Call for Expert Evidence 2022

Environment and Climate Action Plan Delivery Division
Department of the Environment, Climate and Communications
29-31 Adelaide Road
Dublin 2
D02 X285

By email

Irish Bioenergy Association (IrBEA)
www.irbea.org
@irishbioenergy
From [redacted]
To: CallforEvidence@decc.gov.ie

20th September 2022

IrBEA Response to the Call for Expert Evidence - Consultation

Dear Sir / Madam,

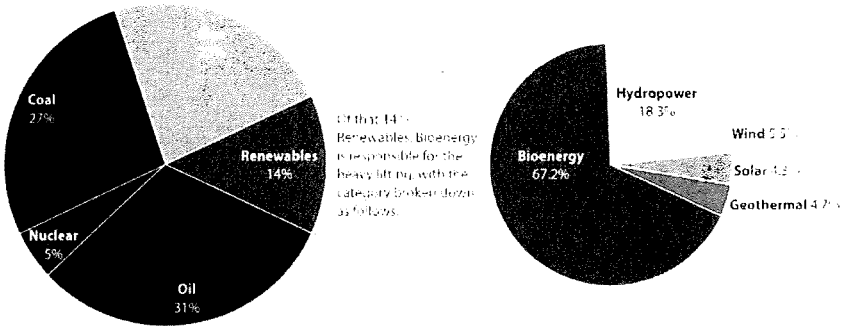
The Irish Bioenergy Association (IrBEA) notes the call for expert evidence consultation as part of the Climate Action Plan 2023 process and provides its response on behalf of our members.

IrBEA as the representative organisation for the bioenergy sector strongly advocates for clear government strategies to provide Ireland with secure, reliable, cost-effective sustainable energy. This should include a wide range of currently available technologies and fuel options.

We have answered the relevant, specific consultation questions below, and also wish to make some high-level, strategic points in response to this consultation.

Bioenergy as a proven and widely deployed renewable energy

According to data provided by the World Bioenergy Association, which looks at the world's TPES or Total Primary Energy Supply, in 2018, the energy mix by different sources looked like the following:



Bioenergy is inherently renewable and recognised by the Inter-governmental Panel on Climate Change (IPCC) as the largest contributor to renewable energy and is likely to remain that way for at least the first half of this century. Moreover, it is required to comply with the strict sustainability criteria in the RED II directive.

IrBEA is also of the view that the state should be placing an emphasis on proven renewable technologies that are already available and deployed extensively in other European Union member states. In particular, the use of wood chip and pellet, anaerobic digestion to produce biogas/biomethane, pyrolysis for syngas, and gasification. These technologies are available to address the urgent and immediate priorities of security of supply, rising costs, and de-carbonisation to meet 2030 targets.

IrBEA recently commissioned UCC MaREI to produce a study exploring the options for the decarbonisation of transport in Ireland. While increased ambition for the roll out of EVs are to be welcomed, the report also highlighted that the immediate increase in blend rates of both bioethanol and biodiesel would further decarbonise existing transport fleets. IrBEA calls for the immediate introduction of E10 and B12 in petrol and diesel. IrBEA also asks that the Climate Action plan includes timeline for mandating a B20 biodiesel blend in captive fleets.

The report also called for the targeting of 5TWh of indigenous biomethane production for use in heavy transport vehicles and also targeting 2TWh of Hydrotreated Vegetable Oils (HVO), using best practice examples such as that achieved by Sweden.[1]

IrBEA, alongside the umbrella grouping of Renewable Energy Ireland (REI), also recently published a study which outlined a 40% renewable heat vision for Ireland by 2030, capable of delivering a 7 % CO_2 abatement per year.[2] While the electrification of heat may provide pathways for decarbonising certain heat requirements, the reality is that a mix of different technologies and options is required to achieve the necessary reductions in CO_2. Bioenergy in

[1] Irish Bioenergy Association Report on Transport copy (irbea.org)

[2] https://renewableenergyireland.ie/wp-content/uploads/2021/05/Renewable-Energy-Ireland_Renewable-Heat-Plan_-Final.pdf

the form of biomass and renewable gas offer readily available and indigenously produced forms of heating energy. IrBEA would call for a 40% renewable heat target to be included in the next climate action plan with the immediate introduction of an ambitious Renewable Heat Obligation in 2023, with an ambition of a 3% annual increase in the obligation up to 15% by 2030.

Another area that IrBEA sees as vital is the mobilisation of an indigenous biogas / biomethane industry on a phased basis up to an increased ambition of 5TWh. Ireland is often referenced as having the greatest potential gains from the development of an industry compared to other countries within the EU due to the lack of development in the sector to date. There are numerous benefits that could be realised with the mobilisation of an industry, allowing for farm diversifications, increased resource efficiencies, the offsetting of the need for as much imported fertilisers, the potential for decarbonisation of heavy goods vehicles as well as scope for grid injection facilities, to name but a few of the potential benefits. A recent report titled "Gas for Climate- A path to 2050[3]" outlined the potential for biomethane in the EU up to 2050 and estimates that a figure of 151 bcm (billion cubic meters) could be available to help achieve the ambition of reaching net zero by mid-century, if allowed and supported to scale. The European Union's REPowerEU[4] articulates the role biogas/biomethane could play in reducing the dependency on fossil fuels and sets out an action plan for increased ambition, involving both industrial partnership and financial incentives to allow the industry grow, with an inclusion of the use of the Common Agricultural Policy as a mechanism to support this.

IrBEA and its members are involved in the supply of solid biomass and wood fuels We would call for a support scheme, administered by DAFM, to be reintroduced, allowing for the establishment of short rotation coppicing and energy crops. This, coupled with an increased ambition of the roll out of the Support Scheme for Renewable Heat (SSRH) would help further the development of sustainably sourced indigenous sources of biomass, allowing for a reduction in the need for imported fossil fuels. We would also call for the SSRH to be expanded and further developed.

IrBEA administer the Wood Fuel Quality Assurance Scheme (WFQA) on behalf of DAFM. The WFQA scheme enables consumers to choose quality wood fuels that have been certified to ISO standards to ensure they meet strict quality and sustainability criteria. The number of certified suppliers is growing within Ireland as is the awareness among the public as to the importance of quality fuels. With the introduction of the new solid fuel regulations, IrBEA believe the promotion and coverage of the WFQA scheme should be enhanced and further promoted to reach a wider cross section of the public.

[3] New Study on Biomethane Production Potentials in the EU - Gas for Climate 2050
[4] https://ec.europa.eu/commission/presscorner/detail/en/ip_22_3131

IrBEA and several its members are actively involved in the growing biochar sector. Biochar, a solid stable form of carbon produced through the thermal conversion of biomass, has seen a rapid pace of research and development within the last decade, both in Ireland but also across the world. The IPCC highlighted biochar production and use as a promising NET or Negative Emissions Technology, capable of carbon dioxide removal (CDR). It provides a pathway for carbon sequestration, offers a means to decarbonise or, under the right conditions, provide carbon negative solutions for both process and district heating requirements. As a material, it is increasingly being recognised as a valuable material, capable of serving across numerous sectors including the agricultural, horticultural, waste management and construction sectors, among many. IrBEA would like to see the inclusion of a dedicated action within the Climate Action Plan, potentially led by Teagasc, exploring both the production and use of biochar, the positive benefits it could bring in terms of emissions reduction, its role within the Irish agricultural sector, PyCCS and carbon sequestration, its role in carbon farming, its use within the important horticulture sector as part of a peat replacement solution. While research and innovation into biochar in Ireland does exist, we firmly believe that a properly resourced and actionable plan for its further development will help address some of the challenges faced by our society.

As an organisation representing the various different bioenergy disciplines, we firmly believe that bioenergy as a whole can continue to provide decarbonisation opportunities across a wide range of sectors and society and that and Government led support and policy measures that can enable carbon reduction measures through the use of bioenergy should be welcomed.
We welcome an opportunity to engage with the department further.

Yours sincerely,

Carbon Pricing and Cross-Cutting Issues

Consultation Questions

1. Are there any unintended barriers within the planning system that should be addressed at national policy level in order to deliver our climate ambitions?

There are considerable constraints in Part L of planning requirements in terms of energy efficiency. While these requirements do recognise energy efficiency, they do not recognise CO_2 reduction sufficiently. Buildings that use heating sources such as biomass or waste heat from district heating gain no credit from doing so – as a result these technologies which are vital to Ireland and the EU meeting its targets are not employed to their full potential – indeed they are effectively discouraged from use due to the current Part L calculations.

We would also ask that the planning system further recognises the differing scales of renewable energy projects.

National planning guidelines on anaerobic digestion plants for biogas/biomethane and digestate bio-fertiliser are required, to assist and inform planning officials, and to ensure consistency in the treatment of anaerobic digestion plant planning applications.

2. What further opportunities exist within our taxation system, beyond measures already implemented and planned, to promote emissions reductions, either on an economy-wide basis, or in specific sectors?

No response

3. Further to recent reforms to Ireland's green budgeting and public procurement policies, are there any additional measures that could be taken to integrate climate considerations into these policy frameworks?

At present many government/state contracts for heating is in the form of annual contracts for the supply of fuel – thus tying the procurement process to fossil fuels. However, if the policy was changed to supply of "Heat" for an extended period of time such as 7-10 years then the capital procurement of renewable heating equipment such as biomass boilers could be considered.

Clear policy is needed to show procurement officials that all procurement of renewable energy is considered above procurement of fossil fuels. Clear policy is required to signal urban development of district heating.

4. Are there any significant cross-cutting gaps not previously discussed in Climate Action Plan 21 that need to be addressed?

No response

5. Are there any other cross-cutting issues that should be considered in the development of the 2023 Climate Action Pan?

No response

Electricity

Consultation Questions

1. What options are available to increase the penetration of renewable electricity beyond the up to 80% committed to in Climate Action Plan 2023.

Support for renewable electricity to date has focused on price per kWh, however we as a nation have become recently aware that a stable electricity system is equally important, and. not just units of energy. Therefore, we propose that future supports should recognise the value of renewable electricity which can be called on at any time of day or night or indeed any time of the year to provide much needed power. We call for support for dispatchable renewable power which will support a stable futureproofed electrical grid.

2. What can be done to accelerate/facilitate the delivery/deployment of offshore wind and solar PV in particular, in the context of Climate Action Plan 2021 and the REPowerEU ambition?

No response

3. What role does renewable gas have in the power generation sector?

Renewable gas in the form of biomethane is a fully developed technology, it can be used to provide dispatchable power when needed and will thus support a stabilized grid. However, it is at higher cost, and this must be considered in our future calculations. Hydrogen is a technology in development at present, it is sparsely available commercially and no systems exist of any scale on a worldwide basis, therefore the role that hydrogen can play in future will be heavily reliant on firstly the development of this technology and secondly the development of these markets. It must also be considered that hydrogen is an energy carrier it is not an energy source therefore the energy must be created by

another means whether that is excess wind excess solar, or excess biomass converted to hydrogen, we must consider using those power sources directly and conversion to hydrogen as only pemitted to store at times of surplus.

4. What role could carbon, capture and storage have in decarbonising our power sector?

We recognise that while Bioenergy Carbon Capture and Storage (BECCS) is not yet widely deployed, as the technology offerings mature, it could play a greater role in reducing emissions from power generation in the near future.

5. What other opportunities exist to support the decarbonisation of the electricity sector?

No response

6. What measures might be taken to improve the resilience of the electricity system to the impacts of climate change?

No response

7. What role do you see for electricity storage and demand-side response in providing flexibility to a system comprised of high renewable penetration and in supporting the decarbonisation of the electricity sector?

Storage of electricity is very much dependent on scale. Battery systems which are currently available do provide some grid stabilization services. It must be recognised however that batteries will never be available at the scale and quantity required to be able to smoothen out the ebb and flow of electricity demand and the ebb and flow of wind availability and solar availability batteries simply do not have the capacity nor does the world have the mineral resources to support the development of such a grand scale of battery development. Scarce resources which can be used in batteries must be conserved for higher value uses such as mobilisation, i.e., electric vehicles. Energy storage at grid scale could possibly be available in Ireland through very large-scale pumped storage or other means as yet to be fully developed.

8. What financial incentives are needed to increase renewable generation capacity?

No response

9. To incentivise commercial scale production.

No response

10. To incentivise microgeneration.

No response

11. What are the regulatory challenges for reaching the renewable energy share targets?

No response

Enterprise

Consultation Questions

1. **What measures can be taken to accelerate the uptake of carbon-neutral low temperature heating in manufacturing?**

No response

2. What measures can be taken to decarbonise high temperature heating in industry?

We recognise the support that the support scheme for renewable heat (SSRH) which is offered by SEAI provides for commercial use of low medium and high temperature heat through utilisation of renewable biomass. Further rollout of these technologies should continue to be supported as they offer significant potential for decarbonisation in the short medium and long term coupled with the ability to do so at affordable and indeed low cost.

3. **What measures can be introduced to reduce to F-Gases in the Enterprise sector?**

No response

4. How can we encourage the diversification away from products with high levels of embodied carbon, such as traditional cement in construction to lower carbon alternatives?

No response

5. What role could Carbon Capture and Storage (CCS) have in industry, and what steps would encourage its deployment?

IrBEA would advocate for the recognition of PyCCS or Pyrogenic Carbon Capture and Storage as a viable and available form of CCS that currently exists. Its inclusion as a specific policy objective (Policy Objective 4.20) in the NWRA's Regional Spatial and Economic Strategy[5] would suggest that the Northwest Region of Ireland be used as a test bed for the development of such systems. There is also great potential for the deployment of BECCS in the future as technology options mature.

6. What other opportunities exist to drive the decarbonisation of the enterprise sector?

We believe that increased roll out of the SSRH to suitable enterprises should allow further decarbonisation of heating requirements.

[5] https://www.nwra.ie/pdfs/NWRA-RSES-2020-2032.pdf

7. What measures should be taken to address the risks that climate change poses for enterprise?

No response

8. Are the measures that can be taken to assist businesses sustain the additional operating costs associated with moving to new, low-carbon technology?

No response

Built Environment

Consultation Questions

1. Currently SEAI provides approx. 50% of the grant of retrofit to Landlords, Housing for All commits to introducing a minimum BER for rented properties from 2025 onwards. What further supports can be put in place to address the split incentive when retrofitting rental properties (residential and commercial)?

No response

2. How can we encourage SMEs to upgrade the energy efficiency of the buildings they own?

No response

3. What immediate actions can we take to address the skills shortage in the construction sector, to facilitate meeting our annual retrofitting targets?

While skills shortage maybe a particular barrier it is not significant in the grander scale of things. The greater difficulty in Ireland is a labor shortage and the fact that we are simultaneously trying to roll out a housing policy in the middle of a housing crisis while also considering the rollout of deep retrofit programs. Both of these policies pull from the same very stretched labour market and thus interfere with the ability to deliver both concurrently. We believe that housing policy is going to be considered to be of greater importance over the next five years and policy for climate change should not be strongly reliant on the belief that there will be increased labor availability to carry out deep retrofit programs.

4. How can we ensure that necessary skills will be available to support district heating projects?

No response

5. Housing for All Commits to 100% funding to retrofit 40% of local authority housing

stock to B2 by 2030 at a cost of 1.4 billion euro. How can we further support local authorities to help them deliver on social housing retrofit targets.

No response

6. In addition to the existing financial supports and policy measures, are there any other incentives/assistance needed to help homeowners upgrade the energy efficiency of their homes?

No response

7. How could the roll-out of district heating be accelerated and what needs to be done to expand its coverage in Ireland?

The roll out of district heating could absolutely be accelerated in Ireland and we would call for the increased recognition of the role locally grown and sourced biomass could play in serving the development of more district heating systems. This sector is much further advanced in other European countries and examples of best practice should be taken to inform a suitable approach here in Ireland.

It is essential that policymakers in Ireland are made aware and understand that bioenergy plays a significant role in district heating systems across other European Union member states. This includes from wood-based biomass and biogas from anaerobic digestion of wastes and residues. District heating offers many opportunities in Ireland and can be deployed with heat from a number of technology types.

8. Are there any specific obstacles in the planning system that is impeding the rollout of district heating and the national retrofit plan? How can we overcome these barriers?

No response

9. What policy levers are needed to encourage and support the retrofitting of shared properties e.g., apartments?

No response

10. Further to the existing supports financed by carbon tax revenues, how can we protect those who are currently experiencing fuel poverty and those who are at risk.

No response

11. What specific measures can be implemented to improve the efficiency of rolling out the National Retrofit Programme?

No response

12. Further to those technologies identified in previous iterations of the Climate Action Plan, what other additional measures could be used to reach our emission reduction target in this sector?

No response

13. What specific measures would incentivise a greater rate of oil boiler replacement?

We would call for consideration to be given for the development of a support mechanism that would allow homeowners to make the switch to modern eco design biomass systems as replacements for oil boilers such as pellet stoves and boilers. These can often be swapped out with relative ease, as a direct replacement, and are particularly suited for decarbonising heat requirements in buildings where deep retro fit or the installation of heat pump technology is not financially or technically viable.

14. What is the next step for geothermal energy application to the built environment?

No response

Transport

Consultation Questions

Sustainable Mobility and Demand Management

No response

Electrification

No response

Freight / Commercial Sector

1. What specific measures can be applied in the commercial transport sector to encourage or accelerate a change to EVs or to other zero carbon alternatives?

Policy must recognise the difference between employing technologies that exist and employing technologies that are currently in development. While large scale electrification of personal vehicles is currently struggling to keep up with market demand there has as yet been a lack of options for transport fleets. Ireland is not a country which develops or manufacturers vehicles, we are therefore reliant on other countries to lead in this manner. Realistically, Ireland can only decarbonise a proportion of transport with EVs over the coming decade. It is clear that electrification of our car fleet is going to struggle to meet stated targets. Indeed, it is most likely to fall dramatically short of ambitions. Policy must be rooted in what is achievable and what is technically possible. We consider that electrification of the car fleet to the level proposed is aspirational beyond the technical possibilities and any additional targets for commercial vehicles and heavy goods vehicles is at this

point something that which would be considered a folly. Decarbonisation of our heavy goods transport fleet and our car fleet has been partially met over the past ten years by the inclusion of biofuels in our fuel mix is a policy that has worked. We consider this policy should be expanded to its maximum technical potential and call for the immediate introduction of both E10 and B12

2. What potential do digitalization, innovation and efficiency improvements in the commercial sector (including, e.g., establishing logistics hubs) have to deliver emissions abatement? What are the barriers to delivery of each?

No response

3. How can the climate costs of home delivery services be mitigated? Should there be a surcharge - depending on the mode of delivery, with cargo bikes and EVs exempt. If this was to be considered, how would transparency around this charging be affected?

No response

4. As a transitionary fuel to help decarbonise the road haulage sector, what obstacles to you foresee in raising the blend proportion of biofuels in road transport to 10% bioethanol (E10), and 20% biodiesel (B20) by 2030? Is there potential for greater Ambition?

We believe it is misled policy to be considering biofuels as a transitionary fuel. To date they've provided the vast majority of decarbonisation of our transport fleets and will remain to be a significant portion of our decarbonisation efforts over the coming decades and perhaps further. Policy should recognise this fact and be directed accordingly. We would call for the immediate introduction of both E10 and B12 as well as a commitment to introduce B20 blends for captive fleets of heavy transport vehicles out to 2030.

Rural Transport

No response

Just Transition & Communication

No response

Agriculture, Land Use and Forestry

Consultation Questions

1. What are the opportunities to increase take-up of measures identified in AgClimatise

and encourage adoption of other practices which reduce emissions?

No response

2. What policies and measures would be needed to support farmers diversify their farm activities to include opportunities such as bioenergy, vegetable growth, forestry, organic farming, etc.?

All farmers should be encouraged to dedicate small plots of their farm to the production of their own energy resources such as would fuel for heating their own houses. It is readily estimated that one acre of farmland will provide adequate fuel for the heating of 1 domestic home, while also providing an area for biodiversity and some carbon storage.

We would also call for the reintroduction of a support scheme, administered by DAFM, for the development of short rotation coppicing and energy crops to ensure security of supply of indigenous material.

3. What can be done to maximise the use of manure and silage as feedstock for biomethane generation in closed digesters and inject into the gas grid to offset natural gas?

We agree that manure slurry and other farm by products have significant capacity to produce renewable biomethane and we agreed that excess silage, another crop material, can also be utilised to provide same. We have laid out in our 40 by 30 report some of the potentials that are technically possible on our island. We do know that 1.6 terawatt hours is readily possible with excess material however we believe that going for figures such as 5.7 terawatt hours have to be properly examined to ensure that the material is available and will not cause stiff competition from the dairy sector for grass silage. It must be noted that the dairy sector has much greater ability to afford high-cost silage than the production of biogas.

Policy should also recognise that there is significant potential to use biogas without going to the high cost of turning it into biomethane. On farm use for powering tractors producing electricity and providing heat can readily be done with biogas that has not been upgraded or partially upgraded for significantly less capital cost then would be required to produce grid quality biomethane.

4. What can be done to increase sequestration through forestry (afforestation, extended rotations, and improved forest management)?

Ireland has attained dramatic success in afforestation over the past three decades however the recent restrictions at times of thinning and harvesting have dramatically reduced the uptake of forestry as a farming enterprise by farmers. Policy must reduce the burden on farmers and recognise that their efforts have sound ecological and environmental benefits, policy must support these measures and must clearly signal that sustainable forestry using conifers is vital for the production of ecologically sound building materials, i.e., timber for all our future building needs. Through an increased land area

going into forestry which will be achieved by reducing the burden on landowners, we will increase our forestry area, we will increase sequestration and through improved forest management methods we may increase biodiversity and longevity of our forestry system. As of yet, we have not seen any evidence that supports the idea of extended rotations. Forest management as a commercial crop must be recognised correctly for its production of ecologically sound materials. Woodland areas which we consider different to forestry areas which are used for native trees and enhanced biodiversity have a different value and may need to be considered and recognised differently to commercial forestry.

5. What opportunities are there to rehabilitate our peatlands and wetlands, and what can be done to realise these opportunities?

No response

6. What measures would support increased sustainable management of grasslands, including those areas on drained organic soils?

No response

7. What opportunities exist for increased use of cover crops, incorporating straw into tillage and for the application of regenerative agriculture practices? How can farmers be supported to take up these practices?

No response

8. What sort of role could Ireland's marine environment (lakes, seas) have in delivering climate mitigation? What are the building blocks that need to be put in place to support the role of the marine environment in climate mitigation (e.g., a regulatory framework, measurement and accounting rules)?

No response

9. What other opportunities exist to support the decarbonisation of the agriculture, land use and marine sectors?

All of these sectors have potential for the further decarbonisation of heat requirements through the deployment of bioenergy powered technology offerings.

10. What specific measures can be taken in agriculture, forestry and land use to adapt to climate change?

No response

Waste and the Circular Economy

Consultation Questions

1. What are the main barriers to consumers embracing the Circular Economy, e.g., lack of awareness, increased costs compared to disposable products, lack of access to circular goods and services?

The circular economy requires a systematic transition towards the designing out of waste from the production of consumer goods and packaging in particular. It is primarily a question of supply rather than demand. It is a challenge for consumers generally to embrace the circular economy, if little or no circular economy options are made available to them on the market.

2. What other opportunities exist to support decarbonisation through the acceleration of a transition to the circular economy?

The use of low value, waste or residual biomass for the provision of bioenergy as well as emerging bioeconomy applications allows for the valorisation of these materials, the creation of employment opportunities and the reduction in the amount of material being disposed of. The cascading bioeconomy principles allow for a more circular approach to the use of biomass where various outputs can be achieved and where energy recovery can be realised at end of life or for fractions that aren't suitable for conversion into bio-based products.

Public Sector Leading by Example

Consultation Questions

No response

Just Transition

Consultation Questions

Consultation Questions

3. What additional targeted supports should be considered to minimise the impact of our climate policies to those on low income or households that are most at risk from fuel poverty (including transport and heating)?

4. Are there are any emerging areas of vulnerability in specific sectors of the economy as a direct result of the implementation of Ireland's climate action policies?

In response to consultation questions 3 and 4: retro-fitting schemes for homeowners that require applicants to provide a large portion of own-funding or self-funding are not an option for lower income households and those struggling to meet increasing electricity and heating costs. High quality, certified wood fuels offer a clean and sustainable alternative to fossil fuels for homes in fuel poverty or at risk of fuel poverty in the short to medium term. Modern, efficient biomass and wood-fuel based systems

also offer a range of alternative options for households and business (especially when availing of the Support Scheme for Sustainable Heat (SSRH)).

7. Should the proposed Just Transition Commission have any other functions in addition to those described above?

It should be within the terms of reference of the Just Transition Commission that it is technology neutral with regard to the renewable energy technology options available as alternatives to fossil-fuel based systems and technology for electricity, heating and transport.

8. What mixtures of skills and expertise are required on the Just Transition Commission?

Any Just Transition Commission membership or personnel must reflect the range of renewable energy technology options immediately available for deployment in the marketplace.

Research and Innovation

Consultation Questions

1. Are the required research and innovation programmes and structures in place to support our climate ambitions; including the provision of the evidence needed to underpin policy in a timely manner?

An ongoing risk within our research and innovation frameworks is that there is an ongoing and repeating pattern of funding research being provided for Technology Readiness Levels (TRLs) 1 to 4. Whilst this is necessary, and has its role, more opportunities and more funding for innovation, demonstration and deployment should be made available to bridge the gaps along through TRLs 5 to 7. The research, development and demonstration funding provided through the Sustainable Energy Authority of Ireland (SEAI) in recent years has been a good step in the right direction, but more of this is required, in particular opportunities to test and de-risk new developments in existing, proven, and deployed technologies to fast-track improvements and deepen de-carbonisation. Please see also the response to question 4 below for this section.

Another emerging risk is that our research and innovation programmes and structures become skewed towards a very narrow or limited range of renewable energy technologies, rather than remaining technology neutral and focused on providing solutions for all socio-economic sectors of the community and all sectors of the economy.

2. Have you identified any research and innovation gaps which need to be addressed?

If so, how can these gaps best be addressed?

As mentioned in the introduction, IrBEA believe that a specific climate action plan action, potentially administered by Teagasc, should place an emphasis and focus on the research and development of biochar, its production and use, its place within the agricultural and horticultural sectors, its ability to

decarbonise or offer carbon negative heating, as well as its huge potential as a carbon sequestration mechanism. As per the NWRA's specific policy objective 4.20 in the recently produced Regional Spatial and Economic Strategy[6], biochar and PyCCS can and should play a role in the decarbonising of heat, powering the bioeconomy and production of a carbon sink in the form of the biochar. The sector needs to be supported and resourced to enable its full potential to be realised.

3. Are there important areas of research and innovation, where Ireland currently does not have sufficient capability, that need to be developed? If so, what are these areas?

4. Is the research and innovation system developing and retaining the skills needed to deliver on our climate ambitions?

Please see the response to question 1 above for this section. In addition, and linked to that response: many master's, PhD, and post-doctoral opportunities are tied to funding provided at TRL 1 to 4 – more funding opportunities in the TRL 5 to 7 range would further develop and retain the individuals and their skillsets needed to deliver on our climate ambitions.

[6] https://www.nwra.ie/pdfs/NWRA-RSES-2020-2032.pdf