Policy suggestion:

Drop the previous government's proposal for "Transitional Support" for large-scale biomass power stations.

250 word Summary

The Transitional Support mechanism consulted on by the previous government is to support electricity generation at large-scale biomass power stations that could possibly be equipped with Carbon Capture.

The proposal is for a new Contract for Difference to replace existing subsidies, which expire in 2027. Although funded by bill-payers and not by taxation, CfDs are effectively public money.

The cost to UK electricity consumers of this support could reach £2.5bn a year, starving investment in offshore wind, solar, wave and tidal power, grid upgrades, energy storage and other infrastructure essential to achieve zero carbon electricity.

The proposal would contravene 2023 advice from the Climate Change Committee not to award any further subsidies for large-scale biomass power without carbon capture after 2027.

Large-scale carbon capture from biomass power stations by 2030 is implausible, because of the readiness of capture technology and the essential ancillary infrastructure to transport and store captured carbon. It cannot therefore contribute to the government's aim of a zero carbon electricity grid in 2030.

Capturing carbon from biomass power is very costly. One analysis estimated that a single power plant would require up to £44 billion in subsidies over 25 years.

The proposed subsidies would prolong UK reliance on imported woodfuel, contrary to the government's aim of improving UK energy security and boosting "homegrown energy".

Summary reasons:

1. The Transitional Support mechanism proposed by the previous government is designed to support electricity generation at UK large-scale biomass power stations that could possibly be equipped with Carbon Capture (BECCS). The mechanism is expected to take the form of a new Contract for Difference (CfD) for Drax and possibly also Lynemouth Power Stations, and would replace existing subsidies which expire in 2027. Although CfD subsidies are funded by a surcharge on electricity bills and not via the Treasury, such new CfDs would have a significant impact on the new government's "green energy" strategy, and are in effect public money. There is also discussion of these types of subsidies being moved from energy bills to general taxation in future, or of them being funded from the UK's Emissions Trading Scheme. According to the Impact

Assessment that accompanied the consultation on Transitional Support, the cost to UK electricity consumers could be as high as £2.5 billion a year. This would leave ***far less money to support offshore wind, solar, wave and tidal power, grid upgrades, energy storage and other infrastructure*** that is needed to achieve zero carbon electricity, and it is not compatible with the Labour Party's manifesto commitment that such an energy transition will result in lower energy bills.

2. The proposed mechanism would represent a continuation of subsidies for unabated biomass electricity (i.e. without carbon capture technology) with lifecycle carbon emissions far above the limit set by the government in 2018 for new Contracts for Difference for biomass electricity (in 2018 the Government set a new limit of 29kgCO2e/MWh, the most recent figure reported by Drax is 97kgCO2e/MWh). The proposal would therefore ***contravene 2023 advice from the Climate Change Committee not to award any further subsidies for biomass power without carbon capture after 2027***.

3. If the proposed transitional subsidies were granted, there would be ***no mechanism to hold the recipients to account should they fail to develop and subsequently deploy carbon capture***. The consultation on transitional support did not suggest an end-date for the proposed subsidy contracts.

4. The previous government's Bioenergy Strategy contains a misleading and overly optimistic statement about the technology readiness of post-combustion carbon capture from biomass plants. The ***technology has not so far been successfully demonstrated in an operational environment at any scale.***

5. Large-scale carbon capture from Drax or Lynemouth Power Stations by 2030 is not a realistic prospect, because of technology readiness and because the essential ancillary infrastructure to transport and store captured carbon will not be implemented - hence BECCS will ***not contribute to the government's aim of a zero carbon electricity grid by 2030***.

6. Even if successfully developed, Bioenergy with Carbon Capture and Storage would be an extremely expensive technology, with one analysis finding that a single plant would require up to £44 billion in subsidies over 25 years. And, according to Drax's 2023 annual report, the useful economic life of its biomass power station will be exhausted by 2039. Achieving a commercial return on the capital expenditure needed to implement carbon capture in such a short timeframe would mean more costly electricity and therefore a higher demand for subsidies.

7. Transitional subsidies for biomass power will prolong UK reliance on imported wood pellets. ***This contradicts the UK government's stated aim of improving UK energy security and boosting "homegrown energy".***

Background

Drax Power Station burns more wood than any other plant in the world: in 2023, it burned almost 6 million tonnes of wood pellets, which is the equivalent of 118% of the UK's entire annual wood harvest.[1] All of the wood burned by Drax is imported, making the UK the world's largest wood pellet importer.

The large majority of the pellets are imported from North America, two-thirds from the southeastern USA, followed by Canada, and the remainder mostly from European countries. Wood for those pellets is routinely sourced from clearcutting of species-rich coastal hardwood forests in a Global Biodiversity Hotspot in the United States and, in Canada, from Primary and Old Growth forests. Ofgem is currently conducting an investigation into whether Drax's wood sourcing from British Columbia may have violated biomass sustainability criteria.

Drax power station's upfront CO2 emissions are higher than those of any other emitter in the UK. Hundreds of scientists have warned "*regrowing trees and displacement of fossil fuels may eventually pay off this carbon debt, but regrowth takes time the world does not have to solve climate change. As numerous studies have shown, this burning of wood will increase warming for decades to centuries. That is true even when the wood replaces coal, oil or natural gas*."

According to the National Audit Office (NAO), Drax received £6.5 billion in subsidies between 2002 and 2023 for burning wood. The NAO warned in its report earlier this year on biomass energy in the UK: "*the government cannot demonstrate that its current arrangements are adequate to give it confidence industry is meeting sustainability standards.*" A review of bioenergy sustainability standards, long promised by recent governments, has still not been published. In addition, at the time of writing this submission, the PAC inquiry into Government support for biomass had been launched but not concluded.

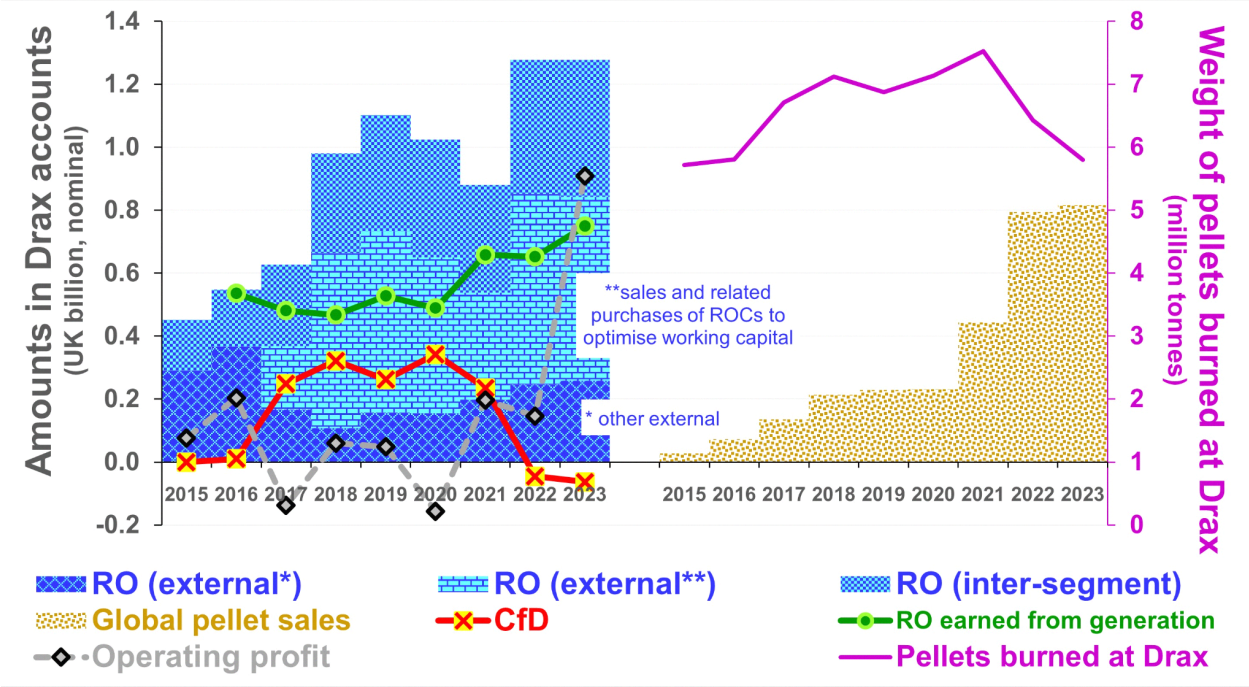
Existing subsidies for Drax are poor value for money for the UK

Since 2018, UK wind power generation has risen by over 47% and solar power by 9.6%, even in the face of policies discriminating against new onshore wind and solar that have been overturned by the new government. Despite Drax receiving more than £1 billion annually in revenue booked for trading Renewables Obligation Certificates and additional amounts of between £0.6 and £0.8 billion in direct subsidy payments, the power station's electricity generation and contribution to UK electricity declined when it was most needed during the recent energy crisis.

Adding carbon capture technology would reduce Drax's electricity generation for the grid further still since, according to Drax's own figures, more than one quarter of its electricity would be needed to run the carbon capture technology. At the same time, Drax's profits, underwritten largely by UK subsidies, have significantly increased. They have allowed the company to greatly

[1] Note that one tonne of wood pellets requires around 2 tonnes of green wood, i.e. freshly cut wood.

grow its pellet production in North America and its sale of pellets to other countries, in addition to growing its shareholders' wealth through share buy backs and increased dividends.



Graphs based on figures from Drax's published Investor's reports, including Annual Reports

And while the cost of wind and solar energy has continued to reduce, the cost of operating such large biomass power stations has not declined and is not forecast to decline because it is tied to a highly competitive international wood pellet market.

"Transitional subsidies" and potential future subsidies for BECCS would divert a large share of financial support from the "green transition"

As stated above, "transitional subsidies" could cost as much as £2.5 billion a year, according to the Impact Assessment that accompanied the consultation. To put this in context, the Secretary of State for Energy Security and Net Zero has announced that the next Contracts for Difference (CfD) auction will make a record £1.5 billion available for new renewable electricity. Transitional subsidies for Drax and possibly Lynemouth Power could thus exceed the annual budget available for all new offshore wind and other renewable electricity projects by as much as 60%.

Overall, these subsidies would take a very significant share of the overall funding available for a "green transition", thus hindering the much-needed transition to genuinely clean and non-emissive renewable energy. While technologies such as offshore wind and solar often generate electricity so cheaply that they end up repaying their subsidies (and in reality bringing people's energy bills down), large-scale bioenergy is so expensive that it almost always increases people's energy bills, counter to one of the Government's key pledges. These extended subsidies would therefore be incompatible with the Labour Party's manifesto commitment that green energy transition should result in lower energy costs.

The proposed transitional subsidies would be better spent in reducing energy demand, for example by insulating homes in the UK, or in electrification of heating. This would reduce UK carbon emissions, energy bills and comfort for those in fuel poverty.

The Government's Clean Power 2030 Action Plan and E3G's The UK's clean power mission: Delivering the prize, both demonstrate that the UK can reach its 2030 clean power goal with no large-scale biomass power stations at all.

In addition it is unclear whether 'negative emissions' if they are achieved in the UK by burning wood imported from other countries, would even be credited to the UK's carbon budget. The IPCC is going to produce by 2027 a methodology report on carbon dioxide removal technologies, it is therefore premature to make financial investments which assume that the UK carbon budget would be the beneficiary of any such 'negative emissions.

"Transitional subsidies" would reverse a 2018 government decision to set a much stricter life-cycle CO2 limit for biomass electricity eligible for new CfDs, and it would go against Committee on Climate Change advice

In 2018, the then UK government decided that, in order to be eligible for future new CfDs, operators of biomass power stations would need to meet a greenhouse gas threshold value of 29 kg CO2e/MWh. The new threshold helps to ensure that scarce money raised from the public's energy bills is good value for money and drives decarbonisation of the energy system - large-scale bioenergy does not meet this test since its emissions are far higher than this threshold.The figure is based on a methodology which largely only accounts for life-cycle fossil fuel emissions arising from the production of wood pellets, such as fossil gas burned in pellet plants for wood drying, and fuelling transatlantic shipping of the finished pellets. The methodology ignores the much greater life cycle emissions caused by depletion of forest carbon sinks and forest carbon sequestration due to additional logging. Based on the limited scope methodology, Drax's supply chain greenhouse gas emissions were 97 kg CO2e/MWh in 2023 - more than three times the threshold for new CfDs since 2018. This is clearly not compatible with a zero carbon electricity system by 2030.

In 2023, the Climate Change Committee stated: "*There should be no role for large-scale unabated biomass generation beyond expiry of existing subsidy support in 2027*." The proposed 'transitional subsidies' would however mean further years of subsidy support for large-scale unabated biomass electricity generation.

No mechanism to hold recipients of "transitional subsidies" to account should they fail to develop and deploy carbon capture

Transitional subsidies were proposed on the basis that Drax and possibly Lynemouth Power would use the extra years of funding post-2027 to develop large-scale BECCS. There is no obvious legal mechanism for drafting a CfD such that support money paid as transitional

support could be clawed back if carbon capture technology is not actually implemented or developed. (Noting also that the biomass generators who would be in receipt of transitional subsidies are only responsible for the 'capture' element of BECCS - other commercial actors are responsible for the 'storage' element of BECCS).

Even if the technology were implemented by the biomass generators, and the essential carbon transport and storage elements were implemented by others, the subsidies to finance BECCS would be so expensive (estimated by Ember thinktank to be £43 billion over 25 years) that it would be economically unviable to operate, and the proposed BECCS installations could become white elephants.

In addition, bioenergy has faced significant environmental challenges, most importantly that even with carbon capture, its impact on carbon stored by forests is so great that it actually increases carbon dioxide in the atmosphere. There is growing recognition of this by politicians around the world and in the UK. Spending billions on BECCS could therefore be wasted money if policy were to be aligned to the science which shows it is harmful, not beneficial, to the climate.

In the case of Lynemouth Power, it is increasingly clear that they do not intend to develop carbon capture: as of now, the company has not even commenced the pre-planning consultation process required before they could submit an application for development consent.

Drax has obtained development consent for installing carbon capture at two biomass units, however, they persuaded the previous government's Secretary of State that they should be allowed to delay a meaningful start on the scheme for up to seven years, meaning that it's possible that they would not **start building** a carbon capture unit before January 2031.

In its presentation of Half Year Results in July 2024, Drax claimed on the one hand that they required a post-2027 subsidy guarantee during 2024 in order to proceed with BECCS but, on the other hand, stated that (regardless of such a guarantee) they would make no Final Investment Decision about BECCS until 2026, and then only in respect of one unit, not two. ***This demonstrates that Drax wants a 'transitional subsidy' CfD to be signed off in the absence of any commitment on their part to subsequently proceed with BECCS***.

There are further reasons to doubt Drax's commitment to and ability to implement carbon capture.

Carbon capture from biomass combustion has not so far been demonstrated at anything like the scale envisaged. During its very short trial of only 90 days - the only trial that has been publicly announced - Drax captured a total of just 27 tonnes of CO_2. Drax claims that by 2030 it can capture **8 million tonnes** per year - 73,000 times higher than what its pilot trial achieved. As Drax admitted in its response to questions raised at the time by Biofuelwatch, they gained only limited information from the trial: for example, the trial did not assess the 'parasitic' energy penalty to run carbon capture where the technology uses up a large share of the electricity the

power station produces. Drax has undertaken no further tests related to its proposed BECCS project and has not announced any planned ones. **Moving directly from a 3-months micro-trial to a multi-million tonne carbon capture project without any interim stages appears highly implausible**. There has been no successful implementation of power station carbon capture from either fossil fuel or biomass globally at the scale proposed for Drax and Lynemouth.

"Interim subsidies" are incompatible with the government's goal of achieving zero carbon electricity by 2030

As explained above, even based on supply-chain fossil fuel CO2 emissions alone, the reported greenhouse gas intensity of Drax's biomass electricity is considerably higher than the threshold set by the previous government in 2018 for financially supporting biomass power. And, if full cycle CO2 emissions, including stack emissions and reductions in forest carbon stores and sequestration were accounted for, biomass power would be the highest-carbon energy source in the UK. Even with carbon capture, the impact on carbon stored by forests (an impact ignored by the UK when it calculates bioenergy carbon emissions) would actually be so significant and would last decades, that BECCS would increase carbon dioxide in the atmosphere, rather than reducing it.

Large-scale carbon capture from Drax power station is highly unlikely to be operational by 2030. Therefore, "interim subsidies" put achievement of the government's zero carbon electricity goal by that date out of reach.

The technology-readiness of post-combustion carbon capture from biomass is significantly behind what Drax and the previous government have claimed

Drax has presented post-combustion BECCS as a proven technology that could be easily implemented. The previous government claimed in 2022 that power-BECCS had a high technology-readiness level, especially when it comes to retrofitting existing plants. This is reflected in its 2023 Biomass Strategy, which says that post-combustion carbon capture technology is "pre-commercial" and "proven to work", putting it at a Technology-Readiness Level (TLR) 8-9. In order for a technology to have reached TLR 8, it must have been "completed and qualified through test and demonstration". However, Drax has only ever undertaken very small-scale solvent testing, capturing just 27 tonnes of CO2 over 90 days. This is not a 'demonstration' project. It is therefore wildly optimistic to categorise post combustion BECCS as a 'proven technology'.

Only one post-combustion carbon capture project worldwide has been cited as evidence that carbon capture from biomass has been demonstrated, for example in a report commissioned by

the last government and published in June 2021. That report stated: "*The demonstration-scale BECCS Mikawa Power Plant (50 MW) in Japan commenced operations in late 2020, now capturing 500 tons of CO2 a day*." In reality, according to the operators, Toshiba, this demonstration project was stopped after just five months, in March 2021. Despite extensive web searches and two queries emailed to Toshiba, we can get no information about the amount of CO2 actually captured at that plant. Toshiba has not announced any further carbon capture plans at Mikawa, nor any other biomass plant.

A 2022 review by the UK Carbon Capture Research Centre about post-combustion carbon capture points out: "*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.*" Given the significantly different composition of flue gas from burning coal or biomass, it is not credible for Drax to argue that their proposed technology has been proven when most of the, albeit very limited, worldwide operational experience of post carbon capture relates to coal burning, not biomass

In any case, there are only two coal plants with carbon capture worldwide (Boundary Dam in Canada and Petra Nova in Texas, USA), each far smaller than a single Drax unit. Neither of them has achieved such high carbon capture levels as Drax is promising, nor indeed met the operators' carbon capture goals.[2]

Further still, the results of the Public Accounts Committee's recent inquiry into Carbon Capture Usage and Storage concluded that the Government is taking a high-risk approach by backing first-of-a-kind, unproven technologies with large amounts of taxpayer and consumer funding, and warned that the government has not assessed the likely impact on consumer energy bills of its carbon capture programme. Such high risk carbon capture projects are likely to face funding cuts as a result leaving BECCS potentially stranded with no pipeline to remove any CO2 that is generated to storage.

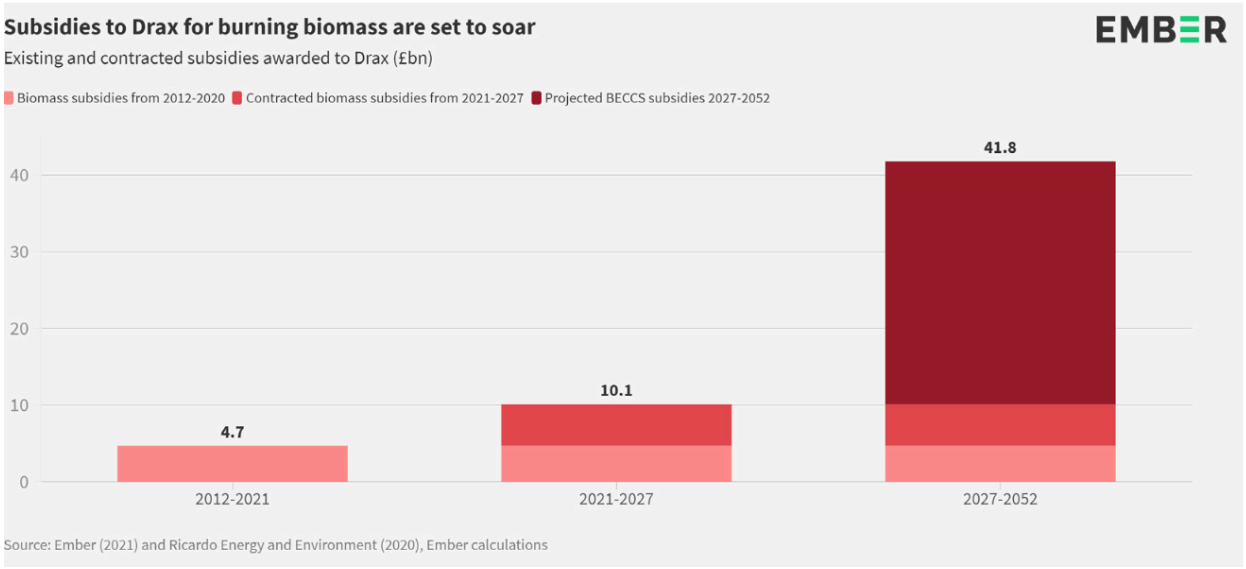
If post-combustion carbon capture from biomass plants such as Drax Power Station was proven, then it would require extremely high subsidies

The £6.5 billion in subsidies paid to Drax since 2002 have been justified by the high cost of wood pellets although, as shown above, they have lately helped Drax make high enough profits to help finance pellet production for sale to third parties.

According to a report by Ember, Drax would require between £24 billion and £43 billion in subsidies over a 25-year period for biomass combustion with carbon capture:

---

2 https://ieefa.org/resources/two-years-behind-schedule-boundary-dam-3-coal-plant-achieves-goal-capturing-4-million and https://ieefa.org/resources/ill-fated-petra-nova-ccs-project-nrg-energy-throws-towel (Note that the Petra Nova plant was restarted under a new owner in September 2023, but that no information about carbon capture rates has been published).



In its calculation, Ember relied on research by the energy consultancy Ricardo, commissioned and published by BEIS in 2020.

However, in that research, Ricardo assumed that a biomass plant with post-combustion carbon capture would have a net efficiency of 30.6%:

Table 3.2 Key assumptions for plant

Plant type	Capacity		Efficiency		Costs [a]			Carbon capture rate
	Gross	Net	Gross	Net	Capex	Fixed Opex	Variable Opex [b]	
	MWe	MWe	%	%	£/kW	£/kW	£/kW	%
Post-combustion – Amine absorption	498	396	38.5%	30.6%	2,793	146	9	90.0%

Drax stated in their consent application that they anticipate a net efficiency of just 28.8% ***without accounting for the energy needed to compress the CO2*** required in order for the CO2 to be fed into a pipeline. CO2 compression accounts for 30-50% of the energy needed for the whole carbon capture process. The current net efficiency of their biomass units is 39.7%, so carbon capture alone would require 27.5% of the plant's total energy. If carbon compression was accounted for, then the energy penalty would therefore be between 35.7 and 41.2%, leaving the plant with a net efficiency of just 23.3 to 25.5%. This is far below Ricardo's estimates and means that operating the plant with BECCS will be significantly more expensive than Ricardo and Ember assumed.

More subsidies for Drax and Lynemouth Power would undermine the government's aim to boost energy independence

Both Drax and Lynemouth Power are fully dependent on burning imported wood pellets. Those power stations cannot burn biomass other than pulverised wood pellets from high-quality wood, except in very small quantities. They cannot burn wood with high bark content,nor fast-growing trees, such as short-rotation coppicing due to the risk of corrosion and other damage to the boilers. And given that Drax burns far more wood than the UK produces annually, replacing imports with domestic wood is not an option.

Conclusion:

“Transition subsidies” would allow Drax and possibly Lynemouth Power to continue receiving billions of pounds more subsidies for burning wood without any carbon capture. This would weaken the government’s commitment to a green energy transition, diverting large amounts of support for investments in wind and solar power, wave and tidal energy, energy storage energy efficiency and for heat-and transport-electrification. It would therefore undermine the government’s commitment to bring down energy costs and carbon emissions through the expansion of renewable energy.

There would be no mechanism to hold Drax or Lynemouth Power accountable should they fail to subsequently develop and use carbon capture. Lynemouth Power has not so far launched a consent application for carbon capture, and Drax stopped testing carbon capture after capturing just 27 tonnes of CO2 and is proposing no further development work or demonstration projects. The technology itself has never been demonstrated by anybody at scale and does not have the technology readiness for commercial use.

Transition subsidies are incompatible with the government’s commitment to zero carbon electricity by 2030, given that Drax’s supply chain fossil fuel emissions alone are higher than what the then government stated in 2018 would be acceptable for new Contracts for Difference. Finally, such transition subsidies would go against 2023 advice from the Committee on Climate Change, which said that there should be no post-2027 subsidies for unabated large-scale biomass electricity.