

Consultation: Transitional support mechanism for large-scale biomass electricity generators

Response from UCL Institute for Sustainable Resources

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The UCL Institute for Sustainable Resources' mission is to provide evidence, expertise and training to respond to climate change and support sustainable transitions for people and planet.

This is a summary of a response submitted via the online questionnaire on the UK government website. We have chosen to answer the questions where we have specific expertise.

We would be delighted to discuss this response, or any of our other work. Please contact Katherine.page@ucl.ac.uk

1. Do you think the government should intervene to create a support mechanism to help biomass generators transition to power BECCS?

We agree with the premise of retrofitting Carbon Capture and Storage on active bioenergy plants with long remaining lifetimes in the context of achieving net zero emissions. The main reason to support BECCS is because, if done well, it is a carbon removal technology, not because it is an electricity generation technology.

However, we suggest caution in supporting new power-BECCS plants, especially if they are large scale.

Reasons for caution:

- (1) The overarching priority seems to be securing the future of a technology to produce negative emissions on the timeline of Carbon Budget 6. Therefore, with negative emissions being the priority, the subsidies should be designed as such, otherwise there will be a maximisation of electricity generation. Whilst there are already low cost commercially available options for renewable electricity generation (solar, wind), there is no current commercial scale negative emissions technologies.
- (2) Prioritising BECCS for electricity has the potential to divert funding away from other renewable generation, measures to support energy efficiency, and preparing the grid for increased intermittent renewables, which could be cheaper and more sustainable over the long term. Government should clarify how it intends to account for and measure the potential crowding out or unintended displacement of other renewables.
- (3) This proposal seems to have limited the scope to electricity generation from virgin woody biomass, ignoring energy from waste, and smaller bioenergy plants, which could also provide negative emissions and should be supported to retrofit CCS.
- (4) By definition, a transitional support scheme should be time limited. Within the document it suggests the length of the transitional support scheme will be decided in collaboration with the generator, so may extend beyond the 2027 – 2030 period where there is a current gap in support. We suggest an end date of 2030 should be set for any transitional support, to avoid making an open ended commitment.

2. Do you agree with the success factors we have identified?

The consultation document identifies four “factors to consider” as factors of success for any mechanism that can “provide an opportunity to remain in the market ahead of any transition” for existing biomass power plant assets. These are that the asset should:

- (1) Have available generation capacity to contribute to security of supply,
- (2) Offer a low-cost service to the consumer,
- (3) Support timely power delivery in a context of increased penetration of intermittent generation, and
- (4) Offer carbon benefits over the use of fossil counterfactuals of coal and gas.

These factors cover some of those the government should consider, but there are significant gaps. The fundamental flaw is that biomass-based power assets and their conversion to BECCS for power should fail at each of these tests:

First, the government recognises in this consultation document that the biomass market is illiquid, immature, and small with low numbers of alternatives for supply and potential for high competition. According to the Biomass Strategy 2023, in 2022 34% of biomass feedstocks used in renewable energy supply (heat, electricity, and transport) were from international sources. This exposes the current and future power sector to real security risks which will only increase as other countries pursue conversions to biomass and BECCS systems. Further support for biomass options will not reduce this exposure. In the light of this, the first factor needs to have a broader approach to energy security. Whilst biomass and BECCS plants can contribute to diversity of electricity generation and could help to balance supply and demand, risks to the availability of fuel from both domestic and international sources need to be considered.

Second, when power-BECCS is running for negative emissions, it will need to run baseload to maximise carbon capture, resulting in lower electricity generation overall. At that stage running flexibly will hamper the ability to deliver negative emissions. In the interim period (2027-2030) there is the possibility for large-scale bioenergy plants to run flexibly and balance the grid while more intermittent generation is coming online, however this flexibility must end in 2030.

Therefore, long term, the design is not for flexibility. The government recognises that we are facing a fundamental change in the power system structure with increasing levels of variability on the supply side, and the UK’s National Grid has previously stated that the era of baseload power generation is giving way to the era of flexible, agile, and smart supply and demand.¹ So, by definition, supporting these large structures further without dedicated thought to their role in an agile and smart system seems to fail on providing reliable power supply services for the future.

Third, the suggestion that biomass based systems provide benefits against counterfactuals of coal or gas based generation are flawed on two counts. One, the medium term future counterfactual for power generation in the UK is low cost wind and solar based systems with corresponding storage capacity. This means that we could be emitting zero at point of generation rather than “much less than gas”. Two, this statement assumes that the use of biomass is carbon neutral over its lifecycle and that the biomass used is sustainable. The difficulty involved in substantiating such claims in systems that involve dynamic land-based systems, international supply chains, decade long surveillance periods, as well as numerous stakeholders spread over different jurisdictions is significant. It is not clear that the UK’s current sustainability criteria systematically deliver this carbon benefit, and the development of new, reinforced criteria, should come ahead of agreeing to supporting future biomass systems rather than as an afterthought of committed support.

¹ <https://energypost.eu/interview-steve-holliday-ceo-national-grid-idea-large-power-stations-baseload-power-outdated/>

3. Are there additional factors we should consider?

A key assumption of the proposed support is that power-BECCS should and will be an important part of the government's decarbonisation commitments. However, it would be worth having further clarification on what is expected to be delivered with power-BECCS acting as a negative emissions technology.

Of particular interest is:

- The definition of carbon capture efficiency. We think that proper carbon efficiency should be measured at the very least as the ratio between carbon contained in the fuel "at power plant gate" (i.e. on input) and carbon entering transport and storage (T&S) system, to avoid a CCS system looking more efficient at carbon capture than it is. Ideally, carbon leakage in the T&S system should also be included. This is particularly important in the case of biomass where any on-site storage will lead to methane emissions through decomposition.
- We would also argue that clarity needs to be provided on how this definition of carbon capture efficiency interacts with the supply chain life cycle assessment (LCA) covering domestic and international resources. Arguably, for a project to be "credibly net-negative" then capture efficiency across the full supply chain should remain significantly positive (i.e. emissions entering T&S divided by the sum of upstream supply chain emissions and fuel carbon content should remain above a minimum threshold). Laying out the LCA methodology that will be applied to assess supply chain carbon emissions under the BECCS business case is essential. This should include guidance on setting analysis counterfactuals, expected global warming potential frameworks, and LCA boundary setting expectations both geographically and through time. Each supply chain will likely be specific enough to require its own LCA and uncertainty analysis including monitoring, reporting and verification (MRV).
- This guidance should also clarify what MRV processes will be put in place to verify the information provided, including how to ensure that these are independent and reliable. This should go beyond assuming that certifications are sufficient, acknowledge that accreditations may be delivered by institutions or organisations that do not have the capacity required to make them credible.
- There needs to be clarity on the scrutiny being applied to the transmission and storage (T&S) side of operations. For instance, how the government is planning to ensure that sequestration is effectively long-term and that any leaks are accounted for.

4. Do you agree with the options above being included as preferred options? If no, please articulate why the option is not suitable and provide evidence where appropriate.

We would suggest that any chosen mechanism should be as simple as possible to implement. The scheme should also be easy to monitor, and transparent. This includes relying on data that can be independently sourced and verified rather than on data that is provided exclusively by those who stand to benefit from the scheme. Relying on existing legislation and on approaches that have demonstrably worked well in the past also makes sense.

In line with the success factors outlined above, the "Availability Payment" option would be the preferred scheme design. It (i) is the simplest scheme design presented, (ii) does not tie the total cost of the scheme (and therefore the cost to consumers) to variable operational and fuel costs thus it reduces exposure to international biomass price fluctuations, and (iii) incentivises flexible and dynamic plant operation (within the realm of what such facilities can offer) that responds to market signals, generating at times when cheaper

variable renewables are not available and more costly solutions will be paid accordingly for their contribution to the system.

However, it should be noted that a potential short-term downside of using the 'Availability Payment' option is that there may be less biomass generation (and therefore more gas generation). This impact could be minimised by continuing to deploy wind, solar, and long term storage as quickly as possible.

Independently of the scheme offered, the government should be explicit about the duration of contractual agreements offered, and we should suggest an end date of 2030 for any transitional support. It is not appropriate to offer terms that will extend so far into the future as to overlap with the roll out of power-BECCS payment mechanisms. This overlap would be particularly inappropriate considering the underlying rationale of the support discussed here is to be "transitional" until other CCS related payments are operational.

This is especially important in the context of uncertainty about the deployment of CCS infrastructure, including transport and storage. Delays to the establishment of safe, reliable, industrial scale CCS infrastructure could extend the transition period, exposing consumers to further market volatility.

6. Do you have views on approaches we should consider as part of our options to ensure generators are not overcompensated?

In order to avoid overcompensation, generators:

- Should not get better terms than they currently have under existing schemes (ROC, CfD). In fact, arguably they should receive lower payments.
- The payments should be supportive of existing operations only, and should not be used as investment plans in CCS retrofit, as this will be covered by future schemes and business models. There is a danger of generators being paid twice for CCS retrofit, when in fact this scheme is designed only to maintain operability until the subsidies for carbon capture are brought in.

9. Do you agree with the eligibility criteria and assessment process set out? If no, how should they be adapted to be more suitable?

Potential to provide net-negative emissions:

- The document states that "projects would be expected to provide a lifecycle analysis (LCA) and a proposed methodology including a monitoring, reporting and verification (MRV) plan as evidence". Given there is currently no set of rules for LCA and MRV for BECCS and GGRs more generally, the government and/or an appropriate regulator should set out a standard methodology for LCA and MRV which all generators have to use. MRV should be provided / verified by a third party organisation.
- As the transport and storage of CO₂ are scaling up, to reduce the risk of not yet available geological storage on the time scale of these projects, utilising CO₂ for durable products should be encouraged.

Have a minimum projected capture rate of 90%:

- The quoted calculation method defines the capture rate as the ratio of carbon into T&S over the carbon in streams intended to be routed to the capture plant.
- This is inappropriate – it should be calculated based on carbon content of the fuel at the gate of the power plant, otherwise it ignores losses of carbon from storage, processing onsite, and leaks upstream of what is defined as "intended streams" of carbon.
- Additionally, while this is outside the scope of this consultation, where payments will be contingent on carbon sequestration there needs to be an adjustment mechanism that accounts for the difference

between “injected” carbon into the T&S and “final sequestered” carbon. Subsidies should incentivise maximum storage.

The project must not be receiving other subsidy for the same power generation upon start of support:

- This condition should be enhanced to ensure that agreements established as part of this transitional support scheme do not continue to offer payments if/when the power plant is transitioned onto CCS related support schemes currently under development.

Demonstrate need for transitional support:

- The need for transitional support should be reviewed by an external independent party such as the NAO.

Security considerations:

- Security is more than security of supply. The contribution of biomass needs to balance different security impacts which may be positive (addition to capacity, help with system balancing if plants can be flexible) and potentially negative (risks of relying on particular supply chains for biomass fuel, which could be mitigated if supply chains are diversified further)
- Specifically, to ensure security of biomass supply even under increased international competition, projects using domestic feedstock should be eligible, in particular ones using local waste fractions.

10. During a transition period from biomass electricity to power BECCS, do you think that the GHG criteria should be strengthened? If so, how? Please provide evidence to support your views.

There are two areas where the GHG criteria could be strengthened:

- The criteria mention considering a whole lifecycle approach, but the specification does not mention land use change (direct or indirect) explicitly.
- The counterfactual reference used is fossil generation and the criteria sets a minimum saving against this counterfactual. The aim should be to recommend an absolute maximum level of emissions to meet rather than improvement against fossil generation, which is increasingly being replaced by variable renewables, long term storage and demand side flexibility options.

11. As part of the proposed transitional support arrangements for large-scale biomass generators that plan to transition to power BECCS, do you think that we should increase the minimum percentage of woody biomass that must be obtained from a sustainable source? If so, what should be the minimum percentage be set at? Please provide evidence to support your views.

All biomass should come from sustainable sources, otherwise the delivery of removals (the reason that the scheme is being proposed) may be compromised altogether.