

An assessment of the business and commercial risks to Drax's biomass-related business models from a financial perspective

A report by Keartland & Co July 2023







This report has been prepared by Hannah Keartland of Keartland & Co. It is an assessment of the business and commercial risks to Drax's business model from a financial perspective. The focus is on Drax's Generation and Pellet Production segments, the two segments that relate to energy from woody biomass. The report is an objective view on the resilience of Drax's business model based on the facts available.

About Keartland & Co

Keartland & Co Limited works with business leaders who want to have a meaningful impact through their business, helping them to scale up and amplify that impact. The business has a particular focus on impact business models and business model innovation.

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Introduction



1

Executive Summary



This report looks at Drax's Generation and Pellet Production segments (i.e. the ones related to power from woody biomass) through three lenses (desirability; feasibility; financial viability) to assess the level of risk to the business.

Desirability of energy from woody biomass

Energy from woody biomass is currently in demand. However, several factors mean this demand could fall away:

Carbon emissions of power from woody biomass are deemed to be zero at the point of combustion - this is contentious

• A crucial element of Drax's value proposition is that carbon emissions arising on the generation of energy from biomass are deemed to be zero at the point of combustion, providing sustainable biomass is used. There is a great deal of debate around this.

GHG Protocol Guidance will help clarify emissions for Drax

• New Greenhouse Gas Protocol Guidance will be finalised in 2023, which specifically references bioenergy and applies to several aspects of Drax's value chain. It will be important to understand the implications for Drax and its assumption of zero carbon emissions at the point of combustion.

Should power from biomass not be deemed zero emissions at the point of combustion, Drax's future funding is at risk

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• If biomass is not deemed to be zero carbon emissions at the point of combustion, this could jeopardise the carbon negativity of power from woody biomass with BECCS, which is a core part of Drax's future value proposition for the UK Government and the key to unlocking future Government funding.

Drax's business model is based on responsible sourcing yet this is in question

• A core feature of Drax's business model is that woody biomass is responsibly and sustainably sourced. However, several investigations indicate that this is not the case and there has also been criticism of the broader non-carbon environmental impacts of using and scaling up the use of woody biomass as a fuel.

Drax could be priced out of electricity market

• Comparative cost could also affect the desirability of energy from woody biomass. The cost of generating electricity from woody biomass is already much higher than other renewable energy sources. Adding BECCS will increase costs and there are several factors which mean this gap could widen and be exposed. The cost of wood is forecast to increase substantially while options for storing energy from intermittent wind and solar improve and drop in cost. If gas and electricity prices are decoupled, Drax may be priced out of the market.



Feasibility of energy from woody biomass

Competing demands for land may remove any cost benefits of using bioenergy

Both woody biomass and BECCS rely on huge amounts of land

 for producing biomass and for storing carbon. With excess
 demand for land, we might see costs increase and there might
 be a prioritisation exercise which means bioenergy is no
 longer feasible as other competing land uses such as food
 production take precedence.

Too little is known of BECCS research and development and potential hurdles; and the timetable is risky for Drax's business

 Drax's strategy relies on successful implementation of BECCS at scale. However, the technology is not currently implemented at scale and so more needs to be understood about the current stage of development of BECCS at Drax, including current carbon capture rates being achieved and technical hurdles still to be overcome. If the technology cannot be delivered on scale and on time then Drax's entire strategy comes into question.

Financial viability of Drax's business model

Drax's business would not be financially viable without government subsidy

• The UK government currently provides substantial subsidies to Drax. The current subsidy regime ends in 2027 and there is no guarantee of any subsidies after that.

However, Drax's financial accounts show that the business would not be financially viable if it didn't receive government

subsidies. The group would have made a loss before tax of £400m in 2022 and £673m in 2021.



Drax Group is reliant on Government subsidies to make a profit

More clarity is needed around alternatives for Drax's business should subsidies end

• We need to understand what alternative sources of funding might be available to Drax if UK Government subsidies stop. Drax's 2022 viability statement says that in this scenario Drax Power Stations would run "on a merchant basis"¹ and they have also shared plans to expand operations in the US¹¹. It would be helpful to see the modelling that gives them confidence in these scenarios, given their current reliance on subsidies.



Profit margins at Drax are not high enough to protect against wood pellet cost rises

 As the world transitions away from fossil fuels, demand for wood will increase across several sectors. The cost of wood pellets is expected to increase by up to 500%ⁱⁱⁱ versus current prices. This would make the comparable cost of energy from woody biomass versus other forms of renewable energy even worse.

Drax's profit margins aren't high. In 2022, a rise in cost of sales of 9% would have wiped out operating profit¹ in the Generation segment. Given that this segment is the main contributor to overall Group profit, the impact would be significant. There isn't a breakdown of cost of sales but wood pellet costs are likely to form a significant part. Therefore, a relatively small rise in the cost of wood pellets could affect Drax's viability.

Capital investment in BECCS

Drax is reliant on Government subsidies to develop and scale BECCS. It was not selected for the UK Government's Track 1 funding programme for CCUS providers^{iv}. In addition to the risk this creates around capital investment in developing BECCS, this also increases the risk of a possible subsidy gap from 2027 when current subsidies end. Drax have announced that they are in formal discussions with the UK government about bridging options^v.

Until the Government commits to providing substantial financial support for the project, its future is in the balance.

Conclusion

Drax's strategy and business model are subject to considerable risk and uncertainty.

This report highlights several areas where Drax could helpfully report additional information to give comfort on how they are mitigating risk and reducing uncertainty. For example, identifying instances where their assurance processes and risk mitigations have resulted in change. Drax has established an Independent Advisory Board to provide independent expert scrutiny. To assess the robustness of this Board, it would be insightful to understand when input from this group caused Drax to change direction or approach significantly.

Given the level of risk and uncertainty, the size of Drax's business and the level of external investment required (including from the UK Government), it would also be helpful to obtain independent assurance regarding key risks and uncertainties.

Drax does recognise these risks and uncertainties in its Annual Report but they don't affect their assessment of viability. And they chose not to focus on transition risks in their 2022 Task Force on Climate-Related Financial Disclosures (TCFD) report as they believe their "strategy is resilient against transition risks"^{vi}. However, this report highlights a high degree of uncertainty, centred around:

 Whether woody biomass will continue to be an attractive fuel in the long term

report and accounts 2022, p187 (2023): <u>https://www.drax.com/wp-content/uploads/2023/03/Drax_AR2022_single_pages-2.pdf</u>



¹ If cost of sales were to increase by £576.5m then operating profit would have been wiped out. Cost of sales are £6,479.2m and so this would be a rise of 9%. Source: Drax Group, *Delivering dispatchable, renewable power – Drax Group plc Annual*

- Whether the supply of woody biomass will be sufficient and available to deliver Drax's strategic growth plans
- If BECCS can work at the promised scale and on time
- The UK Government continuing to support Drax through financial subsidies and future investment in BECCS

We need to believe all these statements are true for Drax's strategy and financial forecasts to hold up. Every one of these assumptions is hugely uncertain. And they are existential – depending on which way they swing, they could kill the whole business model. Like the house that's built upon the sand the whole thing could come tumbling down. Part 1 – Business Overview



1 Value proposition

By generating power from biomass, Drax says that it offers "dispatchable, renewable power"vii or that it "helps to keep the lights on when the wind doesn't blow and the sun doesn't shine"viii. This is currently a core requirement in the UK energy market to replace electricity from fossil fuels. As well as the climate change imperative, it also provides an option for transitioning away from reliance on Russian gas imports. Drax's most recent annual report contains regular references to "energy security"^{ix}.

Energy from biomass can be claimed to be renewable and zero carbon emissions at the point of combustion, though both these claims are seriously criticised (see sections 5.1 and 5.2). If these two assertions are true then woody biomass can help the UK (and other countries) achieve the net zero pathway it has committed to.

Drax is developing technology to capture and store stack emissions (BECCS). When coupled with the assumption that energy from biomass generates zero carbon emissions at the point of combustion, BECCS would enable Drax to generate negative emissions. The UK Government intends to use these to offset emissions from hard-toabate sectors in the wider economy². It would be hard for the UK to meet its Paris Agreement targets without BECCS and so Drax's ability to deliver negative emissions is a key part of its longer-term value proposition.

2 Business strategy

Drax has three business segments – Generation, Pellet Production and Customers. This report focuses on the two segments that relate to energy from woody biomass – Generation and Pellet Production.

Generation

Drax's current business model for Generation is based on burning woody biomass without carbon capture and storage – i.e. unabated. In the UK they benefit from two types of subsidies – a Contract for Difference (CfD) and Renewables Obligation Certificates (ROCs). The current UK subsidy regime will end in 2027.

Unabated burning of biomass will not be long-term acceptable due to the level of stack emissions – this is the clear message from the UK's Committee on Climate Change³. Drax's future business model for Generation, therefore, relies on capture and storage of stack emissions using BECCS. BECCS technology is still in development and there is uncertainty over how it will be funded (see Sections 6.3, 7.2 and 9 for more detail).

https://www.theccc.org.uk/publication/biomass-in-a-low-carbon-economy



² "To ensure that the UK can meet its 2050 net zero emissions target, the Climate Change Committee (CCC) clearly states that greenhouse gas removals (GGRs) will be required to balance residual emissions from some of the most difficult to decarbonise sectors ... Bioenergy with Carbon Capture and Storage (BECCS) is consistently deployed from the late 2020s in current whole systems energy models which achieve net zero by 2050." Element Energy and Vivid Economics, *Investable commercial frameworks for Power BECCS*, p6 (2021):

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attac hment_data/file/1026637/investable-commercial-framework-power-beccs.pdf

⁵ "Most current uses of biomass do not sequester carbon and are in sectors where there increasingly other viable low-carbon alternatives. ... Over time, Government policies should assists a transition towards increased use of ... BECCS, and away from using ... biomass for generating power without CCS" (p12). "Do not provide further policy support (beyond current commitments) to large-scale biomass power plants that are not deployed with CCS technology." (p159). Committee on Climate Change, *Biomass in a low-carbon economy* (2018):

If Drax is successful in developing BECCS technology then there are future opportunities to sell this technology to other countries or apply it to other carbon capture scenarios within the UK. Drax's 2022 Annual Report noted that they are already exploring global options for BECCS, in particular in North America^x, and more details were provided at the May 2023 Capital Markets Day^{xi}. This is unlikely to be a material part of their business model in the short to medium term, however, and so is not considered in this report.

Pellet Production

Drax's Pellet Production segment has two elements – self-supply to Drax's Generation segment and third-party supply. In the year ended 31 December 2020, all sales were internal. Acquisition of Pinnacle during 2021 meant that third party supply grew to 36% of revenue in that year and 47% in 2022⁴. Indications are that Drax intends to continue to grow revenues from third party supply.

Both parts of the Pellet Production strategy (self-supply and thirdparty supply) rely on long term generation in the UK and internationally using woody biomass.

Fundamental strategic assumptions

The strategy and business models of the Generation and Pellet Production segments are based on three fundamental assumptions:

- Energy from woody biomass remains desirable;

- BECCS will be feasible at scale within the necessary timeframes; and
- A UK subsidy regime will remain in place.

We need to believe these things are true for Drax's strategy and financial forecasts to hold up.

They also assume that the global market for sustainable biomass will grow significantly.

It's worth noting that Drax is diversifying its business, partly through selling wood pellets to third-parties and also through hydro-electric power and storage. But the non-woody biomass parts of their strategy are still small relative to the parts of their business that rely on energy from woody biomass.

3 Financial & operational overview

3.1 Revenue and profits⁵

Drax's most recently published financial statements (year ended 31 December 2022) show total group revenue of £8.2bn before exceptional items. This comes from three business segments – Pellet Production, Generation and Customers. The Pellet Production segment supplies the Generation segment and the Generation segment supplies the Customer segment so internal sales form a substantial part of both these segments (53% of Pellet Production, 51% of Generation). Internal purchases from the Generation segment make up 93% of the Customers segment cost of sales⁶.

power - Drax Group plc Annual report and accounts 2022, p187 (2023): https://www.drax.com/wpcontent/uploads/2023/03/Drax_AR2022_single_pages-2.pdf



⁴ See Appendix 1

⁵ See Appendix 1 for more detail

⁶ Inter-segment sales from Generation to Customers is £3,719.3m; Customers segment cost of sales is £3,985.0m. Source: Drax Group, *Delivering dispatchable, renewable*

The vast majority of 2022 operating profit was generated through Generation. It was a similar story in prior years but with losses in the Customers segment.

Despite diversification, the vast majority of revenue is still from the UK (96% in year ended 31 December 2022⁷). Therefore, from a materiality perspective, it is the UK market, subsidy regime and regulation which is particularly relevant.

3.2 Subsidies⁸

Of the revenue generated by the Generation segment, 17% of this is from Government subsidies, both ROCs and CfDs. If we strip out intra-group transactions, 22% of revenue comes from these government subsidies. This is a reduction on prior years though remains a significant percentage.

At a Group level, these subsidies account for 10% of total Group revenue⁹.

The impact of subsidies on profit is more significant and discussed in Section 8.1.

3.3 Feedstock sources¹⁰

Drax's business models are reliant on woody biomass feedstock. In the year ended 31 December 2022, 58% of their feedstock came from the USA and 24% from Canada. The remaining 15% was from a mix of different regions and countries. The figures were similar in 2021. Therefore, from a materiality perspective, it is risks and changes in the USA and Canada (e.g. to regulations or climate) that are most relevant.

4 Other key features of Drax's business model

There are other key features of Drax's business model worth highlighting:

- Drax uses long term contracts to mitigate risk, both in terms of supply of wood pellets and delivery of energy.
- Drax is vertically integrated with substantial intra-group transactions between segments. The Pellet Production segment supplies the Generation segment which in turn supplies the Customers segment (see Section 3.1).
- Drax uses hedging and other financial instruments to reduce financial risk, especially arising from currency fluctuations and commodity pricing.
- Drax achieves economies of scale across all areas of its supply chain.



⁷ 96% of revenue is from UK (£7,461.7m UK revenue out of total of £7,775.3m). Source: Drax Group, *Delivering dispatchable, renewable power – Drax Group plc Annual report and accounts 2022*, p188 (2023): <u>https://www.drax.com/wp-</u> content/uploads/2023/03/Drax AR2022 single pages-2.pdf

⁸ See Appendix 1 for more detail

 ⁹ Total subsidies related to external revenue is £805.8m (£851.5m - £45.7m); total Group revenue is £8,159.2m
 ¹⁰ See Appendix 2 for more detail

- Drax's acquisition of Pinnacle in 2021 demonstrates an appetite to grow through acquisition.
- When switching from coal power generation to biomass generation, Drax's existing assets, infrastructure and relationships were able to be repurposed. This would be somewhat the case in transitioning to BECCS. This could be a barrier to entry for potential competitors.

Part 2 – Business Model Assessment



For a business model to be sustainable, it must meet three criteria:

- Its value proposition is desirable to its customers;
- It is feasible to deliver the value proposition to customers; and
- It is financially viable to deliver the value proposition to customers – i.e. revenues generated exceed costs.

In this part of the report, we will look at Drax's Generation and Pellet Production segments through these three lenses (desirability; feasibility; financial viability) to assess the level of risk to the business.

5 Desirability of energy from woody biomass

5.1 Woody biomass as a sustainable, renewable fuel

The UK Government requires that "power BECCS ... must only use sustainable biomass"^{xii} and is due to publish its Biomass Strategy in 2023, which will include a review and strengthening of the existing biomass sustainability criteria. It will be important to compare these with Drax's current and planned sourcing approach to check that Drax's sourcing approach continues to align with the UK Government's criteria.

A core feature of Drax's business model is that woody biomass is responsibly and sustainably sourced^{xiii}. However, several investigations indicate that this isn't the case^{xiv}. Given how critical this is to the desirability of Drax's offerings, more independent assurance and verification commissioned from and paid for outside Drax is needed. If woody biomass is not deemed to be a sustainable, renewable source of power then there is a risk that this will impact the level of subsidies it is able to attract (see Section 7.1).

5.2 Carbon emissions of power from woody biomass

Drax is operating on the assumption that carbon emissions arising on the generation of energy from biomass are deemed to be zero at the point of combustion, providing sustainable biomass is used¹¹. There is a great deal of debate around this^{xv} and the Intergovernmental Panel on Climate Change (IPCC) notes that "the IPCC Guidelines do not automatically consider or assume biomass used for energy as 'carbon neutral', even in cases where the biomass is thought to be produced sustainably."^{xvi}

The Greenhouse Gas Protocol is currently developing new Land Sector and Removals Guidance that will be finalised later in 2023. This new guidance specifically references bioenergy and applies to several aspects of Drax's value chain – forestry, burning of biomass and technological carbon capture (BECCS). It will be important to understand its implications for Drax and its assumption of zero carbon emissions at the point of combustion.

5.3 Woody biomass with BECCS - is it carbon negative?

The UK Government requires that "power BECCS must result in overall net-negative removal of CO2 from the atmosphere"^{xvii}. This relies on the assumption that the carbon emissions of generating power from biomass are zero at the point of combustion and, as noted in Section

14

¹¹ "The biogenic carbon emissions resulting from generation are counted as zero in official reporting to both UK authorities and under the UK Emissions Trading Scheme as the use of sustainable biomass is considered to be CO2 neutral at the point of combustion. This methodology originates from the United Nations Framework

Convention on Climate Change" Drax Group, Delivering dispatchable, renewable power - Drax Group plc Annual report and accounts 2022, p61 (2023): <u>https://www.drax.com/wp-</u> content/uploads/2023/03/Drax_AR2022_single_pages-2.pdf

5.2, there is risk around this. There are other criticisms of the overall emissions related to BECCS which indicate that the uncaptured emissions of the biomass with CCS process could equal 779 kgCO2/MWh emissions^{xviii}, around 80% of emissions from a coal stack per megawatt-hour, thereby rendering BECCS far from carbon negative.

The Land Sector and Removals Guidance that will be finalised in 2023 is expected to have detailed guidance relating to BECCS and it will be important to assess the implications for Drax.

5.4 Inefficiency of woody biomass with BECCS

To achieve high CO2 capture rates requires a lot of energy such that there is "a trade-off between power production and CO2 capture"^{xix}. Current technologies suggest that modelled capture rates of over 90% will be difficult to achieve.

5.5 Woody biomass as a fuel – other environmental impacts

Beyond carbon, there are broader environmental impacts of using woody biomass as a fuel – e.g. biodiversity, soil depletion, water impacts, alternative land uses. In its consultation regarding potential business models for biomass with BECCS, the UK government stated that "all biomass used for power BECCS will be required to meet sustainability criteria that relate to relevant GHG and non-GHG aspects of sustainability, including land use, biodiversity, and social impacts, which will be detailed further in the Biomass Strategy. We would also expect all power BECCS operators to comply with all relevant air quality regulations."^{xx} There has been criticism of the environmental impacts of using and scaling up the use of woody biomass as a fuel. Increasing criticism and tighter regulations present a risk to Drax's growth strategy and need to be monitored closely.

In December 2022, Australia became the first major economy to rule that wood harvested and burned as energy cannot be classified as renewable. One of the factors that influenced this policy change was the biodiversity impact of woody biomass^{xxi}. There is a risk that biodiversity impacts could influence policy change in other countries, including the UK, USA and Canada. Given the significance of any policy change to Drax's business model, changing public and political sentiment should be monitored closely.

Also in December 2022, the United Nations Biodiversity Conference (COP15) resulted in the agreement of the Kunming-Montreal Global Biodiversity Framework. Transnational companies such as Drax will be required to "monitor, assess, and transparently disclose their risks, dependencies and impacts on biodiversity through their operations, supply and value chains and portfolios"^{xxii}. This could impact on Drax's strategy, operations and reporting.

The Taskforce on Nature-related Financial Disclosures^{xxiii} will also create new reporting requirements for businesses from 2023 related to risks arising from biodiversity loss and ecosystem degradation. It will be important to assess the impact on Drax.

Activities at the Drax Power Station have already been impacted by water stress and, if water stress levels increase or there is a change in regulations around water usage, this could affect their ability to operate or result in fines. In their 2021 Annual Report they said they had commissioned a report to explore the sensitivity of operations to



this¹². The findings of this report weren't shared in their 2022 Annual Report and it would be helpful to see them.

As environmental regulations are tightened, there is a broader risk of fines and it will be important to understand the potential costs.

5.6 Woody biomass as a fuel - comparative cost

The cost of biomass (in the longer term with BECCS) is an important factor when comparing how desirable it is as an energy source versus alternatives.

The cost of generating electricity from woody biomass is more than double large scale solar, 98% higher than onshore wind, 63% higher than offshore wind and 23% higher than large scale hydro power^{xxiv}. This comparative cost becomes considerably more pronounced if we look at biomass with BECCS. One of the main reasons for such a large difference is because solar, wind and hydro power don't require fuel, which is an inherent part of Drax's business model.

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Levelised cost of energy (LCOE)¹³ for BECCS, biomass and energy sources^{xxv}



This high cost differential could make power from woody biomass (with BECCS in the longer term) less desirable to the UK government and general public. Drax benefits from high government funded subsidies (see Section 7.1) with an estimate that in 2021 this "added £11.60 to the average household energy bill"^{xxvi}. There is a risk that this will be unacceptable to the British public who may feel they're paying twice (for subsidies and then for power), especially given the cost-of-

assumed lifetime of the asset. Alternatively, it can be thought of as the average minimum price at which the electricity generated by the asset is required to be sold to offset the total costs of production and operation over its lifetime. The ability to apply this approach to any energy technology allows for a comparison of the cost of a technology. As a result, LCOE is a widely used metric in the energy sector." Source: Trinomics, *Government subsidies for electricity generation and combined heat and power (CHP) from solid biomass*, p27-8 (2022): <u>https://trinomics.eu/wp-</u>content/uploads/2022/11/TECI308-NRDC-Biomass-subsidies-update-2022.pdf



¹² "In 2021, we commissioned third-party specialists to establish the sensitivity of our Pellet Production and Generation operating assets to water stress, should existing rainfall, groundwater and water availability patterns be significantly disrupted as a consequence of climate change." Drax Group, *Innovating for a positive future – Drax Group plc Annual report and accounts*, p54 (2022): <u>https://www.drax.com/wp-content/uploads/2022/03/Drax_AR2021_2022-03-07.final_.pdf</u>

¹³ "The LCOE of a certain energy-generating asset is the average total cost of building and operating the asset per unit of total electricity generated over the

living crisis and the fact that Drax continues to make profits and pay dividends¹⁴.

The UK does not currently attach a carbon price to woody biomass. Introduction of one could impact the desirability of woody biomass as a fuel. If woody biomass is subject to a carbon price then it will become significantly less desirable versus non-fuel sources of energy such as wind, solar and hydro.

This carbon price risk is recognised in Drax's 2022 TCFD report:

"Future regulatory framework(s) no longer consider biomass to be renewable and/or require biomass generators to pay a carbon price on stack emissions or on supply chain emissions" xxvii

5.7 Policy implications

With the vast majority of Drax Group's revenue coming from the UK and most pellets being sourced from North America (USA and Canada), the short to medium term viability of Drax's business models is dependent on UK and North American policy where the following developments demonstrate a shifting in mindset:

- In December 2021, Citi Group downgraded Drax because it does "not fundamentally see biomass as a sustainable source of energy"xxviii
- S&P Global removed Drax from its Clean Energy Index at the end of 2022^{xxix}

Outside these core markets, the proposed changes to the EU's Renewable Energy Directive (REDIII) could make it more difficult to generate energy from biomass^{xxx}. Many countries look to the EU's approach to influence their own policy so any change could have a significant impact on Drax, especially as it expands into other countries such as Japan. The Japanese Ministry of Economy, Trade and Industry are basing their biomass regulations on the EU model.

Also in Europe, the European Academies Sciences Advisory Council says that using woody biomass for energy "is not effective in mitigating climate change and may even increase the risk of dangerous climate change."^{xxxi}

Drax's TCFD scenario analysis^{xxxii} assumes that UK regulations remain broadly the same, whereas there is risk around this and they do note that "the UK Government is due to develop its positioning and publish several relevant documents over the coming months which may impact the Group's licence to operate"^{xxxiii}. It would be helpful to model some scenarios where regulations in the UK and North America become less favourable to understand the impact this would have on Drax's financial viability and ability to scale.

It would also be helpful to understand how the impact of changing policy in one jurisdiction might influence policy change elsewhere in the world. With Australia being the first major economy to rule that woody biomass cannot be classified as renewable, there is a risk that other major economies follow suit.

MacDonald, *Subsidies for Drax biomass*, 25 March 2022: <u>https://ember-climate.org/insights/research/subsidies-for-drax-biomass/</u>



¹⁴ An Ember report noted that at the same time "the company has announced an operating profit of £197 million, alongside a rising dividend to shareholders." Phil

5.8 International expansion

Drax's Pellet Production segment expects to expand internationally on the assumption that the demand for biomass for power generation will grow significantly^{xxxiv}. It would be helpful to understand the evidence for this and the sensitivity of their financial forecasts to these market growth assumptions.

5.9 Alternatives to woody biomass power generation

Current energy model

The UK's current energy model requires reliable, flexible power for baseload and energy security. Scenarios for the UK's energy market assume that some level of dispatchable generation will continue to be needed in the next few decades.

The ability to offer "dispatchable, renewable power" is a central part of Drax's value proposition and the BECCS investment case. To assess the viability of Drax's business model, it will be important to understand how long this demand for baseload power will continue, as well as how much demand will there be for this type of dispatchable power versus cheaper solar / wind power.

Energy storage improvements

A disadvantage of wind and solar power is that they don't produce a reliable, on-demand source of power. As technologies for storing energy improve and costs decrease¹⁵, this could enable cheap energy from wind and solar to be made available when needed. If storage

costs decrease to a point where this is cheaper than energy from woody biomass with BECCS, Drax's value proposition is at risk.

A transformed energy system

Until now the UK and many other countries have had a centralised power model which creates demand for dispatchable baseload power. There are indications that the whole system will be transformed and the Sixth Carbon Budget refers to "a more flexible electricity system"^{xxxv}. With installations of solar panels and wind turbines, power generation is becoming decentralised. Decentralised networks can intrinsically enable resilience and we could see a shift away from centralised asset-based business models.

The proposed decoupling of gas and electricity prices in the UK has the potential to exacerbate the already high comparative cost of biomass (see Section 5.6). Unbundling electricity prices would expose the high cost of biomass-generated power relative to solar and wind and this high price differential would likely stimulate and accelerate system level innovation and transformation.

Market transformation is not only a risk to Drax's market competitive value proposition but could also add further weight to criticism of high comparative costs of energy from biomass with BECCS.

It would be helpful to understand what a decentralised energy system might look like and what business models might exist. Could Drax innovate its business model to take advantage of these new business models or are they more likely to be developed by industry newcomers as has happened in other sectors?

97% in the last three decades (2021): <u>https://ourworldindata.org/battery-price-decline</u>



¹⁵ For example, the price of lithium-ion batteries has reduced by 97% since 1991. Source: Hannah Richie for Our World in Data, *The price of batteries has declined by*

5.10 Reputational risk

Increasing questions and media scrutiny surrounding Drax and the wider energy from woody biomass industry risk damaging Drax's reputation and the desirability of its value proposition.

Enviva's reputation

In October 2022, Blue Orca Capital announced that it had shorted its investment in Enviva (the largest international wood pellet supplier) as it believes Enviva is "engaged in textbook greenwashing". Enviva's share price dropped 19% after this announcement. It recovered towards the end of 2022 before dropping again. In May 2023, it dropped by 60%^{xxxvi} after Enviva announced losses for the first quarter and that they would not be paying a dividend^{xxxvii}. It hasn't recovered and the share price on 27 June 2023 was 17% of its value 12 months earlier¹⁶.

Blue Orca Capital said this about Enviva and the sustainability of its business model:

"We do not believe that investors should reliably model the continuation of environmental subsidies for European customers to buy wood pellets procured from clear-cutting American forests in the name of climate activism. In addition to evidence of greenwashing, it's also a bad business." XXXVIII

With Drax and Enviva operating in the same market and Enviva being a major supplier of wood pellets to Drax, there is a risk that the same could be said of Drax.

Green Claims Code

The Green Claims Code^{xxxix} was introduced in the UK in September 2021. As a result, UK companies are facing increasing scrutiny over their sustainability claims and several large companies have been investigated^{xil} with the Competition and Markets Authority also scrutinising whole industries^{xli}. There is a risk that Drax could be affected and, if its sustainability claims are refuted, its ability to market itself to the public as sustainable could be removed.

6 Feasibility of energy from woody biomass

6.1 Availability of land

A UK government study identified that "the main obstacle for BECCS worldwide is the availability of land, water and fertiliser to supply biomass."^{xlii} The draft Land Sector and Removals Guidance from the Greenhouse Gas Protocol specifically note that bioenergy and BECCS "can increase the competition for land"^{xlii}.

With excess demand for land, we might see costs increase (see Section 7.2) and there might be a prioritisation exercise which means bioenergy is no longer feasible. One of the decision-making factors in any prioritisation exercise could be the amount of land needed to produce a unit of energy. The Land Gap Report notes that "noncarbon renewable energy sources represent more efficient use of land to produce energy than does bioenergy. For example, solar panels are 100 times more efficient per unit land area than bioenergy for energy production."^{xliv}



¹⁶ Share price on 27 June 2023 was \$10.5800; share price on 28 June 2022 was \$61.0300. Source: MarketWatch, *Enviva Inc.* (accessed 28 June 2023): https://www.marketwatch.com/investing/stock/eva

If a 'land use hierarchy' is produced, the position of bioenergy on that hierarchy would impact Drax's strategy for growth and the feasibility of the woody biomass sector as a whole. Therefore, this is an area that needs to be followed closely.

6.2 BECCS feasibility risk

Drax's strategy relies on successful implementation of BECCS at scale. Drax's Annual Report suggests that plans for design and delivery are on track and further detail was given at the May 2023 Capital Markets Day^{xlv}. However, there is no specific detail on technical progress made. The technology is not currently implemented at scale¹⁷ and this presents a significant risk to Drax's strategy and continued operation.

More needs to be understood about the current stage of development of BECCS at Drax, including:

- Current carbon capture rates being achieved (i.e. percentage of emissions capture), how these compare with the UK Government's required capture rates and what is being done to improve these.
- Energy penalty (loss of power output) when CCS is added to the emissions stack.
- Technical hurdles which need to be overcome before BECCS can be rolled out at scale.

As well as the feasibility of carbon capture, there is also a feasibility risk related to the subsequent carbon storage. The draft GHG Protocol Land Sector guidance suggests that companies will only be able to account for carbon removals if certain conditions around storage and monitoring are met^{xlvi}. To ensure that Drax's financial forecasts are complete, it will be important to understand costs of ongoing storage and monitoring, as well as who will pay for these.

Drax has agreed to a long-term contract with Mitsubishi Heavy Industries Engineering for Drax to use its carbon capture technology^{xlvii}. It would be helpful to understand the terms of that contract and any risk-sharing and reward-sharing built in.

7 Financial viability of Drax's business model

7.1 Revenue - government subsidies

The UK government currently provides substantial subsidies to Drax in respect of energy generated from woody biomass. These are in the form of ROCs and CfDs. Drax's 2022 Annual Report assumes that there will be "no material changes to the medium-term regulatory environment and associated support regimes beyond those already announced at the date of this report"xivii. However, this is an area of significant risk.

Drax's financial accounts show that the business would not be financially viable if it didn't receive government subsidies. The group would have made a loss before tax of £400m in 2022 and £673m in

¹⁷ The current pilot has been capturing 300kg of CO2 per day. The intention is that the first full-scale unit will become operational in 2027 capturing 4Mt of CO2 each year, with the second becoming operational in 2030 so that together they're removing 8Mt of CO2 each year by 2030. Sources: International Energy Agency, *Drax BECCS* (accessed 22 March 2023): https://www.iea.org/reports/ccus-around-the-

<u>world/drax-beccs;</u> Drax Group, Delivering dispatchable, renewable power - Drax Group plc Annual report and accounts 2022, p15 (2023): <u>https://www.drax.com/wp-</u> content/uploads/2023/03/Drax_AR2022_single_pages-2.pdf

2021. Operating losses in the Generation segment (where profit before tax figures aren't available for 2022) would have been £655m and £876m. The situation was similar in previous years though the contribution of subsidies to the bottom line is decreasing. See Appendix 1 for details.



The current subsidy regime ends in 2027. Drax have announced that they are in formal discussions with the UK government about bridging options^{xlix} until new subsidies might be available in relation to BECCS and associated negative emissions.

If Drax is unable to deliver negative emissions then its appeal to the UK Government will decrease. In parallel, if the costs and effectiveness at scale of direct air capture technologies improve then these might become a more appealing negative emissions option for government to invest in. The Government will also be influenced by broader sentiment around the desirability of energy from woody biomass (see Section 5). As the UK Government faces increased spending constraints, the risk that it chooses to reduce financial support for Drax increases.

The Government might choose to prioritise other types of climate change investment if these are seen to deliver more effective and immediate impact in terms of reducing greenhouse gas emissions. A recent Trinomics report explored alternative uses of government subsidies and concluded that there could be a better impact if they were used "to install energy efficient home insulation or heat pumps."¹ There's also an argument for investment in behaviour change measures.

Conditions attached to subsidies could also become more stringent. It would be helpful to model how these conditions might change and the associated impact this would have on Drax's operations and cost base.

The level of uncertainty and risk of changes to Drax's current revenue stream increase because there will be a General Election in the UK by January 2025 with current indications that there will be a change in Government.

In this context, it would be helpful to understand what alternative sources of funding might exist if Drax weren't receiving Government subsidies after 2027, when the current subsidy regime expires. How would they plug the funding gap to remain financially viable?

Drax's 2022 viability statement states:

"The Group benefits from the stable and material earnings stream available from current subsidies until 31 March 2027. In



the period beyond current subsidies the viability modelling assumes that Drax Power Station runs on a merchant basis.^{*m*}

It would be helpful to see the modelling that gives them this confidence given the current reliance on subsidies.

In their May 2023 Capital Markets Day presentation, they shared plans to commission carbon capture and storage on a US-based pellet plant by 2026^{III}. This would qualify for tax credits in the US and could potentially provide an additional funding stream when UK subsidies expire. It would be helpful to understand more about these plans, their likelihood and associated risks, especially since CitiGroup analysts said the plans lacked 'fundamentals'^{IIII}.

In addition to Government subsidies, Drax doesn't pay a carbon price on stack emissions since these are assumed to be zero at the point of combustion (see Section 5.2). In contrast, coal and gas power plants pay a carbon price on their emissions. Therefore, there is a risk that if the carbon emissions of power generated from woody biomass were no longer deemed to be zero at the point of combustion, Drax might be subject to a UK carbon price in addition to losing subsidies.

7.2 Costs - biomass cost inflation

Drax relies on woody biomass as a feed stock.

As we globally transition away from fossil fuels, we will see increasing international demand for wood. As the global market for wood grows and pressure on land increases (see Section 6.1), there's a risk that the price of woody biomass feedstocks increases. The Climate Change Committee estimated that by 2050, the cost of wood pellets could increase by 100-500% versus current prices^{liv}. This aligns with modelling carried out by the Network of Central Banks and Supervisors for Greening the Financial System, which projected that 2050 EU biomass prices would be around 200-300% higher than currently^{ly}. This would make the comparable cost of energy from woody biomass versus other forms of renewable energy even worse and so potentially less desirable (see Section 5.6).

Drax's Annual Accounts don't give a breakdown of cost of sales so it's not possible to do a sensitivity analysis of gross profit to the price of wood pellets. However, margins are not high. In 2022, a rise in total cost of sales of 14%¹⁸ would have wiped out gross profit in the Generation segment. A rise in total cost of sales of 9% would have wiped out operating profit¹⁹. Drax is becoming more vertically integrated and this should cushion them from some of the price increases as well as enabling them to benefit from price increases through third party wood pellet sales. However, Pellet Production is still a relatively small part of their business (5% of revenue in 2022²⁰) and only 7%²¹ of Generation's cost of sales relates to internal purchases. Therefore, the forecast dramatic increases in wood pellet prices are likely to have a significant impact.



¹⁸ If cost of sales were to increase by £879.0m then gross profit would have been wiped out. Cost of sales are £6,479.2m and so this would be a rise of 14%. Source: Drax Group, *Delivering dispatchable, renewable power – Drax Group plc Annual report and accounts 2022*, p187 (2023): <u>https://www.drax.com/wp-</u> content/uploads/2023/03/Drax AR2022 single pages-2.pdf

¹⁹ If cost of sales were to increase by £576.5m then operating profit would have been wiped out. Cost of sales are £6,479.2m and so this would be a rise of 9%. Source: Drax Group, *Delivering dispatchable, renewable power – Drax Group plc Annual*

report and accounts 2022, p187 (2023): <u>https://www.drax.com/wp-</u>content/uploads/2023/03/Drax_AR2022_single_pages-2.pdf

²⁰ £377.2m external revenue to Pellet Production out of a total Group revenue before exceptional items of £8,159.2m. See Appendix 1 for detail.

²¹ £425.4m of internal sales from the Pellet Production segment out Generation segment cost of sales of £6,479.2m (£7,358.2m revenue less £879.0m gross profit). See Appendix 1 for detail.

It is not clear whether the forecast price increases in wood pellets incorporate inflation in shipping costs or the costs of managing and recovering from extreme weather events, though this seems unlikely. Drax relies on shipping woody biomass from North America to the UK and so it's important to make sure that any shipping cost inflation is understood and modelled into cost of sales forecasts.

Drax's 2021 Annual Report and Accounts stated that their "strategy is focused on continued reduction in pellet production costs"^{IVI}. And an article from 2017 said that Drax was "examining how to cut biomass costs further so the plant can operate without subsidy"^{IVII}. The 2022 Annual Report and Accounts is less strong on this, stating "we remain focused on opportunities to reduce the cost of biomass but will balance this against the need to optimise our supply chain to deliver value for the Group"^{IVIII}. It would be helpful to understand progress made and the potential impact on costs, as well as future plans in this area.

The risk of high wood costs could potentially be mitigated by using lower-cost non-wood biomass feedstocks. This appears to be a big opportunity for Drax and they have an Alternative Fuels programme looking at options^{lix}. It would be helpful to understand what progress has been made in testing these alternatives, whether they can feasibly be burned using Drax's current power station and how their carbon emissions compare with woody biomass since this could impact their desirability as a replacement fuel. Also, how these different feedstocks would impact cost of sales for Drax's Generation segment.

It would be helpful to understand other ways that price volatility of woody biomass feedstock could be managed or mitigated.

7.3 Costs of BECCS - ongoing operations

As noted in Section 6.2, it will be important to understand costs of ongoing storage and monitoring, as well as who will pay for these. Connected to this, negative emissions would need to be determined, regulated and independently verified. We need to understand costs of this and who would pay to ensure they're factored into financial forecasts.

Drax's financial forecasts assume they benefit financially from delivering negative emissions while carbon prices increase – i.e. their financial return increases as carbon price increases. It would be helpful to understand the impact of this on their financial forecasts and the financial impact if they don't achieve negative emissions as planned.

The investment costs of BECCS are discussed in Section 8.

7.4 Extreme weather events

Drax's 2021 Annual Report talked about having insurance cover in place which can help cover extreme weather scenarios^{1x}. This isn't mentioned in the 2022 Annual Report. It would be helpful to understand if this cover is still in place and, if it is, the nature and extent of the cover.

There is also a risk that extreme weather events become uninsurable, which could have significant financial implications. We are already seeing extreme weather events becoming uninsurable in certain parts of the world (e.g. flooding in Australia). It would be helpful to model this scenario and quantify the potential financial impact on Drax.



Part 3 – Other Financial Considerations



Section 7 looked at the financial viability of Drax's underlying business model and so focused on ongoing costs. In Sections 8 and 9 we look at one off financial investments and balance sheet implications. These are crucial to delivering Drax's strategy but are separate to the business model.

8 Costs of BECCS - capital investment

8.1 Government investment

Drax is reliant on Government subsidies to develop and scale BECCS. The costs of developing, implementing and running BECCS are huge – a recent report estimated that government subsidies of between £23.5bn and £44.3bn would be required^{|xi} though there is a high level of uncertainty about what the actual cost would be.

Public sentiment could influence Government support and so should be monitored. Ember estimated that BECCS-related subsidies would increase household energy bills by £16.44 per year^{lxii}. In the current economic climate and with many generators continuing to make large profits, this could be poorly received by the UK public.

Similar CCS projects in the UK have failed due to the UK Government removing support²² and so this is a substantial risk for Drax. Drax was not selected for the UK Government's Track 1 funding programme for CCUS providers^[xiii]. In addition to the risk this creates around capital investment in developing BECCS, this also increases the risk of a

https://www.sciencedirect.com/science/article/pii/S187661021731906 2 possible subsidy gap from 2027 when current subsidies end. Drax have announced that they are in formal discussions with the UK government about bridging options^{lxiv}.

In March 2023, prior to the announcement of Track 1 funding, Will Gardiner, CEO of Drax, commented:

"Whilst we welcome the Government's ambition to invest billions in carbon capture and storage, we need them to provide us with a firm commitment to BECCS before we invest £2bn in this UK project."^{Ixv}

This suggests that Drax's published strategy is at risk.

The Government has been consulting on the best business model and payments framework to incentivise development of BECCS^{lxvi}. It will be important to stay abreast of government developments regarding funding mechanisms, requirements and business models.

8.2 Financial modelling

In modelling the capital investment in BECCS and associated payback periods we need to understand:

- The investment needed to get BECCS operational at scale;
- The amount of investment already secured and from whom;



²² For example

A proposed CCS plant in Peterhead, Scotland fell through in 2015. Alissa Cotton, Lilian Gray, and Wilfried Maas, *Energy Procedia* (114), 'Learnings From the Shell Peterhead CCS Project Front End Engineering Design' p5665 (2017):

⁽ii) The White Rose Project at Drax's Selby plant in 2012. ModernPowerSystems, Drax Pulls Out of White Rose CCS Project (2015): <u>https://www.modernpowersystems.com/news/newsdrax-pulls-out-of-white-rose-ccs-project-4679344</u>

- Investment amounts and timeframes for cash flow modelling; and
- Ongoing operational revenues and costs.

As early development activities progress, it will be important to stay abreast of how estimates of investment cost and timeframes evolve and become more certain.

As with any major capital project there is a risk of delays, overruns and increased costs – upfront sensitivity analysis and scenario planning will highlight key assumptions and risks to be monitored.

A core part of the value proposition for biomass with BECCS is that it provides flexible, dispatchable power – i.e. that it could be turned on and off when required. This may mean that its utilisation rate is reduced, especially as the UK invests in more cheaper solar and wind power. Any decrease in utilisation rate would increase the payback period for capital investment. It's important to understand the forecast utilisation rate and the impact on financial forecasts and key financial metrics, including:

- Payback period
- Cost per tonne of negative emissions
- Cost per kWh

This modelling would also show how long power from woody biomass with BECCS needs to form a part of the UK's energy mix for the BECCS investment costs to stack up from a financial perspective.

8.3 Contractual risks if BECCS doesn't work at scale

As noted in Section 6.2, there is risk that BECCS doesn't work on time and at scale. It will be important to understand the contractual implications for Drax if it has received funding to develop BECCS (from the Government and other parties) and the technology isn't technically possible as forecast.

One option for recouping investment could be through commercialising BECCS as a technology even when not applied to woody biomass (e.g. to other feedstocks or energy from municipal waste). To understand the financial implications of this we need to understand the specifics of the contract with Mitsubishi Heavy Industries Engineering.

9 Balance sheet implications

9.1 Stranded asset risk

Drax is holding £2.4bn of property, plant and equipment assets on its balance sheet^{lxvii}. Its asset values assume that it will continue to operate as it does now. If this assumption is wrong then these could become stranded assets and this would have a substantial impact on Drax's balance sheet position. This is recognised in the accounts as a "key source of estimation uncertainty"^{Ixviii}.

If energy from burning wood biomass were no longer acceptable or required then Drax would most likely be liable for costs of decommissioning, which would have a further negative financial impact with provisions for these costs required. It would be helpful to model this scenario to understand the financial implications of any wind down.

9.2 BECCS intellectual property

As noted in Section 6.2, Drax has agreed a long-term contract with Mitsubishi Heavy Industries Engineering for Drax to use its carbon capture technology. It would be helpful to understand the terms of



that contract to understand where any intellectual property will be held, especially given that a longer term opportunity for Drax could be monetising this technology.

9.3 BECCS impairment

If Drax's BECCS programme does not scale then previously capitalised development costs will need to be impaired and this is recognised in the Principle Risks section of Drax's Annual Report^{lxix}. These were £24.5m at 31 December 2022 and so the impact would be low, but it could increase as the programme progresses.

10 Debt

In the current climate of rising interest rates, businesses are struggling to service their debts²³. At 31 December 2022, Drax had current liabilities of £2.6bn and non-current liabilities of £2.5bn^{bx}. Some analysts suggest that this level of debt is putting them under strain²⁴. If they were to increase their debt to fund their strategy, or if their income were to fall due to the risks outlined in this report, it would increase their interest rate exposure. Therefore, this is something to monitor closely.

a burden than it first appears. So shareholders should probably be aware that interest expenses appear to have really impacted the business lately. Another concern for investors might be that Drax Group's EBIT fell 18% in the last year. If things keep going like that, handling the debt will about as easy as bundling an angry house cat into its travel box." Source: Simply Wall Street, *Is Drax Group (LON:DRX) Using Too Much Debt*? (2 April 2023): <u>https://simplywall.st/stocks/gb/utilities/lse-drx/drax-</u> group-shares/news/is-drax-group-londrx-using-too-much-debt-3



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²³ E.g. Thames Water. Faarea Masud & Esyllt Carr for the BBC, *Thames Water needs 'substantial' sums of money* (5 July 2023): <u>https://www.bbc.co.uk/news/business-66103356</u>

²⁴ "While Drax Group's debt to EBITDA ratio (3.0) suggests that it uses some debt, its interest cover is very weak, at 2.3, suggesting high leverage. In large part that's due to the company's significant depreciation and amortisation charges, which arguably mean its EBITDA is a very generous measure of earnings, and its debt may be more of

Conclusion



11 Risk assessment

Drax's strategy and business model are subject to considerable risk and uncertainty, in particular the following questions:

- Will woody biomass continue to be an attractive fuel?
- Will sufficient woody biomass be available to deliver Drax's strategic growth plans?
- Can BECCS work at the scale needed and on time?
- Will the UK Government continue to support Drax through financial subsidies?

Drax recognises these risks and uncertainties in its Annual Report, within both the Principal Risks^{loxi} and TCFD disclosure^{loxii} sections and even recognises that "there is a risk that an economic business model for BECCS cannot be developed, including the risk that regulatory and voluntary frameworks do not develop in such a way as to enable Drax to fully participate in these markets."^{Ibxiii}. However, there is no impact on their assessment of viability, which they define as five years into the future versus the one-year time horizon of the going concern assessment^{loxiv}.

The level of potential financial impact of different risks isn't quantified beyond some allocation to different risk categories. Despite 2022 being the third year that Drax has completed a TCFD report, it remains largely qualitative. It would be helpful to see a more quantitative assessment to understand the different scenarios and sensitivities better. Also, they use two transition scenarios and two

²⁵ Note – in the Viability Statement for 2022 they state "There is limited certainty around the Group's markets and regulatory regimes. However, the Board has assumed no material changes to the medium-term regulatory environment and associated support regimes beyond those already announced at the date of this report." Source:

physical climate scenarios^{lxxv}. It would be helpful to set out a 'most likely' scenario that can be critiqued.

In their 2021 TCFD report, they set out their key underlying assumptions – they didn't do this in 2022 and it would be helpful to understand these, especially since several of their 2021 key assumptions were optimistic and because of the risks highlighted elsewhere. Two to highlight are^{lxxvi}:

- "The global economy and financial markets remain relatively stable."
- "The regulatory framework for the electricity market in the UK remains broadly the same, except for changes to enable the transition to net zero."²⁵

Also, they chose not to focus on transition risks in their 2022 TCFD report as they believe their "strategy is resilient against transition risks"^[kavii]. However, this report has highlighted a high degree of uncertainty.

Also, where there is some quantification of risk levels, the quantified assessment does not tally with their conclusions. They categorise two areas of operation as at 'high risk' due to climate change disruption^{lxxviii} and also identify that one of these risk areas (physical risks to ports and shipping UK) would have a significant impact on revenue and costs of sales (i.e. "greater than 20% of 2022 Adjusted EBITDA of £731 million")^{lxxix}.

However, they then go on to conclude:



Drax Group, Delivering dispatchable, renewable power - Drax Group plc Annual report and accounts 2022, p75 (2023): <u>https://www.drax.com/wp-</u> content/uploads/2023/03/Drax_AR2022_single_pages-2.pdf

"Having evaluated these risks, the analysis concluded that the Group has a resilient supply chain, with only minor disruption to supply expected during an average year due to climate related risks. The minor disruption would be equivalent to less than half a shipment to Drax Power Station per year from all the annual transatlantic ship loads we receive."

12 Assurance

Drax has put in place its own audit and assurance process. To assess the robustness of these, it is recommended that the following two specific areas are explored:

- Drax's Independent Advisory Board has been established as a key risk mitigation. It would be insightful to understand when input from this group caused Drax to change direction or approach significantly. Minutes of meetings should be assessed to see if they indicate a robust level of scrutiny and discussion.
- The frequency with which audits of Drax's suppliers or sites have resulted in material changes being made or supply arrangements being terminated, as well as the rate at which improvements or compliance failures are highlighted.

In addition, given the level of risk and uncertainty, the size of Drax's business and the level of external investment required (including from the UK Government), it would be helpful to obtain independent assurance regarding key risks and uncertainties.

13 Concluding remarks

Drax is an established player in the UK energy market and currently forms a part of critical national infrastructure. As the energy transition accelerates, it has tried to align its strategy with national net zero plans.

However, the strategy and business models of the Generation and Pellet Production segments are based on three fundamental assumptions:

- Energy from woody biomass remains desirable;
- BECCS will be feasible at scale within the necessary timeframes; and
- A UK subsidy regime will remain in place.

We need to believe these things are true for Drax's strategy and financial forecasts to hold up. All these assumptions are hugely uncertain. And they need to be true. If a single one fails then the whole business model would collapse.



Appendices



Appendix 1 - financials

Revenues & Profits

Year ended 31 December 2022 Source: note 2.1 of Drax's 2022 Annual Report & Accounts

			Pellet					Intra-group	Adjusted results (before any exceptional
	Generation		Production		Customer		Central costs	eliminations	items)
	£m	%	£m	%	£m	%	£m	£m	£m
Revenue - external	3,638.9	49%	377.2	47%	4,143.1	100%		-	8,159.2
Revenue - internal	3,719.3	51%	425.4	53%	-	0%		(4,144.7)	-
Total revenue	7,358.2		802.6		4,143.1			(4,144.7)	8,159.2
Gross profit	879.0		300.7		158.1			(16.3)	1,321.5
Gross profit margin	12%		37%		4%				
Operating profit / (loss)	576.5		12.0		0.3		(116.9)	(2.5)	469.4

Revenues & Profits

Year ended 31 December 2021 Source: note 2.1 of Drax's 2021 Annual Report & Accounts

			Pellet					Intra-group	Adjusted results (before any exceptional
	Generation		Production		Customer		Central costs	eliminations	items)
	£m	%	£m	%	£m	%	£m	£m	£m
Revenue - external	2,651.2	57%	163.1	36%	2,359.6	100%		-	5,173.9
Revenue - internal	2,031.1	43%	286.7	64%		0%		(2,317.8)	-
Total revenue	4,682.3		449.8		2,359.6		-	(2,317.8)	5,173.9
Gross profit	550.4		182.8		103.7		-	5.9	842.8
Gross profit margin	12%		41%		4%				
Operating profit / (loss)	240.3		23.8		(25.2)		(74.7)	5.9	170.1



Subsidies

All figures exclude any disclosed exceptional items

Source: notes 2.1 and 2.2 of Drax's Annual Report & Accounts - 2017, 2019, 2021 and 2022 Note: years 2018 and earlier also include LEC income with ROC figure

	2022 £m	%	2021 £m	%	2020 £m	%	2019 £m	%	2018 £m	%	2017 £m	%	2016 £m	%
Pellet Production Revenue - external Revenue - internal Revenue - total	377.2 425.4 802.6	47% 53%	163.1 286.7 449.8	36% 64%	0.0 231.0 231.0	0% 100%	0.0 229.4 229.4	0% 100%	0.0 213.7 213.7	0% 100%	0.0 <u>135.7</u> 135.7	0% 100%	0.0 72.9 72.9	0% 100%
Generation Revenue - external Revenue - internal Revenue - total	3,638.9 3,719.3 7,358.2	49% 51%	2,651.2 2,031.1 4,682.3	57% 43%	2,115.7 1,530.1 3,645.8	58% 42%	2,433.8 1,512.7 3,946.5	62% 38%	1,994.9 1,336.7 3,331.6	60% 40%	1,686.2 1,033.4 2,719.6	62% 38%	1,622.7 868.2 2,490.9	65% 35%
ROC revenue - external ROC revenue - internal ROC revenue total	851.5 426.0 1,277.5	% of generation revenue 23% 11% 17%	538.6 342.6 881.2	% of generation revenue 20% 17% 19%	650.2 373.8 1,024.0	% of generation revenue 31% 24% 28%	733.7 368.1 1,101.8	% of generation revenue 30% 24% 28%	664.5 316.3 980.8	% of generation revenue 33% 24% 29%	367.8 258.9 626.7	% of generation revenue 22% 25% 23%	366.7 181.7 548.4	% of generation revenue 23% 21% 22%
CfD revenue - external CfD revenue - internal CfD revenue total	(45.7) 0.0 (45.7)	% of generation revenue -1% 0% -1%	234.9 0.0 234.9	% of generation revenue 9% 0% 5%	342.3 0.0 342.3	% of generation revenue 16% 0% 9%	261.7 	% of generation revenue 11% 0% 7%	321.5 0.0 321.5	% of generation revenue 16% 0% 10%	248.2 	% of generation revenue 15% 0% 9%	10.3 0.0 10.3	% of generation revenue 1% 0% 0%
% of Generation revenue from ROC and CfD (external only) % of Generation revenue from ROC and CfD (total)	22% 17%		29% 24%		47% 37%		41% 35%		49% 39%		37% 32%		23% 22%	



Adjusting whole group consolidated results

	2022	2021	2020	2019	2018	2017	2016
	£m	£m	£m	£m	£m	£m	£m
Gross profit (whole group)	1,321.5	842.8	800.2	867.1	601.0	545.0	376.3
Adjusted gross profit - strip out ROC revenue (external)	470.0	304.2	150.0	133.4	(63.5)	177.2	9.6
Adjusted gross profit - strip out CfD revenue (external)	1,367.2	607.9	457.9	605.4	279.5	296.8	366.0
Adjusted gross profit - strip out ROC and CfD revenue	515.7	69.3	(192.3)	(128.3)	(385.0)	(71.0)	(0.7)
Operating profit/(loss) (whole group)	469.4	170.1	188.7	203.8	76.0	(117.1)	203.5
Adjusted operating profit - strip out ROC revenue (external)	(382.1)	(368.5)	(461.5)	(529.9)	(588.5)	(484.9)	(163.2)
Adjusted operating profit - strip out CfD revenue (external)	515.1	(64.8)	(153.6)	(57.9)	(245.5)	(365.3)	193.2
Adjusted operating profit - strip out ROC and CfD revenue	(336.4)	(603.4)	(803.8)	(791.6)	(910.0)	(733.1)	(173.5)
Profit/(loss) before tax (whole group)	405.4	100.5	119.3	142.2	37.1	(183.2)	197.1
Adjusted profit before tax - strip out ROC revenue (external)	(446.1)	(438.1)	(530.9)	(591.5)	(627.4)	(551.0)	(169.6)
Adjusted profit before tax - strip out CfD revenue (external)	451.1	(134.4)	(223.0)	(119.5)	(284.4)	(431.4)	186.8
Adjusted profit before tax - strip out ROC and CfD revenue	(400.4)	(673.0)	(873.2)	(853.2)	(948.9)	(799.2)	(179.9)
Adjusting Generation segment results							
	2022	2021	2020	2019	2018	2017	2016
	£m	£m	£m	£m	£m	£m	£m
Generation segment gross profit	879.0	550.4	608.9	649.5	396.0	398.4	337.0
Adjusted gross profit - strip out ROC revenue (total)	(398.5)	(330.8)	(415.1)	(452.3)	(584.8)	(228.3)	(211.4)
Adjusted gross profit - strip out CfD revenue (total)	924.7	315.5	266.6	387.8	74.5	150.2	326.7
Adjusted gross profit - strip out ROC and CfD revenue (total)	(352.8)	(565.7)	(757.4)	(714.0)	(906.3)	(476.5)	(221.7)
Operating profit	576.5	240.3	294.8	Not available	Not available	Not available	Not available
Adjusted operating profit - strip out ROC revenue (total)	(701.0)	(640.9)	(729.2)				
Adjusted operating profit - strip out CfD revenue (total)	622.2	5.4	(47.5)				
Adjusted operating profit - strip out ROC and CfD revenue (total)	(655.3)	(875.8)	(1,071.5)				
Profit before tax	Not available	237.9	293.1	Not available	Not available	Not available	Not available
Adjusted profit before tax - strip out ROC revenue (total)		(643.3)	(730.9)				
Adjusted profit before tax - strip out CfD revenue (total)		3.0	(49.2)				
Adjusted profit before tax - strip out ROC and CfD revenue (total)		(878.2)	(1,073.2)				

Appendix 2 - biomass feedstock sources

Drax biomass feedstock sources

Source: page 41 of Drax's 2022 Annual Report & Accounts and page 50 of Drax's 2021 Annual Report & Accounts

	2022 Tonnes	%	2021 Tonnes	%
USA	4,918,900	58%	5,137,071	61%
Canada	2,001,460	24%	1,813,209	21%
Latvia	733,780	9%	719,117	8%
Estonia	124,563	1%	209,482	2%
Brazil	144,816	2%	192,930	2%
Portugal	162,687	2%	187,209	2%
Belarus	25,454	0%	110,229	1%
UK	63,510	1%	57,023	1%
Russia	22,336	0%	33,829	0%
Other European	24,920	0%	10,591	0%
Total	8,222,426		8,470,690	

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