

Drax Independent Advisory Board

Friday, May 29th, 2020

Invited Attendees

IAB: Sir John Beddington, Lord John Krebs, Professor Sam Fankhauser, Professor Virginia Dale, Elena Schmidt, Robert Matthews

Drax: Rebecca Heaton, Ross McKenzie, Laura O'Brien, Arabella Freeman, Brian Greensmith, Jason Shipstone, Angela Hepworth, Selina Williams

Invited external speakers: Alastair Hamilton, Antoine Stevens

Agenda:

1. 1:00 – 1:30: Introductory session

- 1.1 Introductions
- 1.2 Discussion on board operation over next six months: current schedule
- 1.3 Approve minutes and actions from November meeting
- 1.4 Review Issues list (Rebecca Heaton)
- 1.5 IAB Biodiversity study (John Krebs)
- 1.6 Brief intro to today's meeting and global drivers for BECCS (Jason Shipstone)

2. 1:30 - 3:00: Is BECCS scalable at a global level?

Presented by Antoine Stevens and Alastair Hamilton

- 2.1 What is the global potential for biomass?
- 2.2 What assumptions were used? Discussion: When do the environmental downsides become too great?

3. 3:00 – 3:15: BREAK

4. 3:15 - 4:45: Drax's BECCS project: is it technically, economically and environmentally feasible?

- 4.1 Presented by Brian Greensmith and Arabella Freeman (Drax)
- 4.2 Brief introduction to what Drax is doing:
- 4.3 Four key challenges:
 1. Technical
 2. Transport and use or storage offshore
 3. Future fuel sources
 4. Economics: capex/opex

5. 4:45 – 5:00: Conclusions and wrap up

Drax Independent Advisory Board Meeting
Friday, May 29th, 2020

Invited Attendees

IAB: Sir John Beddington (JB), Lord John Krebs (JK), Professor Sam Fankhauser (SF), Professor Virginia Dale (VD), Elena Schmidt (ES), Forest Research (Robert Matthews - RM)

Drax: Rebecca Heaton (RH), Ross McKenzie (RMck), Laura O'Brien (LOB), Arabella Freeman (AF), Brian Greensmith (BG), Jason Shipstone (JS), Angela Hepworth (AH)

Invited external speakers: Alastair Hamilton (AIH), Antoine Stevens (AS)

Introductory session

1. The meeting opened with a discussion on the Board's operation over the next six months.
2. The Board approved the minutes of the February 2020 meeting.
3. JB told the Board that he had been contacted by members of the European Academies of Science regarding their recent work on bioenergy. JB and JK met with them and discussed their roles and the IAB's work.
4. JS introduced the topic of the meeting: Bioenergy with carbon capture and storage (BECCS).
5. The Board discussed the volume of negative emissions that would be needed under IPCC pathways to keep global temperatures below 2 degrees.

Discussion on 'Can BECCS meaningfully contribute to global climate change mitigation?'

6. AH and AS led the IAB through analysis prepared for Drax on the global available potential for sustainable biomass. The analysis looked at three types of biomass:
 - a. woody biomass from forests;
 - b. agricultural residues from arable crops;
 - c. energy crops grown on degraded land.
7. To estimate the volumes of sustainable biomass available for BECCS, the top down analysis used big data and satellite imagery to evaluate the amount of global forest and cropland. The analysis used geo-fences – based on academic papers, which excluded known areas of wetland and protected areas, and incorporated analysis from more than 100 academic and industry reports.
8. The analysis used three key sustainability criteria – environmental, economic and socio-political – to filter out areas that would be unsuitable for sourcing biomass. For example, they excluded areas where sourcing biomass would negatively impact biodiversity, disrupt wetlands, support corruption and impact food security. The sustainability criteria were more stringent than other leading academic studies and research. Applying the stringent criteria resulted in a more conservative evaluation of the amount of sustainable biomass available for BECCS compared with other studies.
9. It was noted that in the modelling, the analysis had not changed current patterns of land-use, meaning agricultural land stays as agricultural and forest land stayed as forest land. It was also noted that forest removals were based on the current annual increment of forest growth.
10. The Board then asked how the analysis defined "environmentally sustainable feedstocks" – in particular residue removal thresholds. The Board noted that maintaining soil carbon is essential, but some removals may be needed to allow access to plant the next crop. Achieving the balance between operational needs (i.e. access) and the need to maintain soil carbon and nutrients will vary from site to site. The Board agreed that there was academic evidence to support the thresholds chosen for this study

11. The Board noted that the analysis estimates of the available global sustainable biomass was at the lower end of current published literature. This was due to the study's application of stringent economic, social and biodiversity filters that reduced the total volumes. RM agreed that the numbers were consistent with studies undertaken by Forest Research.
12. The analysis looked at which agricultural residues could be used as a source of bioenergy for BECCS. Up to half of the agricultural crops were considered to contain residues that could be used for bioenergy.
13. AS presented the modelling work on the potential from energy crops. This focused solely on cultivation on degraded land, that would not re-vegetate naturally. The Board agreed this was an extremely conservative lens and noted that the land could be used for multi-purpose forestry as well as dedicated energy crops.
14. The Board agreed the analysis was rigorous and robust and noted the conservative nature of the assumptions.
15. The Board noted that as the analysis was a snapshot view and not a dynamic view, it could be helpful going forward for Drax to consider dynamic issues related to climate change such as water scarcity, extreme weather events and temperatures as well as urbanization and population growth
16. The Board then discussed space issues relating to BECCS plant, asking how the supply and demand of biomass impacts the siting of BECCS plant.
17. JS noted that the UK is advantaged in its proximity to offshore storage and also has extensive mapping and understanding of the storage potential.
18. Finally, the Board commented favourably on the rigour of the analysis and the conservative nature of the assumptions. The Board concluded that although there were considerable uncertainties, the analysis showed that under reasonable and conservative assumptions, BECCS can contribute to climate change mitigation. The Board added that the study was a valuable addition to the knowledge base on biomass availability.

The Drax BECCS project: is it technically, economically and environmentally feasible?

19. JS introduced the Drax BECCS project and power station site
20. JS outlined the two technologies being considered for carbon capture – the C-Capture technology, which Drax has already trialled at the power station, and a second technology developed by Mitsubishi Heavy Industries (MHI) which is to be installed at the power station in the Autumn.
21. The C-Capture pilot uses an organic solvent to remove the CO₂ from the flue gas. The MHI technology uses an amine-based solvent to remove the CO₂. The MHI technology is already being used around the world in post-combustion carbon capture processes, but this is the first time it will be used with a 100% biomass feedstock.
22. JS explained that the government's preferred delivery mechanism for CCS projects is through an industrial cluster approach where emitters are grouped together. Drax is part of a cluster that has 12 partners including Drax.
23. The Board then discussed the socio-economic impacts of BECCS, both around the plant and in transport and storage, as well as the regions where the biomass is sourced.
24. The Board discussed the physical constraints of CO₂ storage and the need for empty oil reservoirs. The extensive work by the UK Energy Technology Institute to map offshore storage potential was noted as a valuable resource.
25. AF took the Board through Drax's work to reduce the cost of biomass supply by around a third. The Board discussed the alternative uses of the feedstocks being considered.
26. AF explained there were few alternative uses for some of the other feedstocks being considered and that in many cases, disposal was a greater problem as they were considered waste. The Board discussed other potential residues. ES said that there were certification schemes that covered residues and end of life products that Drax could use to evidence sustainability.

27. The economics of BECCS was discussed. JS noted that the cost of biomass is the key factor in the cost of producing negative emissions. The Board discussed the economic viability of BECCS versus other technologies. It was noted that unlike other technologies, BECCS produces two public goods – renewable energy and negative emissions and that both had value. In terms of policy mechanisms to reward BECCS, JS noted that there may be learnings from the successful support of renewable power through the Contract for Difference (CfD) mechanism. Other market-based mechanisms, where producers of negative emissions could sell them to other companies that need them may be an option