess the risks.

## Nitrosamine Uncertainties

140. Biofuelwatch note that EA Guidance<sup>80</sup> says:

*“There is particular concern about impacts on the environment from nitrosamines and other potentially harmful compounds formed by reaction of the amines and their degradation products with nitrogen oxides (NOx) in the flue gases. Check the environmental standards for air emissions for the protective environmental assessment levels. You have a choice between:*

- i. solvents using primary amines that may require more heat for regeneration but will not readily form stable nitrosamines in the PCC*

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<sup>80</sup> <https://www.gov.uk/guidance/post-combustion-carbon-dioxide-capture-best-available-techniques-bat>

*plant, especially if a high level of reclaiming is used to remove degradation products*

- ii. *solvent formulations including secondary amines or other species that may have lower regeneration heat requirements may readily form nitrosamines with NOx in the flue gases in the PCC plant - for controls, see section 3.3 on features to control and minimise atmospheric and other emissions”*

141. (It is important to note that the EA does not say that primary amines do not form stable nitrosamines only that they do not “*readily form stable nitrosamines in the PCC plant*” (emphasis added) - a matter which is considered further later in the document.)
142. According to the EA, there is a tradeoff between solvents that require more heat for regeneration of the solvents (and therefore have lower efficiency) and solvents that more readily form toxic nitrosamines with NOx.
143. Since the chemical nature of the solvent to be used in the proposed development has not been disclosed, there is a lack of information on where the particular solvent lies on the balance between energy efficiency and toxic nitrosamines.
144. This is important information. Biofuelwatch considers that the full details of the solvent should be disclosed because it has a likely significant impact on both emissions and efficiency of the plant.
145. Biofuelwatch is concerned that the application lacks evidence for both the efficiency figures and nitrosamine figures.
146. EA Guidance says:

*“You must work out the solvent performance, including reclaiming requirements and emissions to atmosphere. Determine this through realistic pilot (or full scale) tests using fully representative (or actual) flue gases and power plant operating patterns over a period of at least 12 months.”*

147. Biofuelwatch requested real world data supporting the amine degradation product information from Drax by email (8 December 2021). Drax’s response included<sup>81</sup>:

*“As an integral part of the Environmental Statement, we will assess and model the solvent to comply with the requirements of the EIA regulations. We are commencing the studies which will form part of the Environmental Statement.”*

148. Biofuelwatch is concerned that it appears the applicant has not carried out “realistic pilot or full scale tests using fully representative or actual flue gases” as required by the EA Guidance, because Drax has not disclosed the requested data from its testing. There is a lack of evidence regarding any assessment Drax may have done on the solvent.

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<sup>81</sup> Paragraphs 7.13.12-13 of Drax Consultation Report document reference number 5.1 [APP-018].

149. Biofuelwatch have only found references to the use of the proprietary KS-21 solvent in carbon capture on gas-fired power plants. This raises the concern that the solvent's behaviour, particularly with regard to nitrosamine formation, could be very different when used on a woody-biomass power plant which has a significantly different emissions profile than a comparatively-clean gas-fired plant. Biofuelwatch considers that the applicant must provide the studies that it and/or the KS-21 manufacturer may have done of the breakdown of the solvent in the presence of typical emissions from combustion of woody-biomass.
150. To be confident that health impacts are being minimised and efficiency of the plant maximised, Biofuelwatch requests information on how the formation of nitrosamines using this solvent compare with other choices and how the toxicity of the particular nitrosamine products with the proposed solvent compare with alternatives.
151. Biofuelwatch notes that there is considerable variation in the toxicity of different nitrosamines. The Norwegian Institute of Public Health used information from the US EPA to show the oral toxicity varies by more than a factor of 50 for a very small number of considered nitrosamines<sup>82</sup>. An EAL has been set for N-nitrosodimethylamine (NDMA) but the data shows higher toxicity for nitrosodiethylamine. With hundreds of carcinogenic nitrosamines<sup>83</sup>, the toxicity of some is likely to be even higher. There is therefore insufficient information to be confident that the nitrosamines that may arise from the proprietary solvents will not have a greater toxicity than those considered when the EALs were determined and the toxicity of NDMA for which an EAL has been set.
152. Biofuelwatch also requests full disclosure of the solvent performance information of the particular solvent used and details of the tests from which the solvent performance information has been derived (so that a comparison can be made between the proposed operational scenario and that used for the test). Biofuelwatch remains concerned that there is a lack of evidence that the proxies used by the Environment Agency for permitting and regulatory frameworks for nitrosamines are valid.
153. The information provided in the Environmental Statement about the public health impacts of emissions to air of pollutant compounds known to cause cancer is inadequate. In our view the Environmental Statement for this proposal does not provide sufficient detail for the pollution impacts to be fully and accurately assessed. The proposal documents merely acknowledge that nitrosamines and nitramines

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<sup>82</sup> Section 2.3.6 of "Health effects of amines and derivatives associated with CO2 capture: Nitrosamines and nitramines", Marit Låg, Birgitte Lindeman, Christine Instanes, Gunnar Brunborg and Per Schwarze, Norwegian Institute of Public Health, 2011, ISBN 978-82-8082-462-2 electronic version

<sup>83</sup> Section 2.3 of "Health effects of amines and derivatives associated with CO2 capture: Nitrosamines and nitramines", Marit Låg, Birgitte Lindeman, Christine Instanes, Gunnar Brunborg and Per Schwarze, Norwegian Institute of Public Health, 2011, ISBN 978-82-8082-462-2 electronic version

generated by the PCC are *possible* carcinogens - NDMA is an IARC Group 2A carcinogen - “probably carcinogenic to humans” showing a higher likelihood of carcinogenic impact. The Norwegian Institute of Public Health says “NDMA (CASRN 62-75-9) is carcinogenic in all animal species tested.”<sup>84</sup> The applicant does not mention the endocrine disruptive effects of nitrosamines.

154. In 2011, SEPA recommended that:

*“Operators applying for consent for carbon capture systems should be required to submit detailed emission and impact estimates for all relevant compounds. The source and basis for such emission estimates should be clearly stated.”*

In our view the ES for this proposal does not provide sufficient detail for the pollution impacts to be fully and accurately assessed.

155. The modelling uncertainties mentioned above are compounded further by the limited scientific understanding of the complex chemistry of nitrosamines, these uncertainties are compounded further still, when, as in the case with this proposed development, the solvents themselves are claimed to be proprietary and details of the formulation have been withheld. This makes it impossible to robustly assess the health impacts of the proposed development.

156. There are no real world examples on which to assess the release of amine degradation products from BECCS with woody biomass. Drax admits this is the first project of its kind globally<sup>85</sup>. Since scientific understanding of the chemistry is still poor, there is the possibility of much greater impacts arising from the use of woody biomass than with fossil fuels. This could result in higher levels of nitrosamines than expected or, potentially, compounds with increased toxicity. Biofuelwatch considers these uncertainties have not been adequately considered.

157. The applicant’s predictions are made using the ADMS Amine Chemistry Module<sup>86</sup>. This module was produced in 2016 and aims to simulate reactions shown in a 2011 report<sup>87</sup>. Biofuelwatch has found no updates to the module to account for results of pilot carbon capture installations or recent research. The ADMS predictions may therefore not reflect the latest scientific understanding of nitrosamine formation and dispersion.

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<sup>84</sup> Section 2.3.2 of “Health effects of amines and derivatives associated with CO2 capture: Nitrosamines and nitramines”, Marit Låg, Birgitte Lindeman, Christine Instanes, Gunnar Brunborg and Per Schwarze, Norwegian Institute of Public Health, 2011, ISBN 978-82-8082-462-2 electronic version

<sup>85</sup> File: “TRANSCRIPT\_ISH1\_SESSION2\_DRAXPOWER\_18012023” [EV-009]

<sup>86</sup> Paragraph 6.5.21 of Chapter 6 of the Environmental Statement [APP-042].

<sup>87</sup> Section 1.1 of “ADMS 5 Amine chemistry supplement” version 5.2, November 2016, available from the Cambridge Environmental Research Consultants (CERC) website and download 22 February 2023:



158. Perhaps even more concerning, the developer of ADMS shows no validation of the amine chemistry module<sup>88</sup>. Biofuelwatch considers that confidence in the modelling software system would require a number of independent validation studies using validation data not known to the developers. For the ADMS amine chemistry module, there appears to be *no* validation data - not even any data used by the developer to test their software. It is therefore impossible to verify that the ADMS Chemistry Model is able to appropriately model nitrosamine concentrations and what the uncertainties may be. Predictions made with such unvalidated software should not be considered a reliable indicator of environmental levels.

159. In a presentation made by the EA on 31 January 2022 about the EAL updates, the EA was asked<sup>89</sup>:

*“In terms of demonstrating compliance with the new EAL for nitrosamine, it appears that this is to be conducted by chemical transformation dispersion modelling, how uncertain is this method?”*

160. Alun Roberts-Jones on behalf of the EA responded:

*“The method is very uncertain. I know a colleague in AQMAU [the EA’s Air Quality Modelling and Assessment Unit] has looked at the method. ... this is all really new. There is limited tools available so it is something that we are looking at more, working with industry more, but it is hugely uncertain around those chemicals, what’s happening in the process and then following the process how those chemical reactions continue in the atmosphere. It is very, very uncertain.”*

161. These comments support Biofuelwatch’s view that the dispersion modelling tools for nitrosamines are not mature enough to be used to assess environmental concentrations of nitrosamines. They also show that environmental nitrosamine levels are due to both “what’s happening in the process” and also “how those chemical reactions continue in the atmosphere”.

162. Paragraph 1.3.3 of the Appendix 6.3 of the Environmental Statement [APP-127] shows the applicant also expects this continuation of chemical reactions in the atmosphere and considers nitrosamine and nitramine compounds formed in the atmosphere to be the largest contribution to environmental concentrations:

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<sup>88</sup> See previous section of this document titled “ADMLC Guidance and Air Dispersion Modelling System Uncertainties” which shows the validation scenarios listed by the applicant for ADMS 5 on their website as of 22 February 2023:

<sup>89</sup> Approximately 36:48 of presentation “IAQM Webinar: Environment Agency air emissions risk assessment EAL updates” available on YouTube and uploaded by The Institution of Environmental Sciences on 2 Feb 2022. The webinar presentation by Environment Agency Senior Advisor Alun Roberts-Jones is dated 31 January 2022

*“... the majority of nitrosamine and nitramine compounds associated with the Proposed Scheme will form in the atmosphere as a result of the complex reactions outlined below (i.e., ‘indirect’ emissions).”*

163. This shows that measurement and control of nitrosamine emissions (by regulatory control using Emissions Limit Values) may be insufficient to control environmental nitrosamine concentrations because of the continuing reaction in the atmosphere outside the plant with reactions that are poorly understood and with no reliable and validated means to make predictions of environmental levels. Biofuelwatch considers the comments by Alun Roberts-Jones support this view.

164. Biofuelwatch are concerned about how the ADMS chemistry modelling has been applied. The application says:

*“Given that, based on current understanding, a stable nitrosamine is not formed from MEA in the atmosphere, the concentration output is not reported (CERC, 2012).”*

165. Biofuelwatch considers this statement incorrect. Berit Fostås et al says in “Effects of NOx in the flue gas degradation of MEA”<sup>90</sup>:

*“MEA is a primary amine which in itself is unable to form a stable nitrosamine. However, experiments show that under the influence of NOx, MEA degrades to the secondary amine diethanolamine (DEA) which is then nitrosated. This work shows that some nitrosamine formation in the process must be expected from any amine.”*

166. Biofuelwatch notes that this understanding that MEA can degrade to nitrosamines is consistent with the EA Guidance quoted at the start of the preceding section which does not preclude the formation of nitrosamines from MEA. Biofuelwatch requests that the applicant explains how the ADMS chemistry reaction scheme simulates the pathway from MEA to nitrosamine.

167. The ADMS modelling of amine chemistry requires ozone concentrations<sup>91</sup>. The applicant has said regarding ozone concentrations<sup>92</sup>:

*“Ambient hourly concentrations for each species sourced from representative monitoring location”*

168. Since Biofuelwatch understands there to be just one “species” of ozone (O<sub>3</sub>), Biofuelwatch requests clarification about what hourly concentrations of ozone have

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<sup>90</sup> Berit Fostås, Audun Gangstad, Bjarne Nenseter, Steinar Pedersen, Merethe Sjøvoll, Anne Lise Sørensen, Effects of NOx in the flue gas degradation of MEA, Energy Procedia, Volume 4, 2011, Pages 1566-1573, ISSN 1876-6102, [REDACTED]

<sup>91</sup> Paragraph 1.1 of “ADMS 5 Amine chemistry supplement” version 5.2, November 2016, available from the Cambridge Environmental Research Consultants (CERC) website and download 22 February 2023: [REDACTED]

<sup>92</sup> Table 1.8 of Appendix 6.3 of the Environmental Statement [APP-127].

been used, where they have been sourced from and whether they correspond with the historical meteorological conditions modelled.

169. Since ozone concentrations can have significant local variations and since the government says ozone itself is formed in the air from other pollutants<sup>93</sup>, Biofuelwatch requests further information from the applicant on why ozone at a fixed location that does not take into account the higher pollutant concentrations of the plume, nor local geographical variations, can be adequately precautionary for predictions of nitrosamines over a wide geographical area.
170. If the ozone values used do not both temporally and spatially change to reflect the historical weather patterns considered, Biofuelwatch asks for an assessment of the uncertainties that may arise as a result.
171. ADMS Modelling of amine chemistry also requires the background NO<sub>x</sub> / NO<sub>2</sub> concentration.<sup>94</sup> The applicant has said regarding these background NO<sub>x</sub> / NO<sub>2</sub> concentrations for amine chemistry modelling:

*“Defra AURN urban background monitoring site at Hull Freetown”*

and

*“As per core scenario modelling”*

172. The ADMS user guide for amine modelling says<sup>95</sup>:

*“It is strongly recommended to use hourly varying background values”*

173. Biofuelwatch requests the Examining Authority checks that hourly varying background values have been used for background NO<sub>x</sub> concentrations, whether these values relate to the weather conditions also being modelled, and whether these values also spatially relate to the varying NO<sub>x</sub>/NO<sub>2</sub> concentrations in the area.
174. If the values used do not both temporally and spatially change to reflect the historical weather patterns considered, Biofuelwatch asks for an assessment of the uncertainties that may arise as a result.
175. There are other emitters of NO<sub>x</sub> in the area which could impact local nitrosamine concentrations in ways that the background concentrations cannot accurately reflect (because local concentrations arising from these emissions will depend on the

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<sup>93</sup> <https://www.gov.uk/government/statistics/air-quality-statistics/concentrations-of-ozone>

<sup>94</sup> Section 2.2.3 of “ADMS 5 Amine chemistry supplement” version 5.2, November 2016, available from the Cambridge Environmental Research Consultants (CERC) website and download 22 February 2023:

<sup>95</sup> Section 2.2.3 of “ADMS 5 Amine chemistry supplement” version 5.2, November 2016, available from the Cambridge Environmental Research Consultants (CERC) website and download 22 February 2023:

weather). The resulting uncertainty in nitrosamine and nitramine concentrations needs to be quantified.

176. The applicant has said<sup>96</sup>:

*“Amine sensitivity modelling was based on initial design mass emission data provided by MHI that is no longer representative of the proposed BECCS plant. However, the initial design emissions represent higher mass emissions of the amine compounds relative to the proposed permit ELVs used in the core scenario modelling. As such, the initial design emission rates were used and also applied to the proprietary solvent (confidential) data as part of the sensitivity testing to allow a direct comparison with the proxy compound modelling results, whilst also providing a conservative assessment of amine mass emissions from the Main Stack. Therefore, the results of the amine sensitivity modelling are self-contained and should not be compared to the core scenario modelling results.”*

177. Biofuelwatch requests the applicant provides additional explanation to support the modelling assumptions. Why was the initial design mass emission data provided by MHI no longer representative of the proposed BECCS plant? What has changed?

178. The Environment Agency said in September 2021<sup>97</sup>:

*“We will also consider the need to develop British Standards for monitoring of emissions from carbon capture systems and in ambient air because, as to date, there are no certified standards for continuous emission monitoring (CEMS), periodic monitoring or ambient air quality monitoring”*

179. Biofuelwatch is unaware of a British Standard or certified standards for continuous emission monitoring. So not only does measurement of nitrosamine emissions provide insufficient control of actual nitrosamine concentrations (because of continued reactions in the atmosphere), it appears that neither the standards nor the technology currently exist to support continuous monitoring of nitrosamine emissions and the amine precursors to nitrosamines.

## Nitrosamine Dispersion Modelling to Protect Human Health and the Environment

180. Biofuelwatch recognises that it is for the Environment Agency, not the Examining Authority, to decide how the operation of the plant should be regulated. In order to assess whether the proposal is appropriate in land use terms, it is important to assess risks and this requires a consideration of the limitations of that current regulation. It is therefore instructive to consider how the EA intends to regulate the

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<sup>96</sup> Table 1.8 of Appendix 6.3 of the Environmental Statement [APP-127].

<sup>97</sup> “Consultation on new Environmental Assessment Levels used in air emissions risk assessments”:  
<https://consult.environment-agency.gov.uk/environment-and-business/new-air-environmental-assessment-levels/>

emissions of amines and amine derivatives. The Examining Authority could check Biofuelwatch's understanding with the EA if it wishes to do so.

181. From the EA published EALs for amines and amine derivatives, and from the EA response to the question considered in the previous section, it is Biofuelwatch's understanding that the EA intends to use the same approach to regulate emissions of amines and amine derivatives as it uses for all other air pollutants (except dioxins and furans and dioxin-like PCBs). That approach can be summarised as:
- a. Requiring emissions to be monitored and remain below emissions limits
  - b. to ensure air dispersion models do not predict EALs exceedances
  - c. To ensure Best Available Techniques are used

182. The 2022 Defra "Air quality PM<sub>2.5</sub> targets Detailed evidence report"<sup>98</sup> says:

*"There was a strong view amongst experts from early in the target development process, that assessment of legally binding targets for PM<sub>2.5</sub> should be based on data from fixed monitoring alone. This recommendation was made because there is an established framework for how monitoring is carried out, the performance of instruments is regularly evaluated, and data is ultimately traceable to international metrological standards. With respect to models, it was felt that they are less transparent, less traceable and more subject to changes in inputs and user criteria. There was a clear view from experts that modelling is a vital tool in estimating concentrations at locations that are not monitored, and also for making associations between emissions to air and the concentrations we breathe. They remain critical as tools to help inform policy making as well as for health impact studies. However, the uncertainties associated with modelling mean it may not be as robust for demonstrating compliance with a legally binding target when compared to fixed monitoring, particularly as the assessment will need to consider concentrations at lower than current compliance assessment at 20 µg m<sup>-3</sup>."*

183. Modelling uncertainties "mean it may not be as robust for demonstrating compliance with a legally binding target when compared to fixed monitoring". Modelling is considered by those recognised as experts by Defra to lack transparency, lack traceability and be subject to changes in inputs and criteria compared to measurements. This confirms previously expressed concerns regarding how uncertain modelling is.

184. Human health and ecosystems are important and deserve proper protection. Since modelling uncertainties are considered to make modelling unsuitable for legislation of

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<sup>98</sup> [https://consult.defra.gov.uk/natural-environment-policy/consultation-on-environmental-targets/supporting\\_documents/Air%20quality%20targets%20%20Detailed%20Evidence%20report.pdf](https://consult.defra.gov.uk/natural-environment-policy/consultation-on-environmental-targets/supporting_documents/Air%20quality%20targets%20%20Detailed%20Evidence%20report.pdf)

a target environmental level, modelling should also be considered insufficient to ensure the protection of human health and ecosystems.

185. The Defra Detailed Evidence Report referred to above gives consideration to modelling of PM<sub>2.5</sub> concentrations. The uncertainties around PM<sub>2.5</sub> modelling are significant enough for Defra's experts to consider it insufficiently robust to support legally binding targets. The uncertainties around the modelling of amines and its derivatives are much, much greater than the uncertainties around the modelling of PM<sub>2.5</sub>. If Defra does not consider modelling to be sufficient for a legally binding target for small particulates, Biofuelwatch considers that the far less certain modelling of amines and derivatives cannot be sufficiently robust to protect people's health and well-being.
186. It is, therefore, of great concern that the EA still intends for compliance to be demonstrated by chemical transformation dispersion modelling. The modelling has not been validated, not even by the modelling software developer. Biofuelwatch considers the EA's approach, which depends on unvalidated chemical transformation dispersion modelling, without the standards nor technology to even ensure appropriate measurement of nitrosamines and their precursors, is currently unable to offer sufficient protection for human health and the environment. Biofuelwatch considers it would be reckless to trust unvalidated software to provide realistic estimates of environmental concentrations, when the unvalidated software attempts to model highly complex air dispersion and complex, poorly understood chemical processes arising from the use of an unknown solvent at a novel biomass plant with emissions different from the few operational carbon capture systems (that exist on fossil fuel plants). Biofuelwatch considers it insufficiently precautionary to then compare such an inadequate assessment of the environmental level with a threshold that has been set based on little evidence and a recently relaxed threshold for lifetime risk.
187. Biofuelwatch considers the BEIS biomass policy statement (referred to previously) supports its assessment that current regulation of emissions arising from carbon capture solvents is inadequate. Whilst Biofuelwatch expects the EA's regulatory approach to be developed, what EA regulation can and will accomplish, and therefore what risks the regulation would be able to mitigate, is currently unknown. Consequently, there is insufficient information to be confident that the risks to the area affected by the proposed development can and will be properly controlled and managed and sufficient reasons to consider that the impacts on the surrounding area could be very significant and unable to be satisfactorily controlled by the EA.

## Lack of Environmental Monitoring

188. The applicant considers monitoring in section 6.14 of Chapter 6 of the Environmental Statement [APP-042]. The applicant reports that:

*"There are currently no data relating to ambient levels of amines and nitrosamines within the UK"*

189. Whilst the report says “there are no known sources of amine and / or nitrosamine emissions currently operating within the operational phase study area” that does not mean that there are definitely no such emissions. Furthermore, no consideration appears to have been given to the possibility of naturally occurring amines or nitrosamines.
190. Biofuelwatch requests that environmental concentrations (the background concentrations) are determined prior to the planning and permitting assessments being made because without such concentrations it is impossible to determine cumulative impacts.

## Dioxin Emissions

191. The applicant’s “National Policy Statement Compliance Tracker” (February 2023) says:

*“In addition, emissions of heavy metals, dioxins and furans are a consideration for waste combustion generating stations, but limited by the EPR and waste incineration BAT conclusions and regulated by the EA.”*

192. Research published in 2022 reported dioxin emissions from biomass combustion may far exceed limit values for waste incineration<sup>99</sup>.
193. A peer-reviewed published review by Zhang et al, “Dioxins from Biomass Combustion: An Overview” says:

*“The contribution of dioxins emissions from biomass combustion becomes more and more important, especially since evident guided emissions—principally from waste incineration and metallurgy—have been curtailed drastically.”*

and:

*“Dioxins data for biomass combustion are abundant, yet unusually variable, stretching over several orders of magnitude; the resulting emission factors are poorly reproducible, even during carefully controlled combustion experiments, using synthetically composed fuels fired in a well-designed test rig.”*

194. BEIS therefore recognises the significant contribution wood combustion makes to dioxin emissions, but appears to have given consideration only to domestic combustion<sup>100</sup>.
195. Since there is recent evidence that biomass combustion can result in considerable dioxins (and dioxin-like compounds) and since the regulatory regime does not limit such emissions. Biofuelwatch requests that the Examining Authority requires:

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<sup>99</sup> Zhang et al, Emission characteristics of polychlorinated dibenzo-p-dioxins and dibenzofurans from industrial combustion of biomass fuels, 2022.

<sup>100</sup> [https://naei.beis.gov.uk/overview/pollutants?pollutant\\_id=45](https://naei.beis.gov.uk/overview/pollutants?pollutant_id=45)

- an assessment of the risks to human health from dioxins (and dioxin-like compounds), and
- continuous measurement of dioxin emissions to ensure the limits assumed by the assessment are not exceeded.

## Fugitive Emissions

196. Apart from brief mention of fugitive dust emissions, the application lacks consideration of fugitive emissions.
197. Fugitive emissions of amines have the potential to:
- a. Result in higher environmental concentration of amines and amine decomposition products especially at, and near, the site
  - b. Cause an occupational health risk
  - c. Contaminate groundwater and water runoff
198. The proposal lacks quantification of the potential environmental concentrations that may arise from fugitive emissions, lacks sufficient consideration of this (and other) risks to occupational health and lacks sufficient measures to mitigate risks to groundwater and water runoff.
199. Any fugitive emissions of CO<sub>2</sub>, could significantly impact the carbon capture efficiency of the plant.

## UKHSA

200. Biofuelwatch are deeply concerned that the UKHSA / OHID have chosen to opt out of involvement with this Examination and intend to take no further part in the scrutiny of this proposal (closing comment in RR-141). The Drax Post-Combustion Carbon Capture (PCC) is a significant (and novel) development, the largest such BECCS system ever attempted - not just in the UK but globally. It will need considerable financial support from the public purse, and government policy currently envisages greater use of BECCS in the UK to support Net Zero, if Drax PCC is implemented and judged to be a success. With this in mind, Biofuelwatch's expectation is that the bodies charged with oversight of UK public health would apply the precautionary principle and would thoroughly scrutinise the proposals.
201. We further note the absence of proposals to monitor emissions from the proposed carbon capture facility in the vicinity of salient receptors over the short- and long-term and the absence of information about how that (necessarily independent) monitoring will be paid for. Those matters are particularly salient given the widely reported emasculation of the Environment Agency and the prospect of further austerity. Despite this, the UKHSA and OHID position appears to assume that monitoring and regulation will be satisfactory.
202. Biofuelwatch consider that an independent observer would find it difficult to share UKHSA's apparent confidence in the likely EA approach of reliance on unvalidated



chemical transformation dispersion modelling to ensure compliance against environmental thresholds (that have considerable uncertainty and which were set after relaxing lifetime risk by an order of magnitude).

203. Biofuelwatch are concerned that the explicit decision of UKHSA and OHID not to register an interest may serve to inhibit the Examining Authority and others from questioning matters of public health on the grounds that they cannot be potentially serious. Biofuelwatch considers that UKHSA and OHID lack of input into the process requires the Examining Authority to be more thorough in its consideration of health impacts. If the Examining Authority is unable to obtain advice from UKHSA, Biofuelwatch requests that the Examining Authority consider whether it has the necessary information and expertise to adequately assess the proposal. Without that information and expertise the Examining Authority should refuse consent in accordance with the Precautionary Principle.
204. As well as their decision not to comment on the public health emissions to air and water and the assessment of the risks of these emissions (including the use of unvalidated modelling prediction software for air emissions), the UKHSA is also providing no guidance on the proposal to use unproven BECCS technology with well-documented concerns about its overall efficacy and the feasibility of scaling it up to provide a meaningful level of emissions drawdown. The chief executive of UKHSA has recently commented publicly "*The climate crisis poses a significant and growing threat to health in the UK*" and "*the threat to health should be considered as part of the UK's broader climate policy*"<sup>101</sup>. Biofuelwatch considers it deeply concerning that the UKHSA is not willing to make any comment on whether or not this proposed development would be a good investment of public money compared with other proven and deployable measures to reduce climate-damaging emissions.

## Can the Deterioration in Air Quality be Mitigated or Avoided?

205. As noted earlier, air pollution of non-threshold air pollutants, such as particulates and NO<sub>2</sub>, and almost certainly nitrosamines too, harm health even at very low levels.
206. The impacts of the potential widespread and long-term exposure to nitrosamines is currently unknown but, because of the lack of data, there is the potential for impacts to be severe.
207. Biofuelwatch considers the risks from nitrosamines cannot be adequately controlled using unvalidated modelling of nitrosamine formation and dispersion based on poorly understood chemistry from proprietary, and so undisclosed, solvents from a plant with a different emissions profile to fossil fuel carbon capture plants. The risks of unexpected and elevated concentrations are simply too great.

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<sup>101</sup> "Climate crisis poses 'growing threat' to health in UK, says expert", The Guardian, 23 October 2022 available on the Guardian website and downloaded 22 February 2023:

208. The earlier subsection “Air Quality as an Examining Authority Consideration”, confirmed that EN-1, which applies to this proposed development, requires necessary measures to ensure “no significant pollution”. Biofuelwatch considers the measures outlined to control pollution from the proposed development are inadequate to ensure “no significant pollution”.
209. Biofuelwatch also considers that the “significance” of harm to health, and therefore also the “significance” of the pollution that causes the harm to health, is increased because people would be exposed to this harm without their consent. The harm to health raises questions about whether the plant can be considered compliant with Articles 2 and 8 of the Human Rights Act because there are alternative means to generate electricity without carbon emissions which have no significant risk to human health. The alternative means also do not suffer from the incompatibility of woody-biomass combustion with climate objectives<sup>102</sup> nor the carbon accountancy flaws<sup>103</sup>.
210. Nitrosamines are primarily formed in the atmosphere. Environmental concentrations are likely to be dependent on the presence of the pollutants that would be emitted from the facility (and therefore the wind direction), the presence of pollutants from other sources, temperature and sunlight. Environmental “spot-checks” of nitrosamine concentrations are therefore unlikely to be a reliable indicator of long-term environmental concentrations.
211. Long-term, fixed monitoring at a large number of locations may provide some reassurance as to actual environmental concentrations of nitrosamines, but the modelling shows the dispersion occurring over a huge area so it is doubtful that it would be practical to install equipment to measure nitrosamine concentrations at a large number of locations. There is also the concern that the safe level for long-term exposure is not well understood making it difficult to assess the likely health impact from measurements.

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<sup>102</sup> Norton, M, Baldi, A, Buda, V, et al. Serious mismatches continue between science and policy in forest bioenergy. *GCB Bioenergy*. 2019; 11: 1256– 1263.

<sup>103</sup> Helmut Haberl, Detlef Sprinz, Marc Bonazountas, Pierluigi Cocco, Yves Desaubies, Mogens Henze, Ole Hertel, Richard K. Johnson, Ulrike Kastrup, Pierre Laconte, Eckart Lange, Peter Novak, Jouni Paavola, Anette Reenberg, Sybille van den Hove, Theo Vermeire, Peter Wadhams, Timothy Searchinger, Correcting a fundamental error in greenhouse gas accounting related to bioenergy, *Energy Policy*, Volume 45, 2012, Pages 18-23, ISSN 0301-4215,

## Biodiversity and Ecology

### Risk of Amine Deposition on Ecology

212. A worst-case study<sup>104</sup> was conducted for Norway's CO<sub>2</sub> Technology Centre Mongstad (TCM), where a conservative 2% conversion rate from monoethylamine (MEA) to nitrosamines was used to investigate amine concentrations released into various media. It was shown that maximum MEA deposition fluxes would exceed toxicity limits for aquatic organisms by about a factor of 3–7 depending on the scenario. Due to the formation of nitrosamines and nitramines, the estimated emissions of diethylamine (DEYA) were estimated to be close to or exceed safety limits for drinking water and aquatic ecosystems.
213. The tables in Appendix 6.5 (revision 02) of the Environmental Statement [AS-015] do not show predicted amine depositions even though the ADMS software used for the predictions is able to provide an unvalidated prediction<sup>105</sup>. Given the potential risk of harm to aquatic organisms (and drinking water), Biofuelwatch considers careful consideration should be given to the potential impact of amine deposition on the environment including aquatic environments, any sources of drinking water and any wetland areas.
214. Some products from the degradation of amines have a long half life in certain environments and “they may fulfil criteria for persistence” (Nitramines in sediments ≈300 days<sup>106</sup>). The breakdown rate of amines and derivatives in the environment depends on temperature so worst case breakdown rates should be considered to ensure amines and their products do not accumulate to harmful levels particularly at certain times of the year<sup>107</sup>. The breakdown rate also depends on the source with synthetic amines taking longer to breakdown<sup>108</sup>. Consideration must be given to whether the breakdown figures used reflect the proprietary solvent used.
215. The applicant's ecology report also draws attention to the long-term nature of the impacts “at up to an international geographical scale”<sup>109</sup> (although Biofuelwatch considers the applicant has provided insufficient evidence and especially insufficient

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<sup>104</sup> Karl, M., Wright, R. F., Berglen, T. F. & Denby, B. 2011. Worst case scenario study to assess the environmental impact of amine emissions from a CO<sub>2</sub> capture plant. *International Journal of Greenhouse Gas Control*, 5, 439-447.

<sup>105</sup> Paragraph 1.3.18 of Appendix 6.3 of the Environmental Statement [APP-127].

<sup>106</sup> Section 5.2.5.2 of “Human Health hazard assessment strategy for amine emissions around PCC facilities”, Maria Lathouri, Anna Korre, Maria Dusinska, Sevket Durucan, 2022.

<sup>107</sup> Section 3.1 of “Human Health hazard assessment strategy for amine emissions around PCC facilities”, Maria Lathouri, Anna Korre, Maria Dusinska, Sevket Durucan 2022,

<sup>108</sup> Section 3.1 of “Human Health hazard assessment strategy for amine emissions around PCC facilities”, Maria Lathouri, Anna Korre, Maria Dusinska, Sevket Durucan 2022,

<sup>109</sup> Paragraph 8.9.103 of Chapter 8 Environmental Statement [APP-044].

consideration of uncertainties and the limitations of current scientific knowledge, to be confident that such impacts are of “minor magnitude” and “reversible”).

216. Since the applicant predicts international scale impacts, Biofuelwatch asks the Examining Authority to consider what international consultation should occur before the proposal is approved.
217. There is a risk that chemically produced N-nitrosamines and N-nitramines can accumulate in the surrounding environment and endanger human health.<sup>110</sup> It is therefore unclear that air dispersion modelling alone (even if the chemistry and the solvents under consideration were fully understood) would be able to fully assess the risks to human health and the environment.

## Risk of Cooling Water Contamination

218. Paragraph 2.5.84 of National Policy Statement for Renewable Energy Infrastructure EN-3 says:

*“Generic water quality and resource impacts are set out in Section 5.15 of EN-1. The design of water cooling systems for EfW and biomass generating stations will have additional impacts on water quality, abstraction and discharge. These may include: ... discharging water containing chemical anti-fouling treatment of water for use in cooling systems may have adverse impacts on aquatic biodiversity.”*

219. The environmental permitting application for “Variation to Operate Carbon Capture and Directly Associated Activities on Unit 2 and/or Unit 1 at Drax Power Station (VP3530LS)” obtained from the EA via a Freedom of Information Request, shows cooling water from the plant flows back into the River Ouse and shows the plant increases water pollution concentrations. The applicant’s non-technical summary states that the River Ouse “further downstream forms part of the Humber Estuary Ramsar Site, Special Conservation Area (SAC), Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI).”<sup>111</sup>
220. There is a risk of amine and nitrosamine contamination of cooling water. The existing cooling towers and pipework was not designed to support coolants with amines and nitrosamines and it is unclear that the current design can adequately mitigate the risk of solvent contamination of the cooling water and subsequent discharge to the River Ouse. In addition to increased pollution arising from the cooling water, the applicant recognises the potential for pollution via drainage pathways via Carr Dyke into the River Ouse<sup>112</sup>. Otters, a protected species, inhabit the River Ouse<sup>113</sup> and the applicant considers the otters may be part of the populations referenced in the SSSI

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<sup>110</sup> Section 5.2.1 of “Human Health hazard assessment strategy for amine emissions around PCC facilities”, Maria Lathouri, Anna Korre, Maria Dusinska, Sevet Durucan, 2022.

<sup>111</sup> Page 7 of the applicant’s Non-Technical Summary, Volume 4, Environmental Statement [APP-178].

<sup>112</sup> Paragraphs 8.9.18 and 8.9.19 of Chapter 8 Environmental Statement [APP-044].

<sup>113</sup> Paragraphs 8.9.19 and 8.9.102 of Chapter 8 Environmental Statement [APP-044].

citation for the River Derwent SSSI<sup>114</sup>. The applicant's ecology report also considers fish in the River Ouse to be critical for designated sites<sup>115</sup>:

*“The River Ouse, located more than 30m from the Habitat Provision Area beyond the northern edge of the Order Limits, is likely to be critical in sustaining populations of fish species associated with upstream and downstream designated sites. These include the River Derwent SAC and SSSI and The Humber Estuary SAC, SSSI, and Ramsar Site. Relevant fish species include river lamprey (Lampetra fluviatilis), sea lamprey (Petromyzon marinus), and salmonids such as Atlantic salmon (Salmo salar). These are considered Important Ecological Features of up to International Importance”*

221. Amines and nitrosamines are harmful to aquatic environments and the permit variation request shows little mitigation of the risks of potential contamination which the applicant considers could result in “very large adverse” effects<sup>116</sup>. The applicant recognises there is also the potential for “significant adverse effects” from “accidental release of water-borne pollutants” on “wintering birds that are associated with SPA and Ramsar Sites, particularly Lower Derwent Valley and Humber Estuary Eskamhorn Meadows and Thorne, Crowle and Goole Moors SSSI.”<sup>117</sup>
222. It is also unclear that, in the event of leakage, monitoring is sufficient to detect the leakage or that it would be possible to immediately, and safely, empty the pipework of solvent to prevent further loss. More information is needed to show that such risks have been adequately assessed and minimised.
223. Paragraphs 3.2.23 and 3.2.24 of the applicant's Habitats Regulations Assessment Volume 1 [APP-185] also does not consider the risk of such contamination.
224. The EA's comments refer to consideration of emissions to air and discharges to water, land and groundwater in general<sup>118</sup> but insufficient consideration is given to the potential for emissions of amines and their degradation products to contaminate surrounding aquatic ecosystems, groundwater or drinking water. A study based on a carbon capture system fitted to a 420 MW natural gas plant has shown<sup>119</sup> that amine-based scrubbing results in a 10-fold increase in toxic impact on freshwater ecosystems; therefore we would ask that this is something that is looked at specifically. The study assumed monoethanolamine (MEA) emissions. Since the

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<sup>114</sup> Paragraphs 8.9.114 and 8.9.61 of Chapter 8 Environmental Statement [APP-044].

<sup>115</sup> Paragraph 8.7.39 of Chapter 8 of the Environmental Statement [APP-044].

<sup>116</sup> Paragraph 8.9.102 of Chapter 8 of the Environmental Statement [APP-044] recognises the “risk of accidental pollution from the leakage of amine, chemicals and oil, entering the Carr Dyke and River Ouse”. Section 12.9 of Chapter 12 [APP-048] has very little mitigation and 12.9.15 reports effects may be “very large adverse”.

<sup>117</sup> Paragraphs 8.9.20 to 8.9.21 of Chapter 8 Environmental Statement [APP-044].

<sup>118</sup> Paragraph 6.1.6 of <https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/EN010120/representations/46584>

<sup>119</sup> Human and Environmental Impact Assessment of Postcombustion CO<sub>2</sub> Capture Focusing on Emissions from Amine-Based Scrubbing Solvents to Air, Karin Veltman, Bhawna Singh, and Edgar G. Hertwich, Environmental Science & Technology 2010 44 (4), 1496-1502. DOI: 10.1021/es902116r

toxic impacts may be severe and are “strongly dependent on which types of amines”<sup>120</sup>, the composition of the solvent must be disclosed so that the potential impact on aquatic ecosystems, groundwater, drinking water and human health can be assessed.

## Deposition Impacts and Uncertainties

225. The predicted cumulative impact on annual nitrogen deposition and acid deposition at Thorne Moor SAC/SPA/SSSI is nearly double the 1% significance screening criterion with the critical load already exceeded<sup>121</sup>. The cumulative ammonia prediction also exceeds the 1% screening threshold with that critical level also exceeded. The applicant’s tables show these predictions include the mitigation proposed by the applicant<sup>122</sup> but the figures account for neither the modelling uncertainties considered earlier in this document nor the significant deposition uncertainties (considered later in this subsection).
226. The applicant mentions the potential for harm to statutory designated sites of international and national importance<sup>123</sup>:

*“Oxides of nitrogen (NO<sub>x</sub>), ammonia (NH<sub>3</sub>) and sulphur dioxide (SO<sub>2</sub>) would be emitted as part of the Proposed Scheme’s operational phase. This could lead to nitrogen and acid deposition on habitats within statutory designated sites of international and national importance. This could contribute to increased nutrient nitrogen levels and acidification of habitats within statutory designated sites which could result in changes to the structure, composition and function of the habitats.”*

227. Thorne Moor is “England’s largest area of raised bog” and “rich in species of ‘7110 Active raised bogs’ with bog-mosses *Sphagnum* spp., cottongrasses *Eriophorum angustifolium* and *E. vaginatum*, heather *Calluna vulgaris*, cross-leaved heath *Erica tetralix*, round-leaved sundew *Drosera rotundifolia*, cranberry *Vaccinium oxycoccos* and bog-rosemary *Andromeda polifolia*”<sup>124</sup>. The moor supports 66 pairs of Nightjar (*Caprimulgus europaeus*), representing at least 1.9% of the breeding population in Great Britain. The Woodland Trust says the bird is “listed as an Amber species under the Red List for Birds, meaning it is a species of conservation concern”<sup>125</sup>. The SPA (Special Protection Areas) conservation objectives<sup>126</sup> include:

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<sup>120</sup> Amines Used in CO<sub>2</sub> Capture - Health and Environmental Impacts, Renjie Shao, Aage Stangeland, The Bellona Foundation, 2009.

<sup>121</sup> Table 3.14 of the applicant’s Habitats Regulations Assessment, volume 1 [APP-185] and tables 1.17 and 1.18 of Appendix 6.5 of the Environmental Statement [AS-015].

<sup>122</sup> Table 1.15, 1.17 and 1.18 of Appendix 6.5 of the Environmental Statement [AS-015].

<sup>123</sup> Paragraph 8.9.97 of Chapter 8 of the Environmental Statement [APP-044].

<sup>124</sup> <https://sac.jncc.gov.uk/habitat/H7120/> Joint Nature Conservation Committee, 7120 Degraded raised bogs still capable of natural regeneration, accessed 22.2.23

<sup>125</sup> Woodland Trust information page on the Nightjar, downloaded 22 February 2023:

<sup>126</sup> Table 1 of the applicant’s Habitats Regulations Assessment - Volume 3 - Appendix 2 [APP-190].

*“the obligation to avoid deterioration of the site or significant disturbance of the species for which the site is classified, and seeks to avoid plans or projects that may affect the site giving rise to the risk of deterioration ... Maintaining or restoring bird abundance depends on the suitability of the site.”*

228. The conservation objectives for Nightjar (*Caprimulgus europaeus*) includes air quality as a key issue for the supporting habitat:

*“The structure and function of the habitats which support this SPA feature may be sensitive to changes in air quality. Exceeding critical values for air pollutants may result in changes to the chemical status of its habitat substrate, accelerating or damaging plant growth, altering vegetation structure and composition and thereby affecting the quality and availability of nesting, feeding or roosting habitats.*

*“Critical Loads and Levels are thresholds below which such harmful effects on sensitive UK habitats will not occur to a noteworthy level, according to current levels of scientific understanding. There are critical levels for ammonia (NH<sub>3</sub>), oxides of nitrogen (NO<sub>x</sub>) and sulphur dioxide (SO<sub>2</sub>), and critical loads for nutrient nitrogen deposition and acid deposition. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis.”*

229. APIS, the Air Pollution Information System, lists ammonia, NO<sub>x</sub> and nitrogen deposition as particular risks to the raised bog habitat of the moor and has many scientific references showing the high sensitivity of bogs and raised bogs to even small increases in nitrogen deposition<sup>127</sup>. The Joint Nature Conservation Committee (JNCC) reported in 2020 the considerable evidence that atmospheric nitrogen pollution is a major threat to UK biodiversity<sup>128</sup>. Following government-funded research, Plantlife consider there is clear evidence of observable species loss and habitat degradation from high nitrogen deposition<sup>129</sup>.

230. Harm is expected when levels and loads are increased in excess of levels and loads considered critical. Since the cumulative impact of the proposal significantly

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<sup>127</sup> Air Pollution Information System, node 964, Nitrogen deposition :: Bogs  
[redacted] Air Pollution Information System, Nitrogen Deposition: Bogs, accessed 22.2.23 - full list of references in appendix 2

<sup>128</sup> <https://hub.jncc.gov.uk/assets/04f4896c-7391-47c3-ba02-8278925a99c5> Dragosits, U., Carnell, E.J., Tomlinson, S.J., et al, 2020. Nitrogen Futures. JNCC Report No. 665, JNCC, Peterborough, ISSN 0963-8091, accessed 22.2.23

<sup>129</sup> Plantlife UK and PlantLink (“with help from Carly Stevens at the University of Lancaster, Mike Ashmore at the Stockholm Environment Institute and colleagues at the Centre for Ecology & Hydrology (CEH).”), published by Plantlife, “We need to talk about nitrogen. The impact of atmospheric nitrogen deposition on the UK’s wild flora and fungi” 2017. ISBN: 978-1-910212-49-3. Available for download on the plantlife website:  
[redacted]

increases ammonia, NOx, and acid deposition, all of which are over critical levels/loads, the proposal would harm this Special Area of Conservation and Special Protection Area. Harm can be expected to the protected raised bog habitat itself and the Amber-listed Nightjar (*Caprimulgus europaeus*).

231. The consideration of impacts of the applicant's ecology report does not appear to have been based on cumulative impacts with the its section on cumulative effects limited to just one paragraph<sup>130</sup>. The cumulative impacts are greater than considered in the ecology report and shown above. However, despite this, the ecology report still considers that the proposed mitigation does not bring all impacts below the insignificance threshold<sup>131</sup>.
232. Water quality is also of "critical" importance for Nightjar (*Caprimulgus europaeus*) and the wetland habitats on which it depends<sup>132</sup>. Consideration should be given to any potential for harm to wetland habitats by amines (and its derivatives).
233. Annual acid deposition is also predicted to exceed the 1% screening threshold at Lower Derwent Valley SAC, and Skipwith Common SAC with the critical load already exceeded. The ecology report recognises predicted significant exceedances (even with mitigation)<sup>133</sup>. The ecology report considers these exceedances "unlikely to lead to perceptible ecological change to the habitats within Thorne Moor SAC or Lower Derwent Valley SAC". Critical loads and levels are, by definition, the level beyond which harm is to be expected. The harm may be difficult to observe and attribute to increased air pollution, but that does not mean that the harm would be small or unlikely to occur. The applicant's ecology report also lists predicted exceedances at Brighton Meadows SSSI, Derwent Ings SSSI and Barn Hill Meadows SSSI<sup>134</sup>. Cumulative impacts make the total likely harm even greater than considered by the ecology report.
234. The risks to protected sites are further increased because of the many modelling uncertainties.
235. The Environment Agency Science Report "Review of modelling methods of near-field Science Report – SC030172/SR4a"<sup>135</sup> considers deposition modelling. The report highlights many uncertainties regarding deposition velocities. The conclusions regarding deposition modelling include:

*"1. Current modelling methods, using fixed dry deposition velocities and washout coefficients, bear little resemblance to the physical processes involved, take little or no account of the dependent variables and are of quite*

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<sup>130</sup> Paragraph 8.12.1 of Chapter 8 of the Environmental Statement [APP-044].

<sup>131</sup> Paragraph 8.11.12 of Chapter 8 of the Environmental Statement [APP-044].

<sup>132</sup> Table 1 of the applicant's Habitats Regulations Assessment - Volume 3 - Appendix 2 [APP-190].

<sup>133</sup> Paragraph 8.9.100 of Chapter 8 of the Environmental Statement [APP-044].

<sup>134</sup> Paragraph 8.9.113 of Chapter 8 of the Environmental Statement [APP-044].

<sup>135</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/290995/scho0508bobz-e-e.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/290995/scho0508bobz-e-e.pdf)



*uncertain accuracy (probably somewhere between a factor of two and a factor of ten).*

*“2. Though it is conceivable that current methods provide a reasonable indication of deposition on the annually averaged basis for which deposition is usually calculated, it also seems unlikely. However, without detailed calculations taking more note of the true characteristics of deposition against which to compare them, any possible differences between the two types of calculation remain uncertain. “*

236. No consideration has been given of the uncertainties which, from the above, could be a factor of ten.

237. The Atmospheric Dispersion Modelling Liaison Committee, whose members include Defra, the EA, the FSA and PHE<sup>136</sup>, issued ADMLC 2021 (ADMLC-R12) “Guidelines for the Preparation of Short Range Dispersion Modelling Assessments for Compliance with Regulatory Requirements – An Update to the ADMLC 2004 Guidance” (also referred to earlier in this representation). The ADMLC 2021 guidelines, which were endorsed by the Royal Meteorological Society, say:

*“The underlying model should have a sound physical basis (Scientific assessment);”*

238. But the EA science report shows that the modelling methods “bear little resemblance to the physical processes involved” making it all the more important that uncertainties are properly assessed.

239. The uncertainties regarding deposition velocities are widely recognised by others too. In 2019, “Atmospheric Dispersion Knowledge Gaps and Research Priorities: Results from a Recent Survey of ADMLC Members” presented at the 19th International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, showed deposition was the top-priority issue chosen by Committee members under the heading of “validation” with “a lack of validation data from both field-scale and laboratory experiments” raised as a particular issue. There was also interest in understanding how deposition varies as a function of chemical form, particle size, precipitation type and deposition surface. It is very clear that members considered that this area of atmospheric science and modelling is not well understood and that models lack validation in this area.

240. The depositions used by the applicant for nitrogen dioxide, sulphur dioxide and ammonia<sup>137</sup> are those provided by “(Environment Agency, 2014). These are the values recommended by AQTAG (Air Quality Technical Advisory Group) in March 2014 in “AQTAG 6”<sup>138</sup>. AQTAG recommended these values, however, without providing any supporting evidence for them and without stating they are worst case

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<sup>136</sup> [REDACTED]

<sup>137</sup> Table 1.7 in paragraph of 1.2.24 of Appendix 6.3 of the Environmental Statement [APP-127].  
<sup>138</sup> Biofuelwatch has not found AQTAG 6 available for public download on Government websites but it is available on the UKWIN website (downloaded 22 February 2023):  
[REDACTED]

so actual deposition may exceed the assumed deposition potentially resulting in significantly higher environmental impacts than predicted.

241. Even more uncertain is the deposition velocity of amine, nitrosamine, and nitramine compounds. The applicant has assumed the deposition velocity for all of these compounds to be equivalent to that for ammonia<sup>139</sup> and considers this to be a “conservative” approach. The only research referenced to support this assumption is Karl 2009, but the consideration in Karl 2009 is little more than an educated guess of the deposition velocity based on solubility in water<sup>140</sup> and the deposition velocity of SO<sub>2</sub>.<sup>141</sup> It is not based on measurement and appears to ignore dry deposition seemingly on the assumption of high Norwegian rainfall levels and the solubility of the pollutants<sup>142</sup>.
242. Biofuelwatch requests the Examining Authority asks the applicant:
- a. why the deposition estimated by Karl 2009, which was specific to Norwegian weather conditions, is an appropriate basis for an assessment of deposition of amine (and breakdown compounds of amines) in Yorkshire, UK
  - b. whether the applicant agrees with the EA science report that uncertainties in deposition velocities can be as much as factor of ten (Environment Agency Science Report “Review of modelling methods of near-field Science Report – SC030172/SR4a”)
  - c. whether the applicant agrees that the uncertainty around the deposition velocity for amine, nitrosamine and nitramine compounds should be considered greater than the very considerable uncertainties around nitrogen dioxide, sulphur dioxide and ammonia deposition (because there has been considerably more research and experience of nitrogen dioxide, sulphur dioxide and ammonia deposition)
  - d. what the impact may be if the deposition velocities used significantly underestimated actual deposition.

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<sup>139</sup> Paragraph 1.3.19 of Appendix 6.3 of the Environmental Statement [APP-127].

<sup>140</sup> Section 3.2 of “Amines Worst Case Studies: Worst Case Studies on Amine Emissions from CO<sub>2</sub> Capture Plants (Task 6)”, 2009, Matthias Karl, Steve Brooks, Richard Wright and Svein Knudsen, Norwegian Institute for Air research (NILU) and Norwegian Institute for Water Research (NIVA), reference: NILU OR 78/2008

<sup>141</sup> Section 4.2 of “Amines Worst Case Studies: Worst Case Studies on Amine Emissions from CO<sub>2</sub> Capture Plants (Task 6)”, 2009, Matthias Karl, Steve Brooks, Richard Wright and Svein Knudsen, Norwegian Institute for Air research (NILU) and Norwegian Institute for Water Research (NIVA), reference: NILU OR 78/2008

<sup>142</sup> Section 3.1 of “Amines Worst Case Studies: Worst Case Studies on Amine Emissions from CO<sub>2</sub> Capture Plants (Task 6)”, 2009, Matthias Karl, Steve Brooks, Richard Wright and Svein Knudsen, Norwegian Institute for Air research (NILU) and Norwegian Institute for Water Research (NIVA), reference: NILU OR 78/2008

243. As well as the toxic impacts of the depositions of the amines, nitrosamines and nitramine compounds themselves, these compounds also add to the total nitrogen deposition. Biofuelwatch requests consideration of the potential harm to important ecological sites.
244. If precautionary deposition velocities were to be used for nitrogen (including amines, nitrosamines and nitramines), there is the likelihood that the predictions would show nitrogen deposition poses an unacceptable risk to other ecological sites too.
245. In *Landelijke Vereniging tot Behoud van de Waddenzee v Staatssecretaris van Landbouw, Natuurbeheer en Visserij (Case C-127/02)* [2005] 2 CMLR 31, the Grand Chamber of the European Court of Justice considered that the Habitats Directive must be interpreted in accordance with the Precautionary Principle. *Harris & Anor v Environment Agency* [2022] EWHC 2264 (Admin) (06 September 2022) established that the Habitats Directive has continuing “direct effect” meaning that it continues to stand independently of the Conservation of Habitats and Species Regulations 2017. Biofuelwatch considers that the applicant’s air quality predictions are not sufficiently precautionary for compliance with the Habitats Directive. Biofuelwatch requests that all sources of uncertainty are listed and quantified to support a quantified estimate of the cumulative uncertainty of the modelling predictions.

## River Derwent and River Ouse Acid Impacts

246. The applicant has highlighted how close the River Derwent and the River Ouse are to the site<sup>143</sup>:

*“The River Ouse lies adjacent to the Site, which further downstream forms part of the Humber Estuary Ramsar Site, Special Conservation Area (SAC), Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI). The River Derwent is the closest SAC located north of the Power Station”*

247. The applicant considers that the River Derwent and River Ouse have a high acid buffering capacity<sup>144</sup> and refers to Environment Agency monitoring data 2022. Whilst the acid neutralising capacity of the River may be high (as reported by the EA), this does not mean that the proposal will not have an adverse impact on the river nor that acidic air pollution may not harm important habitats near the River. Otters have been observed in the vicinity<sup>145</sup> and the River Derwent SSSI is important for breeding birds and the Humber Estuary SPA/SSSI/Ramsar is internationally and nationally important for the numbers of wintering waterfowl, nine passage waders, and nationally important assemblage of breeding birds<sup>146</sup>.

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<sup>143</sup> Page 7 of the applicant’s Non-Technical Summary [APP-178].

<sup>144</sup> The applicant’s Appendix 5 (part a), volume 3 of Habitats Regulations Assessment [APP-193].

<sup>145</sup> Paragraph 8.7.23 of Chapter 8 of the Environmental Statement [APP-044].

<sup>146</sup> Paragraph 8.7.30 of Chapter 8 of the Environmental Statement [APP-044].

248. Biofuelwatch request further consideration of the impact of acid air pollutants on these rivers and neighbouring habitats important to the River's ecology and request that such consideration should give attention to:
- a. the potential for variations in river levels for part of river plant species to be above the water and so exposed to acidic air pollution
  - b. riverine trees (which may support lichens and bryophytes that may be particularly sensitive to acidic air pollutants) and
  - c. whether there is sufficient evidence to show beyond doubt that acidic air pollutants will not cause harm to habitats and protected species.

## Non-Statutory Designated Sites

249. Natural England's policy is to only comment on the potential impact of proposals on designated sites. Natural England does not comment on impacts on non-statutory designated sites, such as local nature reserves. Natural England also does not comment on non-statutory designated sites in response to consultation from the Environment Agency either<sup>147</sup>. Since Natural England does not comment on potential impacts on these sites, careful consideration should be given to the applicant's consideration of impacts.

250. Figure 8.2 (drawing number EN010120-PA-ES-6.2.8.2-Sheet1 [APP-093]) shows non-statutory designated sites near the proposal. These are presumed to correspond with the sites considered in appendix 6.5 of the Environmental Statement:

- Common Plantation SINC
- Disused Railway Embankment SINC
- Brockholes SINC
- Meadow East of Orchard Farm SINC
- Cobble Croft Wood SINC
- Hagg Green Lane SINC
- Sand Pitt Wood & Barffs Close Plantation SINC
- Barmby-on-the-Marsh LWS
- Barmby Pond LWS

251. Figures 6.12 and 6.21 of the Environmental Statement show predicted nitrogen deposition in the wider area and show nitrogen deposition is predicted to be lower in the immediate vicinity of the site and then increase some distance away. The same is true for predicted acid deposition<sup>148</sup>.

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<sup>147</sup> The Environment Agency, in section 2.2 of the draft decision document for EPR/SP3609BX/A001 (available from <https://consult.environment-agency.gov.uk/psc/ca6-4se-fortum-carlisle-limited-ca6-4se/>) says "Note under our Working Together Agreement with Natural England, we only inform Natural England of the results of our assessment of the impact of the Installation on designated Habitats sites."

<sup>148</sup> Figures 6.13 [APP-080] and 6.21 [APP-088] of the Environmental Statement

252. Selby District Council lists many Sites of Importance for Nature Conservation in the wider area<sup>149</sup>. All sites that may potentially be impacted should be considered. There may be sites in other nearby Council districts that could also be impacted. Since significant acid deposition and significant nitrogen deposition is predicted at SAC/SPA/SSSI sites, Biofuelwatch expects there may be Sites of Importance for Nature Conservation that will also be impacted by excessive nitrogen and acid deposition too and perhaps at even higher levels.
253. It is particularly important that this matter is considered by the Examining Authority because the Environment Agency does not have evidence to show that the screening criteria used by the EA for the assessment of nature reserves (which do not take background air pollution into consideration) are adequate to conclude that emissions are “insignificant” (Annex 1 to this document shows email correspondence that includes the information request, Annex 2 shows that the EA does not have the evidence requested). The information response also shows that:
- a. the EA has no written evidence that its assessment criteria are sufficient to provide effective protection of nearby nature sites
  - b. that the EA has no written evidence that the criteria used by the EA is sufficient to prevent harm to any Priority Species (either directly or through loss/damage to habitat) that may exist at the local nature site(s) within the specified distance and
254. Annex 3 shows a discussion involving EA officers in which significant concerns are raised about the consistency of the EA’s legal obligations with the screening criteria for the assessment of nature sites and shows discussion that the EA has insufficient resources to assess impacts at nature reserves and wildlife sites.
255. In addition to the recognition within the Environment Agency that its own criteria may not be adequately protective, the Institute of Air Quality Management has written regarding the assessment criteria it uses for nature reserves and wildlife sites<sup>150</sup>:
- “It is difficult to understand how the Environment Agency’s approach can provide adequate protection”*
256. It is vital that the Examining Authority recognise the inadequacy of the EA’s assessment criteria for nature reserve and wildlife site impacts so that it can give due consideration to likely impacts. Such consideration must include ensuring that a full list of sites that may be affected is considered. Where critical loads and levels are exceeded at these sites, further increases in air pollution can be expected to cause ecological harm.

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<sup>149</sup> Selby District Local Plan - Part 1 (General Policies) 2005 Appendices 7 to 10: [https://www.selby.gov.uk/sites/default/files/Documents/local\\_plan\\_part1\\_appendices7\\_to\\_10.pdf](https://www.selby.gov.uk/sites/default/files/Documents/local_plan_part1_appendices7_to_10.pdf)

<sup>150</sup> Institute of Air Quality Management, A guide to the assessment of air quality impacts on designated nature conservation sites, Version 1.1 May 2020, Paragraph 5.5.2.2 of [REDACTED]

## Risk of Harm to Protected and Notable Species

257. Drax's environmental statement also states that a large number of protected and notable species have been identified within 2 km of the proposed project site, including bats, badgers, otters, water voles, breeding and wintering birds, amphibians, invertebrates, reptiles, fish and plants.

258. These include Great Crested Newts which were identified in three ponds close to the order limits during the Amphibian Survey. According to sections 8.9.80 and 8.9.81 of the Ecology Report:

*"Given the connectivity of suitable terrestrial habitat between the Drax Power Station Site and the ponds that support great crested newt (and other amphibians), individual great crested newts and other amphibians could use terrestrial habitats that are to be cleared or disturbed for construction of the Proposed Scheme. This could also result in the killing and / or injury of individual amphibians, including great crested newts. The predicted extent and duration of habitat loss, associated habitat disturbance and the risk of killing or injuring any great crested newt present represents a minor magnitude, partially reversible impact, which is considered to be significant at up to a Local geographical scale."*

259. Section 8.7.40 of the Ecology Report states that invertebrates found within two kilometres of the site include the small heath butterfly which is identified as a SPI via the provisions of Section 41 of the NERC Act. Moreover, according to sections 8.7.41, 8.7.42 and 8.7.44 of the Ecology Report:

*"More than 75 species of terrestrial invertebrate were identified during terrestrial invertebrate surveys of suitable habitat of the Woodyard in the north of the Drax Power Station Site in 2021."*

*8.7.42: 'Six species were identified as protected and / or notable during the survey including: alder leaf beetle (*Angelastica alni*), cinnabar moth (*Tyria jacobaeae*), dusky thorn moth (*Ennomos fuscantaria*), shaded Broad-bar moth (*Scotopteryx chenopodiata*), the crescent moth (*Helotropha leucostigma*) and the rustic moth (*Hoplodrina blanda*). Of the six species, the alder leaf beetle is the only Red Data Book (RDB) species, listed as RDB category K (RDB K), referred to as 'insufficiently known' as per the Pantheon database (Webb, 2018). The remaining five are all SPI via the provisions of Section 41 of the NERC Act.'*

*8.7.44: 'The invertebrate population is considered to be an Important Ecological Feature of District importance.'*

260. There are also green-winged orchids to the north of the power station. The Ecology report says:

*"... the green-winged orchid is classified as Near Threatened on the Vascular Plant Red Data List for Great Britain. It is scarce within North Yorkshire, with only one or two sites recorded as supporting this species and no records*

*within Selby District. Green-winged orchid is considered to be an Important Ecological Feature of District importance.”*

261. There is insufficient information to be confident that the rare orchid would not be harmed by any increased air pollution including accidental or fugitive emissions of amines. Since the plant is harmed by higher nutrient levels<sup>151</sup>, it is likely that the plant would be impacted by increased nutrient enrichment from air pollutants.
262. The wintering bird species include rare and protected bird species and are of considerable ecological importance. The bird species deserve the highest levels of protection<sup>152</sup>:

*“Of the resident species, two are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended); eleven are identified as Species of Principal Importance (SPI) under the Natural Environment and Rural Communities (NERC) Act 2006; nine are identified as Birds of Conservation Concern (BoCC) red list species; and thirteen are identified as BoCC amber list species. Additionally, 15 species are listed as priority species on the Selby Local Biodiversity Action Plan.”*

263. Moreover, Drax’s Ecology Report notes that habitats within and close to the project site are suitable to support protected and notable species and these areas will be impacted. These areas can be expected to include the rare and protected birds with the survey finding “67 bird species were recorded on Site during the wintering bird surveys” and “37 of the species recorded are legally protected or species of conservation concern”<sup>153</sup>.
264. These impacts include the loss of functionally-linked land which could impact the River Derwent SAC, Lower Derwent Valley SPA, Lower Derwent Valley Ramsar, Humber Estuary SPA and Humber Estuary Ramsar<sup>154,155</sup>. The applicant considers other internationally important sites could also be impacted through the same pathways<sup>156</sup>: Eskhamhorn Meadows SSSI, Burr Closes SSSI, Humber Estuary SSSI, and Thorne, Crowle and Goole Moors SSSI.
265. Moreover, section 9.11 of North Yorkshire County Council and Selby District Council’s Local Impact Report states that site clearance and construction will have a detrimental impact on bats:

*'There will be impact upon foraging and commuting bats as a result of site clearance and construction (broadleaved woodland, scattered trees, hedgerows and scrub)*

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<sup>151</sup> Silvertown J., Wells D.A., Gillman M., Dodd M.E., Robertson H. & Lakhani K.H. (1994) Short-term effects and long-term after-effects of fertilizer application on the flowering population of green-winged orchid *Orchis morio*. *Biological Conservation*, 69, 191-197.

<sup>152</sup> Section 3.1.8 of the Wintering Birds survey, Appendix 8.3 of the Environmental Statement [APP-138].

<sup>153</sup> Section 3.1.2 of the Wintering Birds survey, Appendix 8.3 of the Environmental Statement [APP-138].

<sup>154</sup> Table 3.3 of the applicant’s Habitats Regulations Assessment Volume 1 Main Text [APP-185].

<sup>155</sup> Paragraphs 8.9.5 of Chapter 8 of the Environmental Statement [APP-044].

<sup>156</sup> Paragraph 8.9.6 of Chapter 8 of the Environmental Statement [APP-044].

*some of which is permanent habitat loss and there will also be associated severance of habitat. Impacts are expected to be significant adverse at the local level.'*

266. Section 9.16 of the North Yorkshire County Council and Selby District Council Local Impact Report notes that the development will have adverse effects on terrestrial invertebrates:

*“habitat loss and disturbance within the woodyard area of the power station site, will lead to the greatest potential impact upon terrestrial invertebrates. A total of 75 species were identified within the site, of which six species are noted as being protected and/or notable. A residual significant adverse impact is expected at the local level.”*

267. Furthermore, section 9.14 of the Local Impact Report notes that suitable habitats for reptiles will be lost during the construction phase:

*“a limited area of the proposed works (in the woodyard within the northern part of the existing Power Station site) could be used by reptiles. These suitable habitats would be lost or disturbed during construction, including some permanent loss of habitat. There may also be impacts to individual reptiles during site clearance and construction.’*

268. Section 9.17 of the North Yorkshire County Council and Selby District Council Local Impact Report also states that green winged orchids will be impacted by habitat clearance of the woodyard area:

*“green winged orchid populations have been identified within the woodyard area of the power station site and are limited only to this area. The infrastructure associated with the development will lead to the permanent loss of habitat that supports this species. The permanent habitat loss combined with site clearance and temporary works will result in the removal of all habitats supporting this species. The impact of this is major adverse impact at the County scale which is considered significant and irreversible.”*

269. The Government Circular ‘Biodiversity and Geological Conservation - 06/2005’ stipulates that<sup>157</sup>:

*“The presence of a protected species is a material consideration when a planning authority is considering a development proposal that, if carried out, would be likely to result in harm to the species or its habitat”*

270. The application for consent is deficient in that it relies on some outdated species surveys from 2018 and therefore does not properly assess the impact on biodiversity of the proposed development.

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<sup>157</sup> Paragraph 98 of <https://www.gov.uk/government/publications/biodiversity-and-geological-conservation-circular-06-2005>



271. The surveys that were only conducted in 2018 include:

- a. the Reptile survey<sup>158</sup>
- b. the otter and water vole survey<sup>159</sup>
- c. the Breeding Bird Survey<sup>160</sup>
- d. the Bat building emergence survey<sup>161</sup> and
- e. the Bat tree roost Assessment survey<sup>162</sup>.

272. It is concerning that Assumption C of the Ecology Chapter (chapter 8) [APP-044] of the Environmental Statement states that:

*“Unless otherwise stated, the ecological baseline pertaining to protected and notable species has not changed significantly since the ecological impact assessment within the Drax Repower Environmental Statement in 2018.”*

273. Biofuelwatch considers more evidence is required to demonstrate that new surveys are not required, particularly as the worsening climate crisis means that the environmental conditions for species and population numbers may have changed since 2018. For example, swifts were an amber list species when they were recorded during the breeding bird survey in 2018. According to the 2021 Birds of Conservation Concern report, swifts are now on the red list of conservation concern.

274. As many of these species are mobile, there are concerns that the development could impact in some cases on populations of local or county value and the mitigation proposed may not be sufficient for all species.

275. The application for consent is deficient in that it does not pay sufficient attention to the potential for damage to watercourses by sediment and accidental release of chemicals.

276. Given that there are multiple important sites for biodiversity, this should be taken into account when considering the applicant's request to begin construction before the relevant permits have been granted.

## Other

277. The proposal will lead to the disturbance and degradation of vital habitats and so risk harming a wide range of protected species. The proposal is therefore not a sustainable development as defined by the National Planning Policy Framework. It fails to protect the natural environment or to enhance biodiversity, and is incompatible with:

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<sup>158</sup> Environmental Statement, Volume 3, Appendix 8.11 [APP-146]

<sup>159</sup> Environmental Statement, Volume 3, Appendix 8.9 [APP-144]

<sup>160</sup> Environmental Statement, Volume 3, Appendix 8.12 [APP-147]

<sup>161</sup> Environmental Statement, Volume 3, Appendix 8.7 [APP-142]

<sup>162</sup> Environmental Statement, Volume 3, Appendix 8.8 [APP-143]

- a. Commitments made in the Environment Act 2021 to support the “conservation and enhancement of biodiversity in England”
  - b. The aims of the Defra Nature Recovery Green Paper (March 2022) “to address the drivers of nature’s decline including habitat deterioration, loss and fragmentation”.
278. The proposed development will adversely impact nationally- and internationally-designated areas that cannot be adequately mitigated or compensated for.
279. The application for consent is deficient in that:
- a. It relies on some outdated species surveys from 2018 and therefore does not properly assess the impact on biodiversity of the proposed development.
  - b. it does not pay sufficient attention to the potential for damage to watercourses by sediment and accidental release of chemicals.
280. In reference to 2.1.4 Table 12.6 Surface Water Features within the study area that have the Potential to be Affected by the Proposed Scheme, we echo concerns raised by the EA regarding the recorded presence of Great Crested Newt, a protected species and therefore a ‘sensitive receptor’ in contrast to Drax’s statement that these ponds are not considered ‘sensitive receptors’. We are concerned about this downgrading of habitat for protected species, and would welcome comments from the Wildlife Trust on this issue.
281. Biofuelwatch concur with the points made in Part 1 of the Natural England response. In particular the lack of certainty as to impacts on Internationally and Nationally Designated sites due to loss of functionally connected land and potential impacts due to traffic emissions.
282. Natural England requested “Clarification on scenarios used to assess the impacts from aerial emissions”<sup>163</sup>. An updated comment/detailed advice from Natural England on aerial emissions does not appear to be available.
283. Paragraph 2.1.3 of “Natural England’s comments in respect of Drax Bioenergy with Carbon Capture and Storage Project, promoted by Drax Power Limited” (5 Sep 2022) [AS-011] is missing, raising the concern that important comments from Natural England may have been accidentally omitted.
284. It is very concerning that Natural England accepts the destruction of badger setts as part of the development<sup>164</sup>:

*“It should be noted that a licence to exclude badgers and the destruction of setts is unlikely to be granted between the months of December to June.”*

285. In the same document, Natural England said:

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<sup>163</sup> Paragraph 2.1.2.3 of “Natural England’s comments in respect of Drax Bioenergy with Carbon Capture and Storage Project, promoted by Drax Power Limited”, 5 Sep 2022 [AS-011].

<sup>164</sup> In Part II, table 1, point 9 of “Natural England’s comments in respect of Drax Bioenergy with Carbon Capture and Storage Project, promoted by Drax Power Limited” 05 Sep 2022 [AS-011].

*“Natural England is not yet satisfied that the project will not adversely affect the following nationally protected species: badger”*

286. Biofuelwatch requests that the Examining Authority asks Natural England to explain why it might be “satisfied” that the destruction of badger setts would not adversely affect the nationally protected badger.

287. According to the Ecology Report (Chapter 8 of the Environmental Statement) [APP-044], the proposed development is likely to lead to the disturbance and degradation of vital habitats and it risks harming a wide range of protected species.

288. Drax’s non technical summary of the Environmental Statement notes that<sup>165</sup>:

*“Likely effects from construction and decommissioning include disturbance and clearance of habitats, disturbance of protected species, and the risk of release of water-borne pollutants from plant and other machinery”*

289. The proposed development will adversely impact nationally- and internationally-designated areas that cannot be adequately mitigated or compensated for.

290. Areas close to the site that are likely to be impacted include ten international and 12 national statutory designated sites within 15 km of Drax Power Station and nine non-statutory designated sites of county importance within 2 km of the Proposed Scheme.

291. These include the River Ouse which forms part of the Humber Estuary Ramsar Site, Special Conservation Area (SAC), Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI) and the River Derwent which is a Special Conservation Area close to the Power Station<sup>166</sup>.

292. It is therefore not a sustainable development as defined by the National Planning Policy Framework because it fails to protect the natural environment or enhance biodiversity by “minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.”<sup>167</sup>

293. Moreover, the proposed development is incompatible with:

- a. Commitments made in the Environment Act 2021 to support the “conservation and enhancement of biodiversity in England”
- b. The aims of the Defra Nature Recovery Green Paper (March 2022) “to address the drivers of nature’s decline including habitat deterioration, loss and fragmentation”.

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<sup>165</sup> Page 32 of Environmental Statement Volume 4 - Non-technical Summary [APP-178].

<sup>166</sup> Environmental Statement Chapter 8, Ecology [APP-044].

<sup>167</sup> National Planning Policy Framework paragraph 174d.

294. In reference to 3. 6.10 BIODIVERSITY NET GAIN ASSESSMENT 3.1.1 The Biodiversity Net Gain (BNG) Assessment submitted records a baseline river unit value of 2.41 but fails to deliver any increase in river units.
295. As the EA states BNG is meant for enhancement, not mitigation. Based upon the currently available information from the applicant, we are concerned it is not being used correctly. We echo the EA's request for the full BNG metric assessment details, rather than just the headline figures, to be provided as part of the DCO application.

## Climate Change

### Policy Framework

296. EN-1 recognises the need to decarbonise the energy supply but is not prescriptive about how that should be achieved.
297. Section 1.7.2 of EN-1 lists key points from the Appraisal of Sustainability for EN-1. The points recognise the need to “transition to a low carbon economy” but the overarching principle is one of sustainability<sup>168</sup> which is much broader. EN-1 recognises a number of key sustainability criteria.
298. These other key sustainability criteria (with EN-1 paragraph references) include:
- a. improve the UK's security of supply (paragraphs 1.7.2, 1.7.6, 1.7.9, 2.2.6, 2.2.15, 2.2.20, 2.2.24, 2.2.25, 3.3.4, 3.3.9, 3.3.31, 3.4.2, 3.6.2, 3.6.3, 3.6.4, 3.7.8, 3.8.15, 3.8.19)
  - b. Flexible power generation (paragraph 3.3.4)
  - c. Scale and speed of development (paragraph 1.7.2)
  - d. Affordability (paragraphs 2.1.1 and 2.2.6)
  - e. Energy efficiency (paragraph 2.2.2)
299. EN-1 places considerable emphasis on security of supply as can be seen by the large number of references. It is also the reason given why Alternatives A3 and A4 were not adopted.
300. The 2021 draft EN-1 also stresses security of supply (rejecting all four Alternatives considered in favour of security of supply). The draft EN-1 emphasises the “need to dramatically increase the volume of energy supplied from low carbon sources and reduce the amount provided by fossil fuels” (paragraph 2.3.4).

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<sup>168</sup> EN-1 refers to sustainability throughout and the appraisal of sustainability within EN-1 shows the importance of achieving sustainability.

301. The 2021 draft EN-1 does support carbon capture and storage, including from bioenergy (3.3.34) but not at the expense of security of supply. The support for carbon capture and storage is qualified in paragraph 3.3.43:

*“All the generating technologies mentioned above are urgently needed to meet the Government’s energy objectives by: • providing security of supply (by avoiding concentration risk and not relying on one fuel or generation type)”.*

and paragraph 4.8.1 includes:

*“Carbon capture technologies offer the opportunity to decarbonise the electricity system whilst maintaining security of supply ...”*

302. The proposal *reduces* security of supply because with PCC operational, a significant proportion of the existing biomass electrical generation capacity at Drax (approximately 400MW out of 2500MW) would be committed to operating the carbon capture system, and would therefore not be available to the national grid.

303. The 2021 draft EN-1 also emphasises affordability (paragraphs 2.3.2, 2.3.8, 2.4.6), flexibility (paragraph 2.4.8) and the need for speed (with paragraph 3.3.20 saying that “There is an urgent need for new electricity generating capacity to meet our energy objectives”). There are also many references to energy efficiency and an expectation that new projects will lead to greater efficiency going forward (paragraph 3.3.62).

304. Achieving Sustainable Development is the primary objective of the National Planning Policy Framework (NPPF)<sup>169</sup>:

*The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs<sup>4</sup>. At a similarly high level, members of the United Nations – including the United Kingdom – have agreed to pursue the 17 Global Goals for Sustainable Development in the period to 2030. These address social progress, economic well-being and environmental protection<sup>5</sup>.*

*4 Resolution 42/187 of the United Nations General Assembly*

*5 Transforming our World: the 2030 Agenda for Sustainable Development*

305. The NPPF lists three overarching objectives: an economic objective, a social objective and an environmental objective.

306. In October 2021, the Government committed to decarbonise the UK’s electricity system by “building a secure, home-grown energy sector that reduces reliance on fossil fuels and exposure to volatile global wholesale energy prices.” We are aware that Drax has no intentions to expand wood sourcing from within the UK. Rather, their recent acquisition of wood pellet production plants in the USA to supply the UK

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<sup>169</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1005759/NPPF\\_July\\_2021.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf)

power station, clearly indicates that they intend to continue to use imported fuel. The development proposal worsens this situation. It would increase fuel consumption, quite simply as Drax aims to run the BECCS units for more hours per year in order to maximise carbon capture. It would also perpetuate Drax's reliance on imported fuel for decades, hindering the UK's drive for a "home-grown energy sector" and hindering the UK's drive to be self-sufficient in energy. If countries supplying woodfuel to the UK brought in regulatory controls to limit or halt exports, the UK could find itself without a significant fraction of its electricity generation capacity. Such a change could result in the Drax biomass plant and carbon capture units becoming stranded assets, potentially at very short notice. This raises long-term, security of supply concerns as well as sustainability concerns.

307. Paragraph 2.1 of EN-1 stresses the importance of security of supply and affordability for economic prosperity and social well-being:

*"energy is vital to economic prosperity and social well-being and so it is important to ensure that the UK has secure and affordable energy"*

308. The need for more electricity generation is recognised as being necessary to fulfil both energy and climate change policy objectives (paragraph 3.2.3) with EN-1 clearly recognising the need for much, significant and urgent new large-scale energy infrastructure (paragraph 3.3.10) with potentially the need to triple electricity generation (paragraph 3.3.14). The proposed development will reduce the generating capacity at Drax by approximately 400MW.

309. EN-1 recognises the importance of Combined Heat and Power (CHP) to increase energy efficiency.

310. National Policy Statement for Renewable Energy Infrastructure EN-3 recognises that biomass and energy from waste plants have higher impacts than wind-power generation. EN-3 refers to there being a greater number of "negative effects" associated with biomass and energy from waste.

311. Paragraph 2.5.27 of EN-3 says:

*"Given the importance which Government attaches to CHP, for the reasons set out in EN-1, if an application does not demonstrate that CHP has been considered the IPC should seek further information from the applicant. The IPC should not give development consent unless it is satisfied that the applicant has provided appropriate evidence that CHP is included or that the opportunities for CHP have been fully explored."*

312. EN-3 puts further emphasis on CHP to increase energy efficiencies with both EN-1 and EN-3 requiring CHP to have been explored.

313. Paragraph 1.7.7 of the 2021 draft EN-3 recognises the risk of "unintended consequences" of carbon capture and storage with biomass.

314. Paragraph 2.3.2 of the 2021 draft EN-3 considers biomass generating stations should set out how the proposal would be resilient to:

- the effects of rising sea levels and increased risk from storm surge
- increased risk of flooding
- impact of higher temperatures
- increased risk of drought affecting river flows

315. The proposal is considered to be contrary to these policy objectives as shown in later subsections.

316. Reference is also made by the application and the Rule 6 letter to the Government's Net Zero Strategy. The Government's strategy, published in October 2021, was ruled unlawful by the High Court in 2022<sup>170</sup>. The High Court judgement stated that the strategy does not meet the Government's obligations under the Climate Change Act on how to meet the carbon budgets. Any compliance that the proposal may have with an unlawful strategy gives little reassurance that the proposal is in accordance with a realistic and implementable plan that will achieve the net zero objective.

317. Since the net zero strategy is due to be revised by the Government before the end of March 2023 to show how the legally-binding climate targets will be met<sup>171</sup>, Biofuelwatch continues to believe that the examination of the proposed development should be delayed to allow consideration to be given to the revised Net Zero Strategy.

318. The Government's biomass strategy has also not yet been published even though it was expected in autumn 2022. This strategy will presumably inform policy and the role of biomass in UK energy policy going forward, making it highly pertinent to the issue of BECCS from woody biomass. Biofuelwatch requests that the examination timetable be delayed until the updated National Policy Statements, the amended Net Zero Strategy and the Biomass Strategy have been published so that the proposed development can be assessed against up to date Government policies.

## Emissions Trading Scheme

319. EN-1 considers that "the EU Emissions Trading System (EU ETS) forms the cornerstone of UK action to reduce greenhouse gas emissions from the power sector".

320. The EU ETS does not allow the reporting of negative emissions.

321. Therefore, the primary regulatory means of financially supporting greenhouse gas reductions is unable to support the capture of carbon from Drax. Whilst the draft EN-1 shows the government's consideration of expansion of the scheme to support negative emissions, the ETS does not currently support this and Biofuelwatch is not

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<sup>170</sup> [2022] HRLR 18, [2022] ACD 107, [2022] WLR(D) 321, [2023] 1 WLR 225, [2022] EWHC 1841 (Admin)

<sup>171</sup> [2022] HRLR 18, [2022] ACD 107, [2022] WLR(D) 321, [2023] 1 WLR 225, [2022] EWHC 1841 (Admin)

aware of a clear plan for it to do so, or indeed whether it is even practical for the ETS to be extended in this way.

322. This is an important consideration because other grants and commercial incentives may be time-limited or delayed. Drax has been in negotiation with the UK Government over financial support for carbon capture. In its request for a variation to the existing Environmental Permit to cover the use of PCC, Drax wrote:

*“However, the extent to which the project can proceed is conditional on a number of factors, most notably the development by the UK Government of a business model for BECCS and the agreement of an appropriate form of revenue support to underpin the economics of the project.”*

323. With no firm proposal on revenue support, the proposal to add PCC is not currently financially viable and is therefore not sustainable development.

## Carbon Capture at Boundary Dam and Shute Creek

324. The proposed development for PCC at Drax is novel and is significantly larger than any existing operational carbon capture facility worldwide. Most carbon capture projects on thermal power stations have failed, either through technical difficulties or because of cost overruns or regulatory uncertainty. The ‘White Rose’ development initiated by Drax in 2012 was abandoned in 2015<sup>172</sup>. In the light of repeated failures by the CCS industry over the past decade, and the consequent lack of operational experience, Biofuelwatch considers the projections of performance expected to result from retrofitting PCC to biomass units at Drax to be highly optimistic. The following paragraphs show how the only operational large-scale carbon capture facility on a thermal power station worldwide has failed to come close to its original performance targets.
325. The world's only operating commercial carbon capture facility at a coal-fired power plant, is Boundary Dam, in Canada. The carbon capture rate in 2021 was less than 37% of the official target of 90%<sup>173</sup>. The carbon capture rate at the plant deteriorated in 2021 by 43 percent compared to the previous year according to data from Sask Power the Canadian utility company operating the project<sup>174</sup>. The plant’s

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<sup>172</sup> Drax Press Release: “Drax announces plan to end further investment in White Rose Carbon Capture & Storage project” downloaded from Drax’s website on 22 February 2023:

<sup>173</sup> Karin Rives, Only still-operating carbon capture project battled technical issues in 2021, published 6 Jan 2022, S&P Global Market Intelligence, available on S&P Global Market Intelligence’s website and downloaded 22 February 2023:

<sup>174</sup> Carlos Anchondo, CCS ‘red flag?’ World’s sole coal project hits snag, 10 January 2022, E&E News, downloaded from E&E news’ website on 22 February 2023:



performance is so far short of its original target, the company has now revised its carbon capture target to just 65%<sup>175</sup>.

326. The plant's problems are explained in more detail by David Schlissel (Director of Resource Planning Analysis) and Dennis Wamsted (Associate Editor) in "Holy Grail of Carbon Capture Continues to Elude Coal Industry" published in 2018. The article says:

*'SaskPower, the state-owned utility in Saskatchewan, has spent C\$1.5 billion to retrofit Unit 3 at its Boundary Dam generation station with CCS technology. Of that total, 50%, or roughly C\$750 million, went to CO<sub>2</sub> capture equipment and C\$440 million was spent to upgrade and modernise the ageing plant so that it would be able to run long enough to recover the carbon capture investments. SaskPower spent an additional C\$293 million on related emission controls and efficiency improvements.*

*'In its 2014 annual report, the company touted the project as "the first commercial-scale post-combustion project of its kind at a coal-fired power station" and one that would be able to capture 1 million metric tons of CO<sub>2</sub> annually—roughly 90% of the plant's CO<sub>2</sub> output. Much of the captured CO<sub>2</sub> was to be used in enhanced oil recovery efforts (EOR) at an oil field in southern Saskatchewan. The rest was to be stored underground.*

*'Given its first-of-a-kind status, it is no surprise that little has gone well. The project was over budget and behind schedule when it began operating in October 2014. Its overall CO<sub>2</sub> capture rate during its first year of operation hovered at about 40%, a dismal performance, as David Jobe, SaskPower's director of carbon capture and chemical services, acknowledged in an interview with The Chemical Engineer in May of this year.*

*"Let's just say that out of the box, the plant didn't work as designed," Jobe said.*

*'Nor is the plant working now as promised. Boundary Dam has never hit its CO<sub>2</sub> sequestration goal of 1 million metric tons a year, having captured a total of only 2.2 million metric tons in the four years since its carbon capture system came online.*

*'Meanwhile, the utility has had to pay millions of dollars for temporary units that boost the capacity of the system's thermal reclaimer, the unit that purifies the amine solution used to strip CO<sub>2</sub> and sulphur dioxide from the plant's flue gases. The amine solution has been degrading faster than anticipated, overwhelming the plant's installed reclaimer and forcing the utility to bring in*

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<sup>175</sup> Press Release and David Schlissel, IEEFA: Carbon capture goals miss the mark at Boundary Dam 3 coal plant, 20 April 2021, Institute for Energy Economics & Financial Analysis. Downloaded from IEEFA website 22 February 2023:

*mobile units. The fix has worked, but according to a report prepared for SaskPower, it is “not economically sustainable.”*

*‘The amount of CO<sub>2</sub> captured at Boundary Dam is not likely to increase anytime soon either, as the entire plant has been online only approximately 50% of the time from August 2015 to August 2018.’*

*Capturing the CO<sub>2</sub> from Boundary Dam Unit 3 also is very expensive, averaging about C\$60 per metric ton (US\$42 per short ton), doubling the overall cost of producing power at the Plant.*

*SaskPower said this summer that its costly experience with Unit 3 prompted it to decide against retrofitting two other units at Boundary Dam with carbon capture technology. Instead, the two 1970s-era units will be shuttered, perhaps as early as next year.’*

327. The world’s longest running and largest CCS project involves carbon capture from a natural gas processing plant at Shute Creek in Wyoming, USA. The plant processes gas with a particularly high CO<sub>2</sub> content of 65%, making it easier and cheaper to capture. In contrast, the flue gases emitted by biomass combustion are more complex and hard to treat. Regarding the performance of carbon capture at Shute Creek, the Institute for Energy Analysis and Financial Analysis (IEEFA) said:

*“despite its improved performance over recent years, the plant has reached its capturing capacity target (about 75% of total CO<sub>2</sub> emissions) in only a few of those years. At all other times, the plant has fallen short, mostly by a wide margin”*

([ieefa.org/resources/carbon-capture-crux-lessons-learned](http://ieefa.org/resources/carbon-capture-crux-lessons-learned))

328. From these examples it is clear that historically carbon capture has performed very poorly against the intended objectives. Rates of carbon capture have fallen far short of expectations. The implications for the proposed development at Drax are addressed in the following section.

## Lack of Evidence to Support CO<sub>2</sub> Removal Performance using BECCS

329. While there have been decades of research and development into carbon capture from coal power stations, with however very little operational experience, BECCS has never been demonstrated to work at scale at all. Drax has previously admitted in written correspondence with Biofuelwatch that their assumptions about BECCS performance are not based on real-world trials<sup>176</sup>. There are currently no examples of

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<sup>176</sup> Appendix 1 of this document shows written responses from Drax’s consultation team between 17th and 23rd December 2021.

large-scale BECCS working at scale, suggesting this technology is far from ready for implementation.

330. The poor performance of the world's only operating commercial carbon capture facility at the coal-fired power plant discussed in the previous section, is a strong indication that the applicant's expectation of a 95% carbon capture rate from BECCS is highly implausible.
331. Para 6.2.2 of the Environment Agency's representation<sup>177</sup> states 'The Operator has been made aware that BAT applies not only to the proposal but to the whole of the installation. The maximisation of energy recovery is explicit in both the 'Large Combustion plant Best Available Techniques Reference document' and 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'.
332. In written correspondence with Biofuelwatch<sup>178</sup>, Drax said:

*"The plant will be designed to capture up to 95% of the CO2 in the flue gas"*

333. Designed to capture *up to* 95% of carbon dioxide does not guarantee that the design *will* capture 95% of carbon dioxide. The examination should consider what the worst case carbon capture rates may be.
334. Drax has confirmed that during startup and shutdown operations, Carbon Dioxide will be routinely released into the atmosphere - "vented" - rather than captured for transmission via the pipeline to offshore storage<sup>179</sup>. The applicant must provide an estimate of what percentage of carbon captured is intended to be lost in this way.
335. Paragraph 9.2.1.10 of the Applicant's Environmental Permit Variation request (obtained from the EA via a Freedom of Information Request) includes this statement:

*"Whilst a subsidy scheme for BECCS is not yet in place to support the development of power BECCS projects in the UK, Drax expects that any future scheme will be designed such that the units will generally be placed in the merit order such that they operate on a baseload basis.*

*Whilst the units will be able to flex power generation output and associated carbon dioxide capture within defined limits such that Drax can turn down the units in the balancing market where economic to do so or else to support system security, any decision to do so would need to price in and take account of the foregone revenue opportunity from the captured carbon dioxide."*

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<sup>177</sup> Paragraph 6.2.2, Environment Agency Relevant Representation [RR-051]

<sup>178</sup> Appendix 1 of this document (Written Responses from Drax's Consultation Team Between 17th and 23rd December 2021)

<sup>179</sup> Paragraph 2.2.30 of chapter 2 of the Environmental Statement [APP-038].

336. This shows that the subsidy scheme is not agreed. It is not currently known whether the business model will support continuous operation of the units and associated carbon capture plants. It shows power generation may be flexed which would result in a proportion of the carbon dioxide being vented during startup and shutdown. If the plant is flexed, these losses and a reduction in operational hours would result in significantly less carbon captured than hoped for by the applicant in their proposal.
337. The design of the proposed development allows the operator to generate power from the two BECCS units even if the post combustion carbon capture facility is not working. Under such conditions, the BECCS units would release significant quantities of greenhouse gases, contrary to government policy and jeopardising the UK's statutory commitment to achieve Net Zero. There is therefore no guarantee that the proposal will achieve anything approaching the hoped for carbon reductions.
338. The ES Chapter 15 [APP-051] states that the Applicant intends, subject to agreement with others, that the BECCS units 1 and 2 will be operated at full power for 8760 hours per year, i.e. continuously. The carbon balance figures in Document Reference Number: 8.6.2 (Summary of Oral Case at Issue Specific Hearing 1 and Open Floor Hearing 1 [REP-028]) confirm this intention, and accordingly estimate that the gross mass of carbon dioxide captured (B1) will be 9.207m tonnes, and the resultant net negative carbon will be 6.588m tonnes.
339. These estimates represent absolute best-case and are based on implausible assumptions. A 95% capture rate for the PCC, and 8760 hours per year operation for both BECCS units over 25 years, are simply not credible. No thermal power station can operate without maintenance down-time over a year, let alone 25 years. Biofuelwatch invites the Examining Authority to request the Applicant to provide more realistic projections taking account of real-world operating conditions and commercial contracts.
340. For example, if we recast the projections using a (still highly optimistic) 90% capture rate, and 8760 hours of operation, the gross mass captured (B1) would fall to 8.722m tonnes. At a capture rate of 80% again with 8760 hours of operation the B1 Figure falls to 7.753m tonnes.
341. A more plausible figure for operating hours would be 8000 hours per year, based on just over 4 weeks maintenance downtime. With a carbon capture rate of 80%, and 8000 hours per year full-power operation, the gross mass captured (B1) would fall to 7.080m tonnes per year.
342. Biofuelwatch suggests that this gross figure of 7m tonnes captured per year is a more realistic 'best-case' projection. For illustration, the figure falls considerably further if the capture rate achieved is 70% - to 6.019m tonnes.
343. Additionally as discussed elsewhere, there are likely to be greenhouse gas emissions arising from fossil gas powered generation, required to compensate for the parasitic energy used by Drax to run the PCC. Biofuelwatch estimates this could be as high as 1.2m tonnes per year.

344. The proposed development's sole purpose is to capture carbon. Since the development and ongoing operation of the PCC and pipeline are expected to be substantially supported by public funds, it is essential that the examination has access to a clear and plausible statement of the likely performance at capturing carbon. Biofuelwatch considers the projections made by the applicant for carbon capture are not credible.

## Calculation of Emissions Associated with Production of Chemicals

345. Paragraph 15.5.36 of the Environmental Statement [APP-051] assumes that the greenhouse gas emissions for the solvents can be calculated from summing the emissions factors of ammonia and ethylene, and multiplying this with the quantity. Whilst the method used to make the solvent is unknown (because the chemical makeup of the solvent is unknown), a method for the production of ethanol amine<sup>180</sup> describes a technique for making amines from ammonia and ethylene. The patent shows that amines can be formed from one, two, or three ethylene oxide molecules. A simple summing of emissions factors of ammonia and ethylene does not account for additional quantities of ethylene required to make diethanolamines (DEA) or triethanolamines (TEA). One or both of which could well be components of the proprietary solvent.

346. It is also important to note that the solvent manufacturing process requires significant pressure and elevated temperatures. These pressures and temperatures will have an associated energy consumption and therefore associated greenhouse gas emissions. It is doubtful that the solvent used by the plant can be made without similar energy consumption.

347. Furthermore, the plant needed to make such amines is also complex, has significant embodied carbon emissions and the ongoing maintenance and repair.

348. The quantity of solvent that may be required is also subject to significant uncertainty. Solvent degradation issues are regarded as "critical"<sup>181</sup> and the Boundary Dam carbon capture plant has suffered serious solvent degradation problems<sup>182</sup>. Recent research of pilot plants showing the importance of flue gas pre-treatment<sup>183</sup> raises the

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<sup>180</sup> Method and plant for the production of ethanol amines, EP2177501A1 European Patent Office

<sup>181</sup> Degradation of Amine Solvents in a CO<sub>2</sub> Capture Plant at Lab-Scale: Experiments and Modeling Serena Delgado, Benoît Valentin, Domitille Bontemps, and Olivier Authier Industrial & Engineering Chemistry Research 2018 57 (18), 6057-6067

<sup>182</sup> Geoff Leo, SaskPower looking for help to fix 'high cost' Boundary Dam carbon capture flaw, 28 May 2018, accessed on 22 February 2023:

<sup>183</sup> A review of degradation and emissions in post-combustion CO<sub>2</sub> capture pilot plants, Vanja Buvik, Karen K. Høisæter, Sorun J. Vevelstad, Hanna K. Knuutila, published March 2021

concern that flue gas pre-treatment may be inadequate to prevent significant solvent degradation and therefore much higher quantities of solvents.

349. As a result of all the above, Biofuelwatch considers that the application may have significantly underestimated the greenhouse gas emissions associated with solvent production.
350. The proposal also requires the use of a desiccant bed to absorb water. Biofuelwatch requests the greenhouse gas emissions associated with this desiccant (including its manufacture, transport, removal and disposal) are included in the analysis and considers the information provided insufficient to justify the applicant's choice of solid desiccant over alternative technologies that may be associated with less emissions, waste, transport (and therefore also transport emissions and transport impact)<sup>184</sup>.

## Greenhouse Gas Emissions - Inaccuracies and Omissions in the Application

351. The decades-long carbon payback period associated with using woody biomass as a fuel for power generation is incompatible with the need to reduce emissions before 2030 to safeguard 1.5degrees of global warming. While Biofuelwatch recognise that the Examining Authority is bound by Government Planning Policy, the proposed development does not reflect the growing scientific consensus<sup>185</sup> that the burning of woody biomass in power stations is not 'climate neutral'<sup>186</sup> when factors like soil carbon loss, foregone sequestration and tree regrowth performance are taken into account.
352. According to Drax's Environmental Statement Volume 3, Appendix 15.2 [APP-169], the carbon capture development will reduce the combined net capacity of the two biomass units to 931 MW, i.e. 465.6 MW per unit.
353. According to Drax's website<sup>187</sup>, the current biomass capacity is 2.6 GW across four units, i.e. 650 MW per unit. This means that the proposed development will reduce the biomass units' net capacity by 28.4%, and overall electrical

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International Journal of Greenhouse Gas Control

<sup>184</sup> Paragraph 3.5.21 of Chapter 3 of the Environmental Statement [APP-039].

<sup>185</sup> Norton, M, Baldi, A, Buda, V, et al. Serious mismatches continue between science and policy in forest bioenergy. *GCB Bioenergy*. 2019; 11: 1256– 1263.

<sup>186</sup> Helmut Haberl, Detlef Sprinz, Marc Bonazountas, Pierluigi Cocco, Yves Desaubies, Mogens Henze, Ole Hertel, Richard K. Johnson, Ulrike Kastrup, Pierre Laconte, Eckart Lange, Peter Novak, Jouni Paavola, Anette Reenberg, Sybille van den Hove, Theo Vermeire, Peter Wadhams, Timothy Searchinger, Correcting a fundamental error in greenhouse gas accounting related to bioenergy, *Energy Policy*, Volume 45, 2012, Pages 18-23, ISSN 0301-4215,

<sup>187</sup> Drax's About-Us->Business Model page on Drax's website, downloaded 22 February 2023:

generating capacity by 369 MW. This reduction is due to the energy required to capture and compress CO<sub>2</sub>.

354. There is a realistic prospect that the loss of 369 MW capacity, of so-called low-carbon electricity, will be compensated for by increased fossil fuel energy generation elsewhere. Assuming generation for 8000 hours per year, 2952GWh would be 'lost'. If that energy were supplied by a high efficiency gas turbine, the greenhouse gas emissions would be 2,952,000 x 0.43 kg/kWh = 1.268 million tonnes CO<sub>2</sub>e. Biofuelwatch considers that a figure for compensating gas power, in the region of 1.3m tonnes, should be included in any assessment of the net performance of the proposed development.
355. The technology proposed for the development is not efficient, contrary to Government guidance on post-combustion carbon capture: Best Available Technique (BAT) Review for Post Combustion Carbon Capture, V1.0 published July 2021<sup>188</sup>.
356. This would contradict the UK's climate change obligations and also the requirements under the Climate Change Act to reduce carbon emissions.
357. Non-biogenic emissions: supply chain emissions will not be captured (or 'neutralised') by the proposed carbon capture process and due to the energy penalty (or reduction in energy output due to the adding of CCS) the carbon footprint for supply chain emissions increases per MWh.
358. In Appendix 1 of Document 8.6.2 [REP-028], Drax Claim 109 KgCO<sub>2</sub>e/MWh for supply chain emissions. However these figures are disputed: "A Bad Biomass Bet: Why the Leading Approach to Biomass Energy with Carbon Capture and Storage Isn't Carbon Negative" NRDC, October 2021, NRDC commissioned a new analysis to examine the emissions from each step in the biomass supply chain, which revealed that more than one third of carbon emissions occurs off-site rather than at the power station and thus cannot be captured by the addition of CCS at the smokestack. This makes it difficult for BECCS to be carbon neutral, much less carbon negative. This analysis disaggregates and quantifies these *uncapturable* emissions in one specific and common scenario: pellets made of wood from pine plantations in the southeastern United States fueling a BECCS operation in the United Kingdom. The analysis shows that this approach to BECCS not only is not carbon negative but drives substantially more carbon pollution than the current electrical grid averages in either the United States or the United Kingdom. The existence of this study demonstrates *at least* the need for *independent* verification of supply chain emissions and indicate that Drax's supply change may in fact be much higher than they calculate, further calling into question Drax's claims of its ability to achieve 'carbon negativity'.
359. The applicant's Greenhouse Gas calculations<sup>189</sup> do not state how much of the captured CO<sub>2</sub> emissions may leak from the pipeline before it is deposited under the

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<sup>188</sup> <https://www.gov.uk/guidance/post-combustion-carbon-dioxide-capture-best-available-techniques-bat>

<sup>189</sup> Chapter 15 of the Environmental Statement [APP-051].

North Sea nor does it consider the risk of leakage from the CO<sub>2</sub> deposit. Since the project is new, there is insufficient experience to be confident that CO<sub>2</sub> leakage will not occur. Every storage location is different and there can be no confidence that the proposed storage location will have similar leakage characteristics as other storage locations. Any data on leakage from other sites is not necessarily a good prediction of likely leakage at the proposed storage site. It can be expected that some leakage may occur with the potential for significant leakage, but the assessment gives this no consideration.

360. The BEIS Biomass Policy Statement says<sup>190</sup>:

*“The Government is clear that any BECCS deployment must be genuinely and credibly ‘net negative’, meaning it must remove more GHG emissions from the atmosphere than it creates, and store them in long-term geological storage. This assessment would include all GHGs (including methane and nitrous oxide) from the whole BECCS supply chain, including carbon capture at the capture plant and eventual store.”*

361. Biofuelwatch considers the burning of woody biomass is not genuinely and credibly ‘net negative’ in the necessary timescales. Furthermore, it appears that the Applicant and the Examining Authority have reached an agreement that the assessment of this proposed BECCS development EN010120 will not include all GHGs from the whole BECCS supply chain. At 15.4.3 of the ES [APP-051] states:

*“The transport and final storage of captured carbon beyond the Carbon Dioxide Delivery Terminal Compound is outside the scope of this assessment as it will be covered by a separate consent, as described in Chapter 2 (Site and Project Description) (paragraph 2.2.47) of this ES.”*

362. The decision to scope out consideration of parts of the whole BECCS supply chain associated with this development is contrary to government policy, and must be re-considered.

363. It is not rational to exclude from this examination the impacts of transport and storage of captured carbon outside the Carbon Dioxide Delivery Terminal Compound (“the Compound”). A significant length of pipeline with associated infrastructure such as pipeline inspection gauges (PIG traps) is planned to run from the Compound to the proposed Gas-fired power station at Keadby. This section of pipeline will only transport carbon dioxide from the Drax power station. The construction and operational GHG emissions from this section must therefore be accounted for in the assessment of EN010120. The wording of the BEIS Biomass Policy is clear that the assessment should also encompass the pipeline and storage facilities beyond Keadby.

364. As well as implications for climate change, the ecological / biodiversity impacts of the Drax-Keadby pipeline are also relevant to this examination.

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<sup>190</sup> <https://www.gov.uk/government/publications/biomass-policy-statement-a-strategic-view-on-the-role-of-sustainable-biomass-for-net-zero>



365. The likely longevity of the CO<sub>2</sub> emissions also deserves consideration. Section 4.3 of “Capture for Growth” from Zero Carbon Humber considers that the location “could be used to safely store CO<sub>2</sub> under the ground for hundreds of years.” In climate terms, hundreds of years is an alarmingly short duration and risks significant climate harm to future generations should the CO<sub>2</sub> leak (also, if the CO<sub>2</sub> were to leak, there is a significant risk of acidification of the water<sup>191</sup>). Once deposited, recovery of the CO<sub>2</sub> and storage elsewhere is highly unlikely to be economic and may be impossible. It is therefore important to consider the potential risk of leakage into the water environment.

## Importance of Other Sustainability Factors

366. The proposal’s greenhouse gas emissions are considered further in the subsections below, but, from the perspective of EN-1 (which was considered in the Policy Framework section earlier), it is important to weigh any decarbonisation benefits against the other sustainability criteria considered by EN-1.

367. Energy Efficiency: The proposal results in a reduction in energy efficiency. Due to the energy penalty, installing carbon capture and storage at Drax power station will significantly reduce electricity output. Based on Drax’s own figures considered earlier, this will remove 369 MW net electrical capacity from the National Grid. Given the urgent need for new electricity generation capacity shown by both EN-1 and the draft EN1-1, this reduction in energy capacity is not consistent with policy. According to Drax’s Environmental Statement Volume 3, Appendix 15.2 [APP-168] the thermal efficiency of the biomass units operating with carbon capture will be 28.8%. Without carbon capture, Drax claim the units’ net efficiency is around 39%<sup>192</sup>. This is therefore a reduction in efficiency of 26%, a figure that does not correspond with the 28.4% proposed reduction in net capacity, which would reduce net efficiency to less than 28%. We note that Drax provides no information about the data or assumptions behind either of those figures.

According to their Planning Statement (5.2) [APP-032] that rightly sets out, a level of uncertainty, especially where a new technology is concerned, is not an argument against planning consent, as long as the “*maximum-adverse case scenario will be assessed*”. We believe that this test has not been met with regards to their assumption about future net efficiency of boilers nor even with regards to their (different) assumption about the future reduction in net capacity.

Evidence that efficiency and net output could be reduced further comes from the world’s only current commercial-scale carbon capture project at a coal unit, Boundary Dam in Canada. There, 30-31% of the unit’s energy is required to capture and

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<sup>191</sup> Metz, Bert; Davidson, Ogunlade; de Coninck, Heleen; Loos, Manuela; Meyer, Leo, eds. (2005). IPCC special report on carbon dioxide capture and storage. Cambridge: Cambridge University Press for the Intergovernmental Panel on Climate Change. ISBN 978-0-521-86643-9.

<sup>192</sup> Biomass Operations and Cost Reduction Initiatives, Drax Power, November 2019, Drax website viewed 22.2.23

compress CO<sub>2</sub><sup>193</sup>. A similar energy requirement at Drax's biomass units would reduce net efficiency to less than 26%. We believe that Drax's failure to provide evidence that the net efficiency of the biomass units with carbon capture will be >28 is a material planning issue. **Government guidance on post-combustion carbon capture (PCC)**<sup>194</sup> "covers PCC plants that use amine-based technologies to capture CO<sub>2</sub> from the flue gases of power and CHP plants fuelled by natural gas and biomass". It states that developers "must maximise the thermal energy efficiency of the power plant and of the supply of heat for the associated PCC plant" and should have regard to the Large Combustion Plant (LCP) BAT Reference (BREF) document with regards to thermal efficiencies. According to that document<sup>195</sup>, the **minimum net efficiency permitted for any existing biomass combustion plant is 28%**.

368. Flexibility: The plant currently produces power as and when it is needed. EN-1 shows such power capability to be a vital component of the UK's power generation. The proposal is for two boilers with carbon capture to generate electricity continuously and such continuous generation is necessary because the carbon capture components of the plant need to be purged during startup and shutdown<sup>196</sup> reducing carbon capture efficiency. If the boilers are operated continuously, the loss of this flexible component of the UK's power generation would be very significant.
369. Security of Supply: This reduction in energy efficiency and loss of 369 MW net electrical capacity is also a reduction in security of supply which is a key objective of EN-1. The proposal provides no additional electricity generation capacity which is the intended outcome of EN-1. Biomass electricity is classified as renewable and low carbon by the UK government. Biofuelwatch strongly disagrees with this, however, the focus here is on whether the proposal is in line with government energy and planning policies. The proposal would result in a reduction in the most important fraction (zero carbon and flexible) of the UK's overall electricity generation.
370. Affordability: The proposal requires a high level of investment. It is anticipated that significant public money would be required to support the capital cost. The resulting plant would be more complex than the current plant without carbon capture and therefore more expensive to operate, so significant public money would also be required to support the ongoing operational costs. The overall result is more expensive and less-affordable power generation. The existing boilers could operate for more hours than they currently do. Presumably, they do not because they cannot produce electricity at a competitive cost for the night-time electricity market. The

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<sup>193</sup> David Schlissel (Director of Resource Planning Analysis) and Dennis Wamsted (Associate Editor) in "Holy Grail of Carbon Capture Continues to Elude Coal Industry" published in 2018

<sup>194</sup> <https://www.gov.uk/guidance/post-combustion-carbon-dioxide-capture-best-available-techniques-bat>

<sup>195</sup> Commission Implementing Decision (EU) 2021/2326 of 30 November 2021 establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for large combustion plants (notified under document C (2021) 8580). Table 8

<sup>196</sup> Paragraph 2.2.30 of chapter 2 of the Environmental Statement [APP-038].

proposal, however, is to generate electricity continuously but with increased capital and operational costs. It is difficult to understand how such a proposal can be considered sustainable. There is a risk that the proposal may prove to be uneconomic without the long-term support of public funding. Biofuelwatch considers that combustion-based electricity generation is not sustainable compared to alternative forms of zero carbon electricity generation.

371. Scale of Development: The loss of 369 MW net electricity generating capacity is very significant. As considered earlier, the lost generating capacity may be replaced with fossil fuel generation with considerable attendant carbon emissions. Alternatively, to understand the scale of this loss of electricity, a comparison can be made with the number of offshore wind turbines that would be required to offset this lost capacity. To make up the lost 369 MW generating capacity would require approximately two hundred 3.6MW offshore wind turbines, assuming they could operate with a capacity factor of 40%. The lost generating capacity is very significant and the likely environmental impact of the loss, whether replaced by fossil fuel generation or wind generation, also very significant.
372. Speed of Development: The timescale of the proposal will reduce overall power generation during the decade when it is particularly needed to support the UK's decarbonisation (which includes an increase in electricity to support electric vehicles and the replacement of gas heating with electric).
373. CHP: There appear to be no plans for the plant to support CHP and, contrary to EN-1 and EN-3, the options for CHP have not been considered<sup>197</sup>. By way of explanation, the applicant said: "The post-combustion plant design will be optimised to maximise heat recovery and so only low-grade heat would be available, which is not considered suitable for district heating purposes. This means the post-combustion plant extension is not suitable to be CHP from the outset." It is, however, normal in any plant to maximise heat recovery for increased energy efficiency so there is no obvious reason why consideration should not be given to CHP. The applicant also considers that the EA does not require a CHP assessment<sup>198</sup> but this is not surprising because the EA explicitly refers to consideration of CHP as a planning consideration in its CHP Ready guidance including referring to EN-1 requirements for a consideration of CHP<sup>199</sup>. The suitability of the site for support for CHP infrastructure is an important planning consideration because CHP is an important means by which energy efficiency can be significantly increased, but it is only possible if there are suitable nearby uses for the waste heat. There has been insufficient consideration on whether the proposal may be better located on another plant that is able to utilise waste heat.
374. Economic: The NPPF shows the economic objective would be achieved for proposals that "help build a strong, responsive and competitive economy, by ensuring

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<sup>197</sup> Paragraph 4.9.4 of the applicant's Planning Statement [APP-032].

<sup>198</sup> Paragraph 4.9.3 of the applicant's Planning Statement [APP-032].

<sup>199</sup> Section 3.1 of "CHP Ready Guidance for Combustion and Energy from Waste Power Plants", [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/296450/LIT\\_7978\\_e06fa0.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296450/LIT_7978_e06fa0.pdf)



377. EN-1 places significant importance on all the above, particularly security of supply. It is Biofuelwatch's view that, regardless of any consideration of greenhouse gas emissions or reductions, the above issues are so extensive and significant that the proposal should not be considered to be in accordance with EN-1 and so should be refused.

## Summary of Greenhouse Gas Impacts

378. The proposal will reduce energy efficiency and has given inadequate consideration of CHP. The subsequent reduction in peak power generation (from a plant considered low-carbon) and the increased costs will occur during the period when government policy considers energy security and energy affordability to be a very high priority. The reduction in power generation will likely result in increased fossil fuel power generation elsewhere with increased carbon emissions that have not been accounted for in the proposal. The proposed change from flexible power generation to less flexible power generation is also significant when government policy recognises the importance of flexible power generation in an energy supply with an increasing contribution from renewables that are dependent on wind/sun.

379. The current ETS also calls into question the sustainability of the proposal (see section titled "Emissions Trading Scheme").

380. The proposal would increase consumption of biomass per unit of electricity and therefore increase the associated production and transport emissions per unit of electricity - emissions that cannot be captured.

381. The increased production of biomass fuel is associated with other harmful ecological and climate impacts and the plant relies on imported biomass which raises long-term security of supply questions. Government policy recognises the "negative effects" of biomass, so it follows that increased use of biomass will result in increased "negative effects". Government policy recognises the importance of 'home-grown' energy and security of supply. Compared to alternative means of energy generation, the proposal requires very considerable financial investment for energy generation with greater 'negative effects' and less security of supply.

## Flood Risk and Water Environment

382. The latest Climate Change Risk Assessment policy paper (CCRA 2022) advises that climate change adaptation must be integrated effectively into all new infrastructure and that "the evidence shows that we must be prepared for warming up to 4°C" (CCRA 2022: 3). This means an increasing flood likelihood of 44% by 2050 and 75% by 2080. The 4°C global warming scenario is not taken into account by the Flood Risk Assessment document.

383. Furthermore, the site is partially located in areas of high flood risk (3a and 3b, including a flood plain). The Sequential and Exception Test was applied to the decision making process, as per NPPF (2021) guidance on sites located in areas of

higher flood risk. The justification for the approval despite inherent risks of flooding is based on the benefits outweighing the risks within the Needs and Benefits Statement (document reference 5.3).

384. Scientists have raised the near term warming projections this year, as well as the proximity to tipping points which include polar ice and glacier melt (impacting on sea levels). To provide a realistic Flood Risk Assessment, these additional factors should also now be taken into account.
385. It is also important in this case to scope in the flood risk to the transport (rail) infrastructure as it lies on the Aire flood plain and has a history of flooding. This raises issues of risk surrounding the continued operation of Drax Power Station, and therefore the BECCS operation.
386. Within table 12.2 of the Environment Statement [APP-048], Elements Scoped Out of the Assessment it is stated that for Foul Water Treatment: No discharge to Yorkshire Water sewers during construction and / or operational phases is proposed. As the EA notes in paragraph 2.1.2 of [RR-051], this is in conflict with document 3.1 Draft Development Consent Order Schedule 1 [AS-076] - Work No. 1 (f) (viii) Work No. 1D “common supporting infrastructure including – (aa) a wastewater treatment plant”. We agree with the EA that Drax should not be allowed to scope out the drains listed in 2.1.3 of [RR-051].
387. In section 12.7 [APP-048] Baseline Conditions, it is stated in paragraphs 12.7.11 and 12.7.12 that surface water run-off is managed by a drainage system and then discharged into Carr Dyke and the River Ouse. The potential for contaminants in particular silt and gravel during construction entering those waterbodies is concerning, and we agree with the EA that these features should not be scoped out. We also are asking for clarity regarding which drains are hydraulically connected to (i) each other and (ii) the river system and therefore require a risk assessment for the surface run-off into the river system. We believe the Examining Authority and the EA should seek clarification on whether the additional waste water treatment plant has sufficient capacity to manage emergencies to protect the drainage system.
388. In reference to 2.1.5 of [RR-051], section 12.9 [APP-048] Preliminary Assessment of Likely Impacts and Effects should clarify why from the surface water receptors identified as ‘sensitive’, only three are assessed in relation to increased pollution from silt and sediments:
389. We echo the EA in asking for clarity as to whether Drax is implying that none of the other waterbodies will be affected, or they are omitted because they have not been assessed. Moreover, the changing weather patterns already experienced through climate change mean that extreme rainfall events are more intense, more protracted and increasingly frequent. Risk assessment of the site run-off needs to model widely anticipated extreme weather events and flooding around the site. Prolonged heavy rain could easily carry toxic matter or contaminated water between drains. We are currently not confident that the site bunds are sufficient to isolate the site from flooding from the Ouse and Aire river systems between now and 2050.

390. Environmental permit in specific relation to amine emissions to water. In para 6.1.6 of [RR-051] the EA mentions emissions to air and discharges to water, land and groundwater in general. However in Drax's documentation there appears to be no reference to the potential for emissions of amines and their degradation products to contaminate surrounding aquatic ecosystems, groundwater or drinking water. Studies have shown that amine-based scrubbing results in a 10-fold increase in toxic impact on freshwater ecosystems therefore we would ask that this is something that is looked at specifically.
391. It is also of note that there is no reference in Drax's application to occupational exposure (either by water, aerosol or air) to amines and its degradation products. This is concerning given Drax is currently being taken to court by the Health and Safety Executive regarding exposing its workers to wood dust.
392. Paragraph 2.3.2 of the 2021 draft EN-3 considers the need to show resilience to "increased risk of drought affecting river flows". Table 1.1 of Appendix 14.1 [APP-166] of the Environmental Statement has limited mitigation for drought. If there is a drought, it is unclear that the mitigation measure of utilisation of surface water runoff (runoff which is likely to be minimal during drought), "whenever it is feasible" will significantly reduce water abstraction from the River Ouse. The table says the "nature and volume of discharge from Drax Power Station Site will be within the existing permit limits" but the table does not give consideration to the ecological impact of water abstraction in a period of drought and how severe ecological harm will be prevented in drought conditions. It is not clear that table 2.1 of Appendix 14.1 [APP-166] considers drought at all.
393. The onus should be on Drax to transparently demonstrate it has adequately assessed all the risks.

## Accidents and Natural Disasters

394. Groundwater is vulnerable to accidental discharges of pollutants<sup>201</sup>. The proposal includes storage of the proprietary solvent. Whilst the applicant says this will be in "appropriate secondary containment" the proposal lacks sufficient consideration of other infrastructure, such as pipework, that contain the solvent and the potential for leaks. The proposal lacks sufficient consideration of the risks of such leaks to groundwater and water runoff.
395. Reference WE1 in the Register of Environmental Actions and Commitments [AS-092] lists areas that will be kerbed or bunded to collect surface water runoff for the containment of spills but there is a lack of detail. Should a leak or spillage of the solvent occur, such as during filling of storage tanks, the proposal lacks sufficient information to show that containment in this way will be adequate to prevent the release of the solvent into the environment (water and/or air), how the environment would be cleaned and how any rainwater contaminated with solvent would be safely disposed of.

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<sup>201</sup> Page 12 (page 14 of the PDF) of Appendix 17.1 of the Environmental Statement [APP-171].

396. Reference WE5 in the Register of Environmental Actions and Commitments [AS-092] lists the control measure “Daily checks will be carried out to inspect for chemical and oil leakage” but does not explain how such checks will be done to detect potential pollutants that may be harmful to the environment in quantities that observation may be unable to detect. Biofuelwatch requests information on what continuous measurement of surface water runoff will be carried out to ensure leaks or discharges do not go undetected.
397. Biofuelwatch also notes that WE5 makes no commitment to install leakage detection systems, not even in “high risk areas” and asks whether a lack of leakage detection can be considered adequate.
398. Some desiccants are extremely reactive and toxic. Further information is needed on the desiccant and any potential risks arising from its delivery, use and destruction.
399. Table 2.1 of Appendix 14.1 [APP-166] of the Environmental Statement shows a “Preliminary Assessment of Likely Significant Effects”. Biofuelwatch questions the applicant’s assessment of risk and requests the Examining Authority gives consideration to whether all risks have been appropriately assessed and classified, and whether any mitigation is sufficient to control the risk. For example, explosion resulting in major release of amine based solvent<sup>202</sup> has not been considered to be a “major accident/disaster event”. Another example is the risk of fire which is stated as “low” yet there have been fires, including significant fires, at Drax<sup>203,204,205,206,207,208,209</sup>. The applicant considers the “Significance” of fires to be “Not Significant” even though risks from fire can be very large and Drax has clearly not prevented fires from occurring. Even though fires emit pollution, these are not included in the applicant’s list of pollution incidents<sup>210</sup>. The current regulatory regime also appears inadequate

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<sup>202</sup> Risk record entry 2 in table 1.1 of appendix 17.2 of the Environmental Statement [APP-172].  
<sup>203</sup> Tom Rees, Market report: Drax power plant fire sends £10m in earnings up in smoke, 20 December 2017, accessed 22 February 2023 from the Telegraph website:

<sup>204</sup> Nathalie Thomas and Katie Martin, Drax says power station fire will have £10m impact, 20 December 2017, accessed on 22 February 2023 from the Financial Times website:

<sup>205</sup> Blaze at Drax Power Station, 25th April 2015, accessed 22 February 2023 from the York Press website:

<sup>206</sup> Crews tackle fire at Drax Power Station, 8th November 2010, accessed 22 February 2023 from the York Press website:

<sup>207</sup> Alamy Stock Photo, Image ID: G4WD3F, accessed 22 February 2023 from the Alamy website:

<sup>208</sup> Building fire at Drax Power Station 12 May 2014, accessed 22 February 2023:

<sup>209</sup> Zach Boren, ‘Significant’ fire among 76 incidents at UK’s biggest power plant, 28 November 2014, accessed from [unearthed.greenpeace.org](http://unearthed.greenpeace.org) 22 February 2023:

<sup>210</sup> Table 6.1 of Appendix 11.1 of the Environmental Statement [APP-156].



to prevent fires (because, if it was adequate, the fires would not have occurred). The risks and potential consequences of a significant fire, which may include chemical release, should be considered.

400. Biofuelwatch also questions whether the likelihood of many events associated with a changing climate in table 2.1 of Appendix 14.1 [APP-166] of the Environmental Statement should be considered to be low, such as:

- a. Damage to structures from increased run off
- b. Thermal expansion of building joints
- c. Greater demand for cooling
- d. Overheating of equipment
- e. Wind driven rain infiltration into surfaces and materials
- f. Existing drainage infrastructure overwhelmed leading to surface water flooding

401. Biofuelwatch asks the Examining Authority to give consideration to:

- a. whether the applicant's assessment of risks arising from increased temperatures and weather events have been appropriately assessed and considered
- b. Whether sufficient consideration has been given to the mitigation of these risks, for example, the "Increased wind loading on Main Stack compromising the structural integrity" is considered a "Significant" risk but no mitigation appears to be stated. The Scoping Opinion specifically mentioned that if "further works/mitigation would be required" then these should "be described in the ES and cross-reference provided to any relevant documents, including to where they are secured"<sup>211</sup>.

402. The proposal says<sup>212</sup>:

*"The new buildings will be designed to accommodate temperatures up to 35 degrees with no risk to health and safety of occupants and components for worst-case scenario temperatures."*

403. A temperature of more than 40 degrees was recorded in 2022 at Coningsby<sup>213</sup> (about 50 miles from the site). Biofuelwatch asks the Examining Authority to give careful consideration to whether the applicant's "worst-case scenarios" really are "worst-case".

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<sup>211</sup> ID 4.1.8 of Section 4.1 of the Scoping Opinion (February 2021) [APP-116].

<sup>212</sup> Table 1.1 of Appendix 14.1 of the Environmental Statement [APP-166].

<sup>213</sup> Press Office, Record high temperatures verified, 28 Thursday July 2022, accessed from the Met Office website 22 February 2023:  
<https://www.metoffice.gov.uk/about-us/press-office/news/weather-and-climate/2022/record-high-temperatures-verified>

404. Biofuelwatch also notes that the applicant makes frequent use of terms such as “relative worst-case”<sup>214</sup>, “reasonable worst-case”<sup>215</sup>, “reasonably worst-case”<sup>216</sup>, “realistic worst-case”<sup>217</sup>, “a worst-case”<sup>218</sup> (suggesting there might be another “worst-case” that could perhaps be even worse?), “current worst-case”<sup>219</sup> and “likely worst-case”<sup>220</sup>. Since the Scoping Opinion [APP-116] repeatedly showed the need for the worst-case scenario to be considered (paragraphs 2.3.24, 2.3.11, 2.3.21, section 4.7 IDs 4.1.8 and 4.7.6, and in Public Health England’s and North Yorkshire County Council’s consultation comments), Biofuelwatch requests the Examining Authority to consider whether the applicant’s qualified “worst-case” scenarios really are “worst-case” and, if not, to require consideration of the genuine worst-case.
405. Biofuelwatch notes Drax has been accused of health and safety breaches<sup>221</sup> which raises questions over whether operational procedures, and governance are adequate to protect human health. It is alleged that these breaches occurred over an extended period<sup>222</sup>. Since HSE brought the case against Drax<sup>223</sup>, it would appear that the HSE must consider that regulation, and how it is enforced, did not (and perhaps could not) prevent ongoing breaches over many years.
406. Biofuelwatch notes that the HSE have said:
- “HSE does not have a role assessing risk assessments, including the extent and severity of hazards on local populations, during the NSIP planning process. Our roles and responsibilities in terms of the operators risk assessments are undertaken at an appropriate time under health and safety legislation.”*
407. HSE consider they do not have a role assessing risk assessments and the UKHSA have opted out of involvement in the examination. The Environment Agency assessments are largely based on:

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<sup>214</sup> For example, paragraph 6.1.7 of Chapter 6 of the Environmental Statement [APP-042].

<sup>215</sup> For example, paragraph 6.5.55 of Chapter 6 of the Environmental Statement [APP-042].

<sup>216</sup> For example, paragraph 7.9.19 a of Chapter 7 of the Environmental Statement [APP-043].

<sup>217</sup> For example, paragraph 3.3.21 of the applicant’s Habitats Regulations Assessment Volume 1 Main Text [APP-185].

<sup>218</sup> For example, paragraph 4.5.12 of Appendix 8.6 of the Environmental Statement [APP-141].

<sup>219</sup> For example, paragraph 14.6.11 of the Environmental Impact Assessment Scoping Report [APP-115].

<sup>220</sup> For example, paragraph 16.7.1 of the Environmental Impact Assessment Scoping Report [APP-115].

<sup>221</sup> Megi Rychlikova, “Drax Power Station accused of 10 plus years of health and safety breaches”, 10 February 2022, York Press, downloaded from the York Press website on 22 February 2023:  
[REDACTED]

<sup>222</sup> Jillian Ambrose, “Drax faces prosecution over health risk of dust from biomass pellets”, 2 Sep 2021, The Guardian, downloaded from The Guardian website on 22 February 2023:  
[REDACTED]

<sup>223</sup> BBC “Drax: Power station firm denies health and safety breaches”, 30 November 2021 downloaded from BBC website on 23 February 2023:  
[REDACTED]

- a. The likelihood of EALs being exceeded (and, in this case, the EAL for NDMA has been set based on little health evidence and a more relaxed lifetime cancer risk), and
- b. Whether the facility can be considered BAT, but since this is a novel process there is little evidence that BAT would reduce risks to health to acceptable levels.

408. Biofuelwatch asks the Examining Authority how it intends to assess the health risks of the proposal when the UKHSA and HSE statutory consultees appear unwilling or unable to give a sufficiently detailed and considered assessment of the health risks and when the EA assessment may be narrow and based on an EAL with little supporting evidence. Biofuelwatch are concerned that the current regulatory regime may be inadequate to prevent health risks and unable or unwilling to provide adequate comment to the Examining Authority regarding the risks to health arising from the proposal.

## Do the Benefits of the Proposal Outweigh the Risk of Adverse Impacts?

409. Biofuelwatch recognises the urgent need both to reduce greenhouse gas emissions and to address the global biodiversity crisis. Both “threaten nature, human lives, livelihoods and well-being around the world”<sup>224</sup>.

410. The following table outlines Biofuelwatch’s assessment of the benefits and risks of the proposal based on the information currently available:

Benefits	Risk of Adverse Impacts
<p>Felling trees and transporting them around the world for woody-biomass burning, even with 100% carbon capture, is unlikely to be carbon negative in the timescales necessary to tackle the climate crisis (because the trees cut would have continued to capture carbon and because newly planted trees capture little carbon for many years and because disturbed soils can release much carbon and because not all carbon emissions have been accounted for and because the carbon capture and efficiency goals are unlikely to be achieved). At best, carbon capture may make the unsustainable generation of electricity from the combustion of biomass slightly less damaging, but only if it does not result in an increase in the quantity of biomass burnt or prolong the burning of biomass.</p>	<p>Reduces energy generating capacity in the decade when significant increases in energy generating capacity is required.</p> <p>The risk that this lost energy generating capacity may be replaced with fossil-fuel generation with significant carbon emissions</p> <p>The impact on the UK energy network from a reduction in energy flexibility and/or a loss in the effectiveness of the carbon capture system</p> <p>Increased harm to health arising from increased air pollution with unquantified uncertainties, unregulated dioxins, and pollutants arising from undisclosed solvents with uncertain long-term toxicity, poorly-understood chemistry, and no validated tools</p>

<sup>224</sup> Press release issued by Issued by the Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) “Tackling Biodiversity & Climate Crises Together and Their Combined Social Impacts Global Experts Identify Key Options for Solutions First-Ever Collaboration between IPBES and IPCC Selected Scientists“ June 2021. Downloaded from UN website on 23 February 2023:

<p>Unfortunately, this proposal is expected to both increase quantities and prolong the unsustainable burning. Biofuelwatch therefore considers the proposal to be unlikely to realise any benefit.</p>	<p>with which to predict environmental concentrations</p> <p>Health risks increased because of a lack of engagement by UKHSA and HSE, and the reliance by the EA on modelling prediction comparisons with EALs</p> <p>Expected harm to protected and internationally-recognised ecological sites</p> <p>Harm to protected species</p> <p>Expected harm to local ecological sites with critical loads/levels already exceeded and for which the Environment Agency has neither adequate assessment criteria, nor the resources, to protect</p> <p>No plans for environmental monitoring over a large area to assess the concentrations of air pollutants harmful to health and the environment</p> <p>No plans for environmental monitoring over a large area to assess the deposition of harmful amine pollutants to the environment and its ecological impacts</p> <p>Environmental risks from solvent leaks that may arise from plant failure/degradation or accidents</p> <p>Increased risk of accidents/disasters (inc. fires, flooding and explosion) with potentially major consequences</p> <p>Given the experience of other carbon capture projects, there is a high risk that the project may never realise the hoped for carbon capture benefits</p> <p>The likelihood of considerable public expenditure that could have been spent on proven and truly renewable energy generation capacity</p> <p>Risk that the proposal will prolong the use of a non-CHP plant with old abatement technology so prolonging poorer energy efficiencies than achievable with CHP and prolonging (and increasing) public exposure to increased levels of harmful air pollutants</p> <p>Risk to amenity from construction and operation (including from air pollution, noise and increased traffic)</p> <p>Prolonging the unsustainable cutting of trees for burning causing severe climate and ecological harm</p> <p>Prolonging the harm to communities where the logging and production of wood pellets is occurring</p>
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## Appendix 1: Written Responses from Drax's Consultation Team Between 17th and 23rd December 2021

The following information from Biofuelwatch's website is reproduced below.

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Drax has also responded to questions from Biofuelwatch during a consultation in March 2021, in which it admitted that it had no real-world evidence for capturing carbon from their biomass units.

Some observations:

- 1) There's no data about the amount of energy that will be required to capture CO<sub>2</sub> from the plant;
- 2) There's no data on the reliability of the technology;
- 3) Drax has not achieved continuous operation of carbon capture.

**Biofuelwatch** (17/12/21): Hi there. Thank you for holding this consultation. I have three questions I'd like to ask if I may.

- 1) How much CO<sub>2</sub> has been captured and how much has been stored as part of the joint trial with MHI and over what period?
- 2) What percentage of CO<sub>2</sub> from a biomass unit do you expect to capture in future?
- 3) Has it been established through the trial how much of a biomass unit's electricity will be required to capture a set proportion of CO<sub>2</sub>? Are there trial results from which to deduce the energy penalty?

**Drax** (17/12/21): Many thanks for your questions

- 1) I do not have this information to hand, but I can liaise with the project team and get back to you separately via email or telephone.
- 2) BECCS at Drax has the potential to capture 8 million tonnes of carbon each year in Selby alone – a significant proportion of the 53m tonnes CO<sub>2</sub> per year the CCC says are required from BECCS for the UK to become net zero. Again, I do not have this as a percentage, but I can get this information to you.
- 3) We do not have the exact figures to hand, but I can speak to a project engineer to source this information for you

**Drax** (19/12/21): Many thanks for participating in the Drax live chat session yesterday. Please find answers to your questions below

- 1) How much CO<sub>2</sub> has been captured and how much has been stored as part of the joint trial with MHI and over what period?

The carbon capture pilot captures around 250 kg/h of CO<sub>2</sub>. The purpose of the trial was to provide data on the capture of CO<sub>2</sub> from biomass flue gas that will help to validate the full-scale design of the capture system.

The CO<sub>2</sub> was released into the flue gas stream after capture, as there is not yet any CO<sub>2</sub> transportation & storage infrastructure in place for permanent sequestration.

2) What percentage of CO<sub>2</sub> from a biomass unit do you expect to capture in future?

The plant will be designed to capture up to 95% of the CO<sub>2</sub> in the flue gas

3) Has it been established through the trial how much of a biomass unit's electricity will be required to capture a set proportion of CO<sub>2</sub>? Are there trial results from which to deduce the energy penalty?

This was not within the scope of the trial, however, it has been an important consideration in the selection of the vendor and energy efficiency is an essential part of the project design. Specific values are commercially confidential at this point, but this aspect will be considered in the relevant chapter of the Environmental Statement.

**Biofuelwatch** (22/12/2021): For how many hours have you been able to capture 250Kg/hour without interruption?

**Drax** (23/12/2021): In response to your questions, the trial unit has been running since mid-2020, during which time it has been regularly taken in and out of operation. The aim of the trial was to not to prove operational reliability, as a pilot plant is not representative of a large-scale process in that regard. Instead, the trial has been successful in its aim of providing data on the interaction of the carbon capture solvent with Drax flue gas.

## Appendix 2: References from APIS (Air Pollution Information System) Website

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## Annex 1: Information Response EIR NR253625 Request and Notification of Delay Emails

The following emails include information request NR253625.

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From: [REDACTED][@environment-agency.gov.uk](mailto:[REDACTED]@environment-agency.gov.uk)>  
Date: Tue, 15 Mar 2022 at 10:37  
Subject: RE: NR253625 - Information request for evidence held to support the EA's Air Emissions Guidance  
To: [REDACTED][@gmail.com](mailto:[REDACTED]@gmail.com)>  
Cc: National Requests <[national.requests@environment-agency.gov.uk](mailto:national.requests@environment-agency.gov.uk)>

Hi Shlomo

I just wanted to provide you with a quick update on this. Staff resource pressures mean that we have only been able to have an internal discussion about this request this morning and we have decided that we now need to consult the AQTAG group and our legal department before we respond to this formally. We are not able to ask for a formal extension to the 20 day response period but I hope you will accept our apologies for the delay and we will provide a response as soon as possible.

Best regards

[REDACTED]

[REDACTED]  
E&B Senior Advisor (Energy from Waste)  
Environment Agency  
[\[REDACTED\]@environment-agency.gov.uk](mailto:[REDACTED]@environment-agency.gov.uk)  
Tel. [REDACTED]

**From:** [REDACTED][@gmail.com](mailto:[REDACTED]@gmail.com)>

**Sent:** 16 February 2022 09:56

**To:** [REDACTED][@googlemail.com](mailto:[REDACTED]@googlemail.com)>; [REDACTED]

**Subject:** Fwd: Information request for evidence held to support the EA's Air Emissions Guidance

FYI

----- Forwarded message -----

From: [REDACTED] [REDACTED]@gmail.com>

Date: Wed, 16 Feb 2022 at 09:55

Subject: Information request for evidence held to support the EA's Air Emissions Guidance To: Unit Enquiries <[enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk)>

To Whom It May Concern

I make this request under the Environmental Information Regulations 2004.

EA Air Emissions Guidance

(<https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>) says:

When there are local nature sites within the specified distance

If your emissions meet both of the following criteria they're insignificant – you do not need to assess them any further:

- the short-term PC is less than 100% of the short-term environmental standard
- the long-term PC is less than 100% of the long-term environmental standard

You do not need to calculate PEC for local nature sites. If your PC exceeds the screening criteria you need to do detailed modelling.

1. Please provide the evidence held by the EA that the criteria above are sufficient to conclude the emissions are "insignificant".
2. Please provide the evidence held by the EA that the criteria above are sufficient to provide effective protection of the local nature sites within the specified distance.
3. Please provide the evidence held by the EA that the criteria above are sufficient to prevent harm to any Priority Species (either directly or through loss/damage to habitat) that may exist at the local nature site(s) within the specified distance.

Thank you in advance for your consideration of this request for environmental information.

Kind regards,  
Shlomo Downen, on behalf of UKWIN

Information in this message may be confidential and may be legally privileged. If you have received this message by mistake, please notify the sender immediately, delete it and do not copy it to anyone else. We have checked this email and its attachments for viruses. But you should still check any attachment before opening it. We may have to make this message and any reply to it public if asked to under the Freedom of Information Act, Data Protection Act or for litigation. Email messages and attachments sent to or from any Environment Agency address may also be accessed by someone other than the sender or recipient, for business purposes.

## Annex 2: EIR NR253625 Response

The following email shows the information response NR253625 from the Environment Agency.

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From: [REDACTED]  
Date: Fri, 1 Apr 2022 at 18:08  
Subject: RE: NR253625 - Information request for evidence held to support the EA's Air Emissions Guidance  
To: [REDACTED] <[REDACTED]@gmail.com>  
Cc: National Requests <[national.requests@environment-agency.gov.uk](mailto:national.requests@environment-agency.gov.uk)>

Dear Shlomo

### **Enquiry regarding evidence held to support the EA's Air Emissions Guidance**

Thank you for your enquiry which was received on 16 February 2022 and apologies for the delay in responding to you.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

We do not hold any written evidence on the topics listed, but we are satisfied that our approach (which is described in the quoted guidance) is sufficient to enable us to fulfil our duties with respect to local nature sites.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the response we have sent.

Yours sincerely

[REDACTED]  
E&B Senior Advisor (Energy from Waste)  
Environment Agency  
[\[REDACTED\]@environment-agency.gov.uk](mailto:[REDACTED]@environment-agency.gov.uk)  
Tel. [REDACTED]

## Annex 3: Information Response EIR NR281128

The following emails were obtained by information request from the Environment Agency.

---

**From:** [Name redacted]  
**Sent:** 01 April 2022 11:54  
**To:** [Email addresses and contact names redacted]  
**Subject:** RE: Level of legal protection offered to local nature sites?

OK thanks all – I'll stick with the original text without the bit in red.

Cheers

[Name redacted]

**[Name redacted]**  
E&B Senior Advisor (Energy from Waste)  
Environment Agency  
[email address redacted]  
[Telephone number redacted]

**From:** [email address and name redacted]  
**Sent:** 01 April 2022 11:34  
**To:** [Email addresses and contact names redacted]  
**Subject:** RE: Level of legal protection offered to local nature sites?

Hi [Name redacted]

Yes, to the not including the text in red as NRW and NIEA have already deviated from the 100% threshold for specific circumstances, i.e. if there lichens and bryophytes present in an ancient woodland, LNR or LWS, then a 1% threshold of the lower critical level applies.

This does not mean that we have to go around surveying such sites as this would be a massive and wholly impracticable task, but in Wales, for example, my understanding is that the local-wildlife trust or The Woodland Trust would be expected to provide survey evidence showing the presence of lichens and bryophytes. If they do not, then the 100% threshold still applies.

Regards

[Name redacted]

**From:** [email address and name redacted]  
**Sent:** 31 March 2022 17:11  
**To:** [email address and name redacted]  
**Subject:** RE: Level of legal protection offered to local nature sites?

Hi [Name redacted]

Thanks for getting back to me on the below. It's helpful to know that there are no additional AQTAG documents that reference the 100 %, only our internal guidance.

As approaches vary and there is no clear consensus from the AQTAG, do you think it will be better for [name redacted] not to include the additional text in red?

If you agree I'm happy to respond to [name redacted], unless you would prefer to do

so? Thank you,

[Name redacted]

**From:** [Name redacted]

**Sent:** 31 March 2022 17:01

**To:** [email address and name redacted]

**Subject:** RE: Level of legal protection offered to local nature sites?

Hi [Name redacted]

That's what I found too – only AGTAG 14 refers to the 100% threshold and then only fleetingly.

We elaborate on the thresholds in OI 66\_12: Simple assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation and OI 67\_12: Detailed assessment of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation; and in the two equivalent OIs for intensive farming permit applications.

It is notable that these procedures state that the thresholds could change as we are reviewing them along with Natural England and the forerunner of NRW. That was in 2012 (i.e. ten years ago).

I don't think that referencing the AQTAG documents will be much use because each regulatory or conservation body uses different thresholds to a lesser or greater degree, which is why we do not have an AQTAG document for thresholds.

Regards

[Name redacted]

**From:** [email address and name redacted]

**Sent:** 31 March 2022 09:30

**To:** [email address and name redacted]

**Subject:** FW: Level of legal protection offered to local nature sites?

Hi [Name redacted]

Re. the below, I think [name redacted]'s suggested additional text is good provided we are confident AQTAG support the 100 % threshold. I just wanted to check which AQTAG guidance includes the 100

% threshold for local nature sites and if you have checked with the AQTAG separately that they support this approach, especially given NRW's differing approach for AWs?

I could only find it referenced in AQTAG 14. If this is the case I will try and make the agreed changes this morning so you can get it finalised in case it will be helpful for [name redacted] to be able to reference, unless you feel pointing to the level of legal protection is a more robust stance?

Thanks,

[Name redacted]

**From:** [Name redacted]  
**Sent:** 30 March 2022 17:08  
**To:** [email address and name redacted]  
**Cc:** [Email addresses and contact names redacted]  
**Subject:** RE: Level of legal protection offered to local nature sites?

Thanks [name redacted]. How's about:

*We do not hold any written evidence on the topics listed, but we are satisfied that our approach (which is described in the quoted guidance) is sufficient to enable us to fulfil our duties with respect to local nature sites. **Our approach has also been agreed with the Air Quality Technical Advisory Group (AQTAG) and Natural England.***

Thanks

[Name redacted]

**[Name redacted]**  
E&B Senior Advisor (Energy from Waste)  
Environment Agency  
[email address redacted]  
[Telephone number redacted]

**From:** [email address and name redacted]  
**Sent:** 30 March 2022 17:02  
**To:** [email address and name redacted]  
**Subject:** RE: Level of legal protection offered to local nature sites?

Hi [Name redacted], just a thought on mentioning AQTAG guidance and Natural England, as they are the renowned entities/grounds on protection on habitats and have agreed/been working with these approaches.

[Name redacted]

**From:** [email address and name redacted]  
**Sent:** 30 March 2022 16:52  
**To:** [Email addresses and contact names redacted]  
**Cc:** [Email addresses and contact names redacted]  
**Subject:** RE: Level of legal protection offered to local nature sites?

Thanks [Name redacted]. On reflection, I think we should probably keep the reply short and sweet and not necessarily mention our resources nor any possible intentions to review the approach. To

do otherwise will only invite more challenge. I therefore propose the following:

*We do not hold any written evidence on the topics listed, but we are satisfied that our approach (which is described in the quoted guidance) is sufficient to enable us to fulfil our duties with respect to local nature sites.*

Please let me know if you have any other comments, otherwise I'll send off the above reply in the next couple of days.

Cheers

[Name redacted]

**[Name redacted]**

E&B Senior Advisor (Energy from Waste)  
Environment Agency  
[email address redacted]  
[Telephone number redacted]

**From:** [email address and name redacted]

**Sent:** 30 March 2022 16:11

**To:** [Email addresses and contact names redacted]

**Subject:** RE: Level of legal protection offered to local nature sites?

Hi [Name redacted]

One of our AQTAG guidance notes does indeed specify these thresholds for local wildlife sites and ancient woodlands.

You have seen the reply from [name redacted] and whilst the ideal would be to apply the same threshold as we do for SACs and national SSSI's, the reality is that many local sites, etc, are not in good condition due to management factors (e.g. little or no controls on livestock grazing) rather than poor air quality, whilst there is not much readily available information or data on their condition.

Even if there were, there are so many local sites that we simply do not have the resources to look at them.

Regards

[Name redacted]

**[Name redacted] PhD CEnv MIEMA MISTC DipFM**

**Air Quality Senior Advisor | Monitoring & Assessment | Environment & Business Directorate**

Environment Agency, Lutra House, PO Box 519, Preston PR5 8BD  
[Telephone number redacted]

Incident role: Community Information Officer (CIO)

Working pattern: Monday to Friday 09:00 to 17:30



**From:** [email address and name redacted]

**Sent:** 30 March 2022 16:07

**To:** [Email addresses and contact names redacted]

**Subject:** RE: Level of legal protection offered to local nature sites?

Thanks [Name redacted]

**[Names redacted]** – I still need to provide a respond back to the original EIR query – copied below. I think one of you was going to check with the AQTAG network on this, but otherwise my conclusion at the moment is that we don't really have any evidence on this as such, and indeed may be wanting to double check that this remains the right approach.

For the moment then I presume our response is that we are not able to provide any written evidence, but we are satisfied that this approach provides the an adequate level of protection for the environment, taking into account the limited resources that we have to carry out assessments on the large number of local nature sites, and that we intend to review our approach in due course to check that it remains appropriate.

**Does that sound about right?**

Thanks

[Name redacted]

**Original EIR request**

*I make this request under the Environmental Information Regulations 2004.*

EA Air Emissions Guidance (<https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>) says:

*When there are local nature sites within the specified distance*

*If your emissions meet both of the following criteria they're insignificant – you do not need to assess them any further:*

- *the short-term PC is less than 100% of the short-term environmental standard*
- *the long-term PC is less than 100% of the long-term environmental standard*

*You do not need to calculate PEC for local nature sites. If your PC exceeds the screening criteria you need to do detailed modelling.*

*1. Please provide the evidence held by the EA that the criteria above are sufficient to conclude the emissions are "insignificant".*

*2. Please provide the evidence held by the EA that the criteria above are sufficient to provide effective protection of the local nature sites within the specified distance.*

3. Please provide the evidence held by the EA that the criteria above are sufficient to prevent harm to any Priority Species (either directly or through loss/damage to habitat) that may exist at the local nature site(s) within the specified distance.

**[Name redacted]**

E&B Senior Advisor (Energy from Waste)  
Environment Agency  
[email address redacted]  
[Telephone number redacted]

**From:** [email address and name redacted]

**Sent:** 24 March 2022 09:59

**To:** [email address and name redacted]

**Cc:** [Email addresses and contact names redacted]

**Subject:** RE: Level of legal protection offered to local nature sites?

Hi [Name redacted]

Based on [name redacted]'s assertion that we have a duty contained in section 7(1)(b) Environment Act 1995, requiring us to have regard to the desirability of conserving and enhancing natural beauty and of conserving "flora, fauna and geological or physiographical features of special interest" when formulating or considering any proposals, as an air quality specialist, I find it hard to square this requirement with our allowing deposition of pollution up to the critical level (damage threshold) without taking background air quality into account.

I am not being cynical here, as I understand completely that the thresholds for local wildlife sites and ancient woodlands are a compromise between the resources we have available and the sheer number of local wildlife sites in existence – in other words, we just do not have the people or the time available to assess the impacts on so many wildlife sites and meet the target of permitting activities within a given time.

[Name redacted] – I would like to revisit this sometime, to update how we assess such sites, to streamline the process and provide a better degree of environmental protection. I think NRW have found this balance, in that a 100% threshold applies, unless the local site or ancient woodland has lichen and bryophytes on site, in which case the threshold is that same as that for European and National SSSIs, i.e. 1%.

Whilst it could be argued that pollution-sensitive species should be present, NRW, like ourselves, do not have the resources available to assess every single local wildlife site or ancient woodland in this way. The Woodland Trust, as far as I understand, accepted this approach.

Regards

[Name redacted]

**From:** [email address and name redacted]

**Sent:** 22 March 2022 13:58

**To:** [Email addresses and contact names redacted]

**Cc:** [Email addresses and contact names redacted]

**Subject:** RE: Level of legal protection offered to local nature sites?

[Name redacted]

[Paragraph redacted as contains legally privileged advice]

Local and national nature reserves – these are defined in s15 National Parks and Access to Countryside Act 1949 whereby land is managed for the purpose of “preserving flora, fauna or geological or physiographical features of special interest in the area” and section 21 of 1949 Act gives powers to local authorities to designate local nature reserves. The EA has a duty contained in section 7(1)(b) Environment Act 1995 requiring us to have regard to the desirability of conserving and enhancing natural beauty and of conserving “flora, fauna and geological or physiographical features of special interest” when formulating or considering any proposals. So we must take account of these features when undertaking permitting of activities but the duty is only a “have regard” to and is weaker than the equivalent duty for non-pollution control functions in s7(1)(a).

Local wildlife sites – these are non-statutory i.e. have no legal conservation designation but are subject to our general duty in section 7(1)(c)(ii) Environment Act 1995 “to take into account any effect which the proposals would have on the beauty or amenity of any rural or urban area or on any such flora, fauna, features, buildings, sites or objects”. This means that we must for example screen any permitted activity for its effect on wildlife and amenity, but it is up to us to decide how we do this as by doing so we are taking account. This applies equally to all our functions and does not place more emphasis on designated sites over any other areas of nature conservation value.

Ancient woodlands are not legally defined but could be included in local wildlife sites. They are defined in the National Planning Policy Framework (July 2021) as follows “Ancient woodland: An area that has been wooded continuously since at least 1600 AD. It includes ancient semi-natural woodland and plantations on ancient woodland sites (PAWS)” which provides protection from development for such areas. Ancient woodlands would be subject to the duty in section 7(1)(c)(ii) Environment Act 1995 above. I don’t know if they could be included as a special interest feature when nature reserves are designated

There is also Section 40 Natural Environment and Rural Communities Act 2006 which imposes a duty on the Environment Agency to exercise its functions to have regard to the purpose of conserving biodiversity. It defines “conserving biodiversity” as including “in relation to a living organism or type of habitat, restoring or enhancing a population or habitat”. Therefore, the Environment Agency must assess how proposals could protect, restore or enhance nature conservation and include this as part of our decision-making process when considering exercise of any of our functions. This is a more general conservation duty in that it is not confined to protecting particular species and habitats or sites. **NB this duty has been amended by Environment Act 2021 but the changes are not yet in force.**

[Paragraph redacted as contains legally privileged advice]

[Name redacted]

Senior Managing Lawyer - Water and National Permitting Service  
Legal Services – National  
Environment Agency

[Telephone number redacted]

E-mail: [Email address redacted]

***This correspondence is from a member of the Environment Agency Legal Services team. To the extent that it contains legal advice it is legally privileged and may be exempt from***

*disclosure. Please talk to us first before you discuss this email or any attachments with anyone outside the Environment Agency, or send it outside the Environment Agency.*

**From:** [email address and name redacted]

**Sent:** 21 March 2022 16:54

**To:** [Email addresses and contact names redacted]

**Cc:** [Email addresses and contact names redacted]

**Subject:** Level of legal protection offered to local nature sites?

[Names redacted]

I have question about our legal obligations when it comes to protecting local nature sites under EPR - not sure which one of you may be best placed to answer this one?

The background is that have had an FOI from the UK Without Incineration Network (UKWIN) asking what evidence we have which underpins our guidance on gov.uk [here](#) with respect to the assessment of local nature sites (whereby local nature sites = ancient woods, local wildlife sites and national and local nature reserves).

Our guidance firstly requires applicants to calculate a process contribution (PC) using our risk assessment tool and then compare this to the short and long-term PCs for the local nature sites in question. If the PC is less than 100% then no further assessment is necessary. If it is over 100%, applicants are required to do detailed modelling.

We are in the process of putting together a justification for this (in response to an anticipated challenge from UKWIN on our current position where the PC is less than 100%) which is likely to centre around the conservative nature of the risk assessment tool, as well as the practicalities of having to carry out assessments around the many local nature sites which would otherwise have to be done (and about which there is often limited info). It would also be useful though to understand the legal side of things.

I've had a look at the attached document which doesn't mention ancient woods or national nature reserves and says that local wildlife sites are non-statutory, but that we have certain duties around local nature reserves. Even so I'm not really very clear on what this means from a practical point of view when permitting an energy from waste plant for example. **Please could you therefore set out in the simplest possible terms what are legal obligations are wrt to these types of site when it comes to permitting.**

Many thanks in advance.

[Name redacted]

**[Name redacted]**

E&B Senior Advisor (Energy from Waste)

Environment Agency

[email address redacted]

[Telephone number redacted]