ESG Viewpoint

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A new life for old coal power?

The Paris climate goals require rapid decarbonisation of the global economy. As part of our 2020 climate-related engagement, we will tackle coal as it is the most carbon-intensive fossil fuel. We have been calling on electric utility companies to phase out unabated coal-fired power generation by 2030 for developed countries, and 2050 for developing countries[1].

However, closure of coal-fired power comes with a social cost, as the Just Transition[2] agenda reminds us. Whole communities may be reliant on their local coal power station for jobs. And financially, the potential retirement of coal plants before their scheduled date leaves companies with significant 'stranded asset' risk.

Faced with these issues, some companies are now looking to repurpose their coal-fired power plants instead of closing them, by replacing coal with alternative fuels – particularly biomass from wood. Power companies in the UK and Denmark have already taken this step, with plans by companies in other countries including Germany, Japan and Finland now being developed.

In theory, the idea of biomass energy is appealing. Rather than the linear process of extracting and burning coal – a non-renewable resource – biomass holds out the promise of a circular process: trees absorb CO_2 whilst growing and release it when burnt, leading to a carbon-neutral outcome. Biomass also has an advantage over intermittent renewables such as wind and solar in being able to provide a predictable power source.

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[1] See Institutional Investors Group on Climate Change joint investor letter to Eurelectric (December 2018) calling for a 2030 phase-out for developing countries, and the Powering Past Coal Alliance which supports the 2030 and 2050 timescales

[2] A 'just transition' for workers and communities as the world's economy responds to climate change was included as part of the 2015 Paris Agreement on climate change

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But some experts have called this assumption into question, pointing to the whole range of side effects and unintended consequences that large-scale land use change can bring. And investors are cautious, given the memory of the biofuels boom and bust of the late 2000s.

We visited the UK's largest power station, Drax, to gain a better understanding of the sustainability of biomass and the practical issues involved in converting power stations. In a joint investor visit, co-ordinated by the Friends Provident Foundation, we met with senior company staff including their Head of Climate Change, and toured the power station.

Drax

Drax Group plc is the owner of the UK's largest power station, Drax Power Station, which has a generating capacity of almost 4GW and is able to provide power to around 6 million households. It was built in the early 1970s close to the country's northern coal mining region, and from 1974 until 2013 ran entirely on coal.

In 2013 the company started the conversion of its boilers to run on wood pellets. Today, four of its six power generating units run entirely on biomass, and by mid 2019 94% of electricity produced was biomass-generated.

In late 2019 Drax announced its intention to be 'the world's first net carbon negative company' by 2030, based on plans to introduce large-scale carbon capture and storage, working with partners National Grid and Equinor. In 2020, Norway's sovereign wealth fund removed Drax from its investment blacklist, citing the transition away from coal.

What is involved in converting a coal plant to biomass?

From our discussion with Drax, it was clear that the challenge in coal-to-biomass conversion lies not within the power station itself, but in the supply chain.

The conversion of the coal-fired power station itself to run on biomass from wood pellets is not technically difficult, and Drax told us that only minimal work was needed on the power plant to adjust to the different fuel.

Conversely, Drax has had to make significant investments to manage the new supply chain in areas including sourcing, transportation and storage. The company has developed its in-house forestry expertise, and invested in supply chain management systems, such as audits and site visits. Onsite, we saw four 65-metre biomass domes, and a dedicated train line bringing in 14 trains every day. In sharp contrast to the plant's early days, when it sourced from local coal mines, it now has a complex global supply chain requiring an entirely different level of due diligence.

Alongside this logistical exercise, there are also significant financial challenges. The ongoing operating cost of biomass power is also not yet competitive with conventional power, due to the processing and transportation costs. In the UK market – even with the existence of a carbon floor price – biomass power is only commercially viable due to the existence of subsidies. Drax told us that it is aiming to reduce the cost of biomass in time for subsidies being removed in 2027, largely by bringing more of the supply chain under the direct control of the company.

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What is the sustainability impact?

The sustainability benefits of biomass against coal depend on a critical assumption – that the process as a whole is carbon neutral, with trees absorbing as much greenhouse gas when they grow as they release when burnt. Several academic and NGO studies have highlighted, however, that there are many reasons why this may not be the case.

One issue these studies point to is timescales. Achieving the Paris goals requires urgent action to reverse the trend in emissions in the coming decade. Burning biomass releases greenhouse gas emissions at least as high as coal, or higher due to the lower energy density; but a newly-planted tree takes many years to absorb the equivalent amount of CO_2. Similarly, forest residue left in place to rot may release carbon over decades, but if removed and burnt for power, all stored carbon is released immediately.

Emissions reduction calculations also need to consider the counterfactual – what would happen if the biomass was not sold to the power industry? For instance, if new forests are planted for the purposes of supplying biomass, any CO_2 savings would have to take into account the loss of CO_2 stored in the vegetation that was previously there.

Finally, the concept of carbon neutrality does not consider supply chain emissions. The process of turning raw wood into pellets is energy-intensive, and the majority of Drax's wood has to be transported by ship and rail from North America, where its main suppliers are located.

All biomass is not equal

In our discussions, Drax emphasised the importance of choosing the right biomass feedstock. Rather than buying purpose-built plantations or mature trees, its strategy is to use the by-products of the timber and paper industries, particularly waste from working woodland (such as weaker trees, removed to thin out the forest canopy) and industrial waste (such as sawdust and wood shavings). Drax told us that these would otherwise be burnt or disposed of as waste, so using them for power generation has no net additional emissions. The company discussed the extensive steps it has taken to ensure that it only gets feedstocks from these sources, including site visits and audit trails.

We questioned whether it can really be sure that all these sources are genuinely neutral in their impact. Drax told us that it is still doing further analysis on some feedstock sources, with the help of a newly established Independent Advisory Board.

We encouraged the company to be more frank and open about areas where there remains some ambiguity about the science, such as whether forest thinnings are genuinely neutral in their impact.

The journey to carbon negative?

In 2019 Drax announced an ambition to be carbon negative by 2030, by removing more carbon dioxide from the atmosphere than it produces through its operations. Further to maintaining a sustainable biomass supply chain, this would involve the use of carbon capture and storage (CCS) for both its biomass and gas operations. We saw an on-site pilot unit, currently capturing one tonne of CO_2 per day; the company has ambitions to scale this up to 16 million tonnes per year.

This is an ambitious agenda. Despite years of research, CCS remains at an early stage of deployment – the total capacity of all CCS facilities operating or under construction globally is around 40 million tonnes a year[3], much of this in the gas and industrial sectors rather than power generation. CCS also adds cost to the power production process, and there remains

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[3] Global CCS Institute

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significant uncertainty over government policy incentive structures as well as issues around liability and public acceptability.

However, it is clear from analysis by institutions such as the International Energy Agency that CCS is a necessary part of the effort to meet the Paris goals, particularly if the world aims for a 1.5°C future. Drax's strategy relies on the UK government accepting this logic and putting in place policies that would make the company's plans economically viable.

Conclusion

The use of biomass to extend the life of coal power stations and reduce emissions is no silver bullet, with the full lifecycle impacts of the production and use of biomass varying widely depending on the source. Managed poorly, it is quite conceivable that biomass could have more severe climate impacts than coal.

Drax gave us a compelling story about the sustainability of their sourcing policies, and we applaud their decision to announce their ambitious carbon-negative plans. Further work is still needed to explore whether energy generation from biomass is genuinely carbon neutral, and to cut supply chain emissions. We also encouraged the company to consider contingency plans in the event that feedstock costs do not fall as far as they hope and/or government support is not forthcoming. This includes considering the potential local community impacts of different future business scenarios, using the Just Transition framework as a structure to consider the risks.

Drax clearly has put significant research and resource into selecting and monitoring its biomass sources. As investors, our wider concern is that others may not be as rigorous. Biomass as a large-scale energy source carries significant risks of negative unintended consequences. There may be a natural limit to how far biomass energy can grow as genuinely sustainable sources are taken up by first movers.

As part of our wider engagement with electric utility companies, we will continue to encourage them to shift their business strategies towards the decarbonisation of the electricity system. Where we see companies planning biomass power, we will engage them on how they intend to implement robust sustainability standards.

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