Where our electricity comes from

Chapter 8

Summary of recommendations

1. Large majorities of assembly members strongly agreed or agreed that **three ways of generating electricity should be part of how the UK gets to net zero:**
   - **Offshore wind** (95%);
   - **Solar power** (81%);
   - **Onshore wind** (78%).

2. Assembly members tended to see these technologies as **proven**, **clean** and **low cost**, with wind-based options suitable for a "windy" UK. Offshore wind had key additional benefits, particularly being **"out of the way"**. Solar power was viewed as flexible in terms of where it can be located, among other advantages. Some assembly members suggested a range of points to bear in mind when implementing all three technologies. These included their location and environmental impact, progress on electricity storage, ways to incentivise and facilitate uptake, visual design, and where they are manufactured.

3. **Assembly members were much less supportive of bioenergy, nuclear and fossil fuels with carbon capture and storage** – although, particularly for bioenergy, significant numbers of assembly members were unsure about its use:
   - 40% of assembly members 'strongly agreed' or 'agreed' that **bioenergy** should be part of how the UK gets to net zero, 36% were 'unsure', and 24% 'strongly disagreed' or 'disagreed';
   - The equivalent figures for **nuclear** were 34%, 18% and 46%;
   - **For fossil fuels with carbon capture and storage** the results were 22%, 22% and 56%.

4. For some assembly members, their view on **bioenergy** would depend on how bioenergy is produced, including what is being burnt, how production is regulated, and therefore what its environmental and CO_2 impacts are. Assembly members' dislikes about bioenergy included concerns around burning trees and crops, land use and environmental effects, as well as a feeling that better alternatives exist.

5. Assembly members' had three main concerns around **nuclear**: its cost, safety, and issues around waste storage and decommissioning. Their dislikes of **fossil fuels with carbon capture and storage** centred on safety risks (if carbon leaked during storage or transfer), the continued use of fossil fuels, and a feeling that it only provides a "short-term", expensive solution when better alternatives are available.

6. Assembly members did not hear detailed evidence about **tidal, wave, hydro and geothermal** technologies. However assembly members were in principle supportive of the use of these final four ways of generating electricity, particularly for suitable local areas.

Where our electricity comes from

How the UK generates its electricity is a central question on the path to net zero. The UK still produces a significant amount of its electricity from fossil fuels, particularly gas. This emits carbon dioxide, which contributes to global warming and climate change. All the UK's electricity generation will need to come from low carbon sources if its net zero target is to be met. The UK is also likely to need more electricity in future due to an increase in electric vehicles and electric heating.

What did the assembly consider?

All assembly members heard evidence, deliberated and voted on this topic. They heard about six main ways of generating electricity, before considering whether or not each of them should be part of how the UK gets to net zero:

- Onshore wind
- Offshore wind
- Solar
- Bioenergy
- Nuclear
- Fossil fuels with carbon capture and storage

The evidence session for this theme took place during the assembly's online weekends.[1] It covered:

1 The assembly also heard introductory evidence on this topic at the start of weekend two. This ensured assembly members were aware of key issues about where our electricity comes from, before discussing related themes such as surface transport and heating our homes. The subject of hydrogen was touched on during this weekend two introductory session and is picked up in comments from some assembly members in this chapter. Similarly, assembly members who looked at air travel heard evidence on synthetic fuels during weekend two, another area touched on by some assembly members during this chapter.

- What each of the above six generation methods are and different views on their desirability;
- The design of the electricity system and how it may need to change;[2]
- Some limited evidence on generating electricity using hydro, tidal, wave and geothermal technologies.[3] Assembly members were able to express their views on these methods in their discussions and on their ballot papers, albeit in a more limited way than for the six ways of generating electricity listed above.

Assembly members had the opportunity to question each speaker[4] in detail.

After the evidence session, assembly members discussed what they had heard. They then voted by secret ballot.

What's included in this chapter?

Assembly members had less time overall to discuss 'where our electricity comes from' than they had had for the themes covered in previous chapters. They therefore primarily focussed on just one question: which of the above six ways of generating electricity should be part of how the UK gets to net zero. Assembly members looked at this question in some depth.

This chapter presents their views in the following order:

A. **Vote results:** the assembly's final recommendations on which of the six ways of generating electricity should be part of how the UK gets to net zero;

B. **Rationale and conditions:** assembly members' rationale for their votes, as well as areas they would like to see considered around the implementation of each of the six options;

C. **Other technologies:** assembly members' views on the technologies that they heard less evidence about – hydro, tidal, wave and geothermal;

D. **Cross-cutting considerations:** points raised by assembly members that cut across all the ways of generating electricity.

The chapter ends by summarising the conclusions from across these sections.

2 This included information about measures needed to ensure that the supply and use of electricity are balanced in real time – including storage (e.g. via batteries) and interconnectors (cables to other countries).

3 The assembly did not have sufficient time to look at every way of generating electricity. It therefore focussed mainly on the technologies with most potential to generate a substantial amount of low carbon electricity in a cost effective way.

4 The assembly heard from three speakers on where our electricity comes from: Mike Hemsley, Committee on Climate Change (informant); Professor Patricia Thornley, Aston University (informant); Professor Jim Watson, University College London (informant). All speakers' presentations are available as slides, videos and transcripts at climateassembly.uk/resources/. An 'informant' is a speaker who we asked to cover the range of views and available evidence on a topic.

Contents of this chapter

A. Vote results

Assembly members voted on ways of generating electricity by secret ballot. There were two different ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each method should be part of how the UK gets to net zero. The second ballot paper asked them to rank the methods in their order of preference.

The votes from this second ballot paper were counted in two ways:

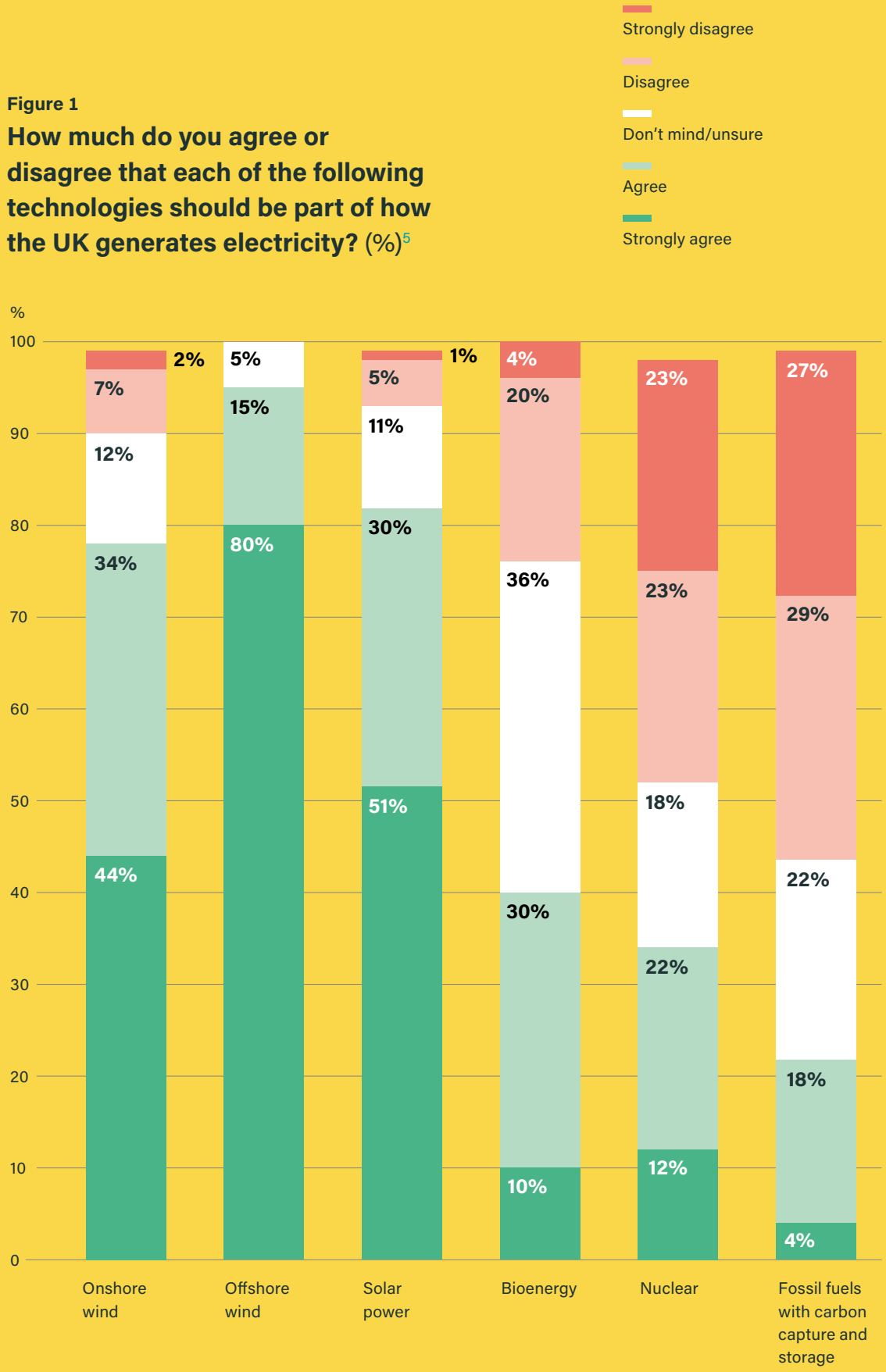
- **Counting assembly members' first preference votes only.**
- **Using Borda count.** This involves allocating points for preferences – a first preference vote scored five points, a second preference vote four points and so on. A sixth preference vote scored no points. Counting the votes like this tells us which methods are most acceptable to the greatest number of assembly members. This is particularly useful for this question, as it is likely that more than one way of generating electricity will be needed.

A majority of assembly members strongly agreed or agreed that three ways of generating electricity should be part of how the UK gets to net zero. In their order of preference these were:

- **Offshore wind** (95% of assembly members 'strongly agreed' or 'agreed', with a large majority of 80% 'strongly agreeing'; no assembly members 'strongly disagreed' or 'disagreed');
- **Solar power** (81% 'strongly agreed' or 'agreed', with 51% 'strongly agreeing');
- **Onshore wind** (78% 'strongly agreed' or 'agreed', with 44% 'strongly agreeing').

Figure 1

How much do you agree or disagree that each of the following technologies should be part of how the UK generates electricity? (%)[5]



5 Where bars in the graph don't add up to 100% this is because some assembly members abstained.

The other three methods saw much lower levels of support, and higher degrees of both uncertainty and disagreement. In assembly members' order of preference:

- 40% of assembly members 'strongly agreed' or 'agreed' that **bioenergy** should be part of how the UK gets to net zero, 36% were 'unsure', and 24% 'strongly disagreed' or 'disagreed';
- The equivalent figures for **nuclear** were 34%, 18% and 46%;
- **For fossil fuels with carbon capture and storage** the results were 22%, 22% and 56%; a majority of assembly members 'disagreed' or 'strongly disagreed' that this way of generating electricity should be part of how the UK gets to net zero.

The results of the preference votes largely reinforce this picture. A majority of assembly members (65%) chose offshore wind as their first preference method, with all other options a long way behind. In the Borda count, offshore wind, onshore wind and solar were again more popular than the other methods – with onshore wind scoring slightly more highly than solar power in this vote. Assembly members' order of preference for the other methods was again bioenergy, followed by nuclear, with fossil fuels with carbon capture and storage bringing up the rear.

Figure 2

Please rank the following technologies in your order of preference
(% first preference votes)

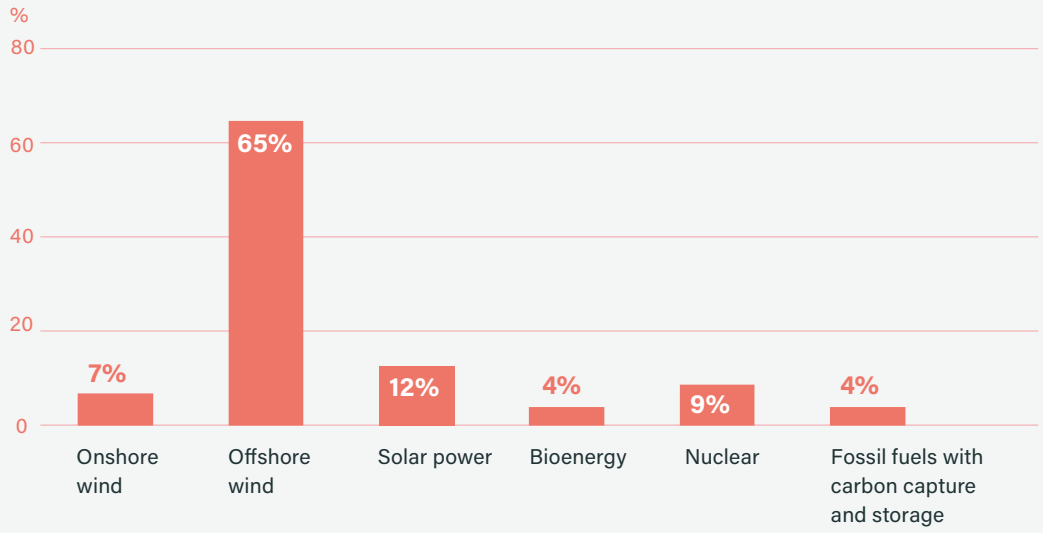
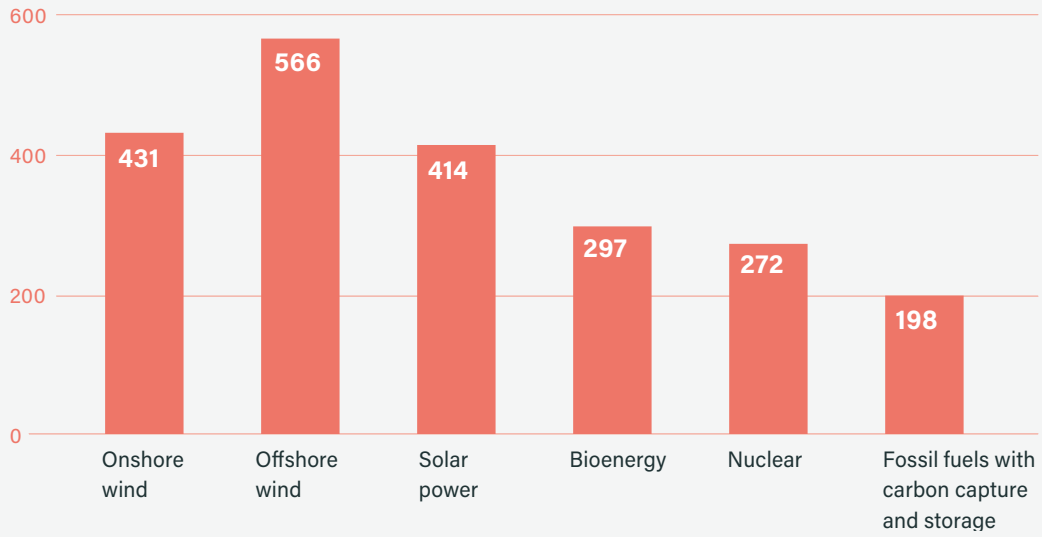


Figure 3

Please rank the following technologies in your order of preference
(Borda count)



B. Rationale and conditions

This section contains:

- The reasons that sit behind assembly members' votes, as just reported;
- 'Conditions' that some assembly members felt would support the use of each technology or that they suggested should be in place for it to be used.

Given the detailed nature of assembly members' comments, we have categorised the pros and cons for each of way of generating electricity under six headings:

- Environment impact and land use
- Practicality, efficiency, readiness and scale
- Costs, the economy and jobs
- Public support
- Safety and risk
- Other

The category titles are our words, not assembly members', and are just there to make assembly members' thoughts easier to navigate. All the content under the headings is assembly members' own.

We have kept in contradictory opinions in order to show the full range of views amongst assembly members. The results of the votes above tell you what conclusions assembly members reached having considered all these points, and the weight of feeling in support (or not) of each way of generating electricity.

B.1 Onshore wind

Onshore wind means wind turbines that are located on land. Assembly members discussed this technology in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about onshore wind.

⊕ Environmental impacts and land use

Some assembly members liked that onshore wind is "**sustainable**", "**renewable**," "doesn't run out" and is "environmentally friendly." Others described it as "**clean energy**", "cleaner", "low carbon" and "not dirty (i.e. does not use fossil fuels)." Some said they liked that "no CO_2 [is] produced (except in construction)" or that it is a "non-polluting operation."

Some assembly members labelled onshore wind "a **natural** way of ...[generating] electricity" or noted that it "uses natural resources to produce energy." Some highlighted that there is "**no waste**", "no nuclear waste" or "no residue at the end."

A number of assembly members commented on **wind turbines' appearance**, expressing a range of views. Some were **positive** commenting that they are "majestic", "pretty in the right location", "pleasant to look at on the horizon" or that they like "seeing wind turbines...[and] think they look nice, even the modern ones." Others were **more muted** suggesting that "some don't mind the look of them", or that "turbines are more attractive than slag heaps." Some noted that "one or two turbines can be built on their own (i.e. in industrial areas)" and that these "are not huge farms, so that makes them quite attractive." Others commented "houses aren't attractive in the environment so why do we have a problem with wind turbines?" Some assembly members presented **a different view**, saying "they are an eye sore, but if the potential is there this outweighs the negatives.... Other things are eye sores (e.g. power stations, masts), we have had to get used to them, we'll get used to this."

Some assembly members talked about **benefits for future generations.** Comments included that "we are all responsible for what happens to the world, and this is one solution." Others noted a "lack of [negative] impact for future generations" or that "they are temporary and when they are done the landscape returns and the impact is gone."

One assembly member said "if placed where it's effective, you can have dual land use."

⊕ Practicality, efficiency, readiness and scale

Some assembly members said that onshore wind is a "**proven technology, it works**, we have it already up and running." Some suggested that "no testing [is] needed" and "we know if we build more it will be fine." Others described it as a "very well researched tech ...[which is] gaining traction as a well established technology", is "available now" and "practical."

Some assembly members suggested that it is "**easy** to do – technically" and "easy to use," including being "low maintenance," "easy to fix and maintain" and "easy to set up." Some commented that it is "easier (than off-shore) to maintain – to access and upgrade as technology improves."

A number of assembly highlighted the benefits of using onshore wind at a **small scale and in strategic locations**. Some assembly members suggested that "whilst 'wind farms' can be seen as a negative, for some farmers, having a single turbine to generate power can be vital." Others said that "there may be an opportunity to extend use beyond feeding into the grid to power specific factories or other sites" or that it "works on [a] smaller scale / homes as well as [a] larger scale." Some suggested that "there would be [an] opportunity to expand production in strategic locations to minimise energy lost in transmission."

Some assembly members said it is "**scalable** – 10 x more potential than currently so can produce lots of energy." Others noted that it can be done "at a large scale" or suggested that there is the "ability to produce a large amount of energy (even if storage [is] currently problematic)." Some assembly members commented that "it's an existing technology so can be more easily scaled up."

Some assembly members noted that "we are an island so there is always wind" or suggested that this is a "**good source of energy for the UK**." One assembly member pointed out that it "can still be windy at night, unlike [the sun and] solar energy."

Other individual assembly members suggested that "you can store the energy in batteries", that "power can be moved easily" or that there's the "ability to build on existing infrastructure." One assembly member felt that it "could be used with geothermal well."

⊕ Costs, the economy and jobs

A sizeable number of assembly members described onshore wind as **"low cost",** "cheap", or "cheaper", with some suggesting specifically that it is "cheaper than off-shore to build, maintain and (mostly) to transmit the energy." Some labelled it "cost effective," suggesting that "production is virtually free once its built – represents good value." Some said that "costs are coming down" and that because of "economies of scale...[it] will only get cheaper." Others suggested that it is "becoming much more attractive for companies to build." Some assembly members described it as "**free energy."** Others said "we should be exploiting free energy, and it will be available for generations."

Some assembly members felt onshore wind would have **benefits for the economy and jobs.** They suggested it would be "economically good as [turbines] create a lot of on-going engineering jobs" or that "there could be a positive impact on industry in manufacturing them." Others said more generally that "we could exploit the opportunities of this technology as a country."

Some assembly talked about the **potential to make and raise money.** Some members suggested that there is a "possibility to make money as individuals from it", while others felt they are a "good investment for energy companies as [they] can have confidence." Some noted the "benefits from wind farms giving donations to local causes."

Public support

Some assembly members **wondered whether public hostility had been "over-hyped" or was being "given too much attention":**

> *"We were informed the Government stopped awarding contracts in 2015, when 80% of the public thought onshore wind was acceptable. Would public opinion have changed since then; would more people find it acceptable?"*

More than one assembly member talked about a "local example of [a] wind farm near where I live – after initial resistance, people have accepted it." In one case they said this was because people "can see land is being used well (wasn't useful for much else, not fertile, etc.)." Some assembly members felt that "people are used to wind turbines so not so difficult to introduce" or suggested that concerns about public acceptability "should not be allowed to overly influence decision-making." Some assembly members said that onshore wind turbines may not be people's choice but they are "what people need."

Some assembly members suggested that **people being able to see wind turbines is positive**; some commented that "when located in towns, it's good to make people realise where the energy comes from" or that "you can see it producing our energy and that there are no emissions."

One assembly member suggested it's "quiet."

⊕ Safety and risk

One assembly member said onshore wind is "safer compared to offshore wind."

⊕ Other

Some assembly members said that onshore wind has "**very few negatives**" or that "there are lots in my area – I have no problem with them. There's nothing to dislike about them." Other assembly members also expressed general support, saying they "like the idea of onshore wind", that it is "good and productive" or it's "good to see lots of it happening."

One assembly member suggested that "everyone benefits" from its use.

⊖ Cons

Assembly members identified the following areas as points that they disliked about onshore wind.

⊖ Environment impacts and land use

A sizeable number of assembly members expressed concerns about **land use**. They noted that turbines "take land that could be used for something else" or suggested that they are "probably not the best use of land, we're a very populated nation." Others felt that it would "hinder farming and food producers" or that the land "might be better used for growing local produce", for "housing", or "for trees." Some said that "there is room for onshore wind (land space available to increase the number of turbines) but not endlessly," while others felt we "would need lots of them for it to be worthwhile – need them to take up huge amounts of land." Some assembly members said that "there is lots of demand for land use in some parts of the UK we may not be able to find appropriate sites."

The sizeable number of assembly members who commented on **wind turbines' appearance** had a range of views. Some **disliked the "visual impact"** or "local visual impact", saying that turbines "don't look nice", ruin the landscape, and are "ugly", an "intrusion", an "eyesore" or "spoil the view and nature." Some said they were "particularly concerned [about the] impact on areas of natural beauty, such as mountains." Others described them as "not scenic" and suggested that they "need to be sited away from the beaten track/somewhere it doesn't look awful." Some lamented the fact you "would see it when you are walking about" or "wonder[ed]

what they will look like in 2050: will they be rusty and unclean?" **Others' dislike was slightly more muted**, with some assembly members suggesting that the "visual is a concern, but not too much, as benefits outweigh the negatives" or that they're "not good for resident's views, but [it's] just one of those things – a chance you take if you live in the countryside." Some said they didn't like the "visual impact...but not that bad." Others said "they are ugly" but that "this might improve as the technology improves."

Some assembly members voiced concerns about "**negative impact on wildlife**" or the "impact on migrating birds," with some asking "what about endangered species, peatland, birds." Others mentioned "bird strikes, bats" whilst noting we're "glad they are taking steps to try to reduce the impact on birds."

Some assembly members noted concerns about **habitat loss or "environmental impact"** more generally, with some picking out hedgerows and peatland as particular areas of concern. Others said turbines "destroy natural habitat" or suggested that "the 'changed' wind that comes off the turbines can be damaging to landscapes and eco-systems." Some queried whether there are "additional risks of damage to land used in this way, eg flooding or erosion?" Others said that "there could be an impact of manufacturing on the environment (especially if imported)." Some assembly members talked about "concrete bases", "non-recyclable materials" and "cradle to grave impact – consider where they are sited and impact – e.g peatlands, road building – need to assess lifetime cost."

⊖ Practicality, efficiency, readiness and scale

Some assembly members disliked that wind turbines are a "**variable source of energy**", labelling them "unreliable if wind not blowing", or saying they are "intermittent", "unpredictable" or that you "can't rely on wind for electricity." Some suggested that a wind farm located on the West coast "might not produce its full capacity. Do you want to take up all that land space for 85 000 wind turbines?"

Some assembly members said that "on days where there's too much [electricity] produced, [we] **haven't got the facilities to store it** at the moment", with others simply noting "can't store it." Some felt this meant we "should use it to generate synthetic fuel from CO_2 in [the] atmosphere – in this way [we] don't need batteries or H2. Synthetic fuel has longer lasting utility than batteries and H2 needs new infrastructure."

Some assembly members commented of the **location of wind turbines**:

> *"Windfarms need to be close to where the energy is used to be more effective. But we see lots of them far away from cities. The more the energy travels, the more you lose in the transfer, so that's a problem."*

Others noted that the "best places to locate the turbines might not be the places where the most energy is needed, therefore transmission costs and losses increase." Some worried that turbines might be located "in places that might not continue to supply the energy to us (i.e. Scotland if they get independence)."

Some assembly members commented on **efficiency and capacity.** Some suggested that onshore turbines are "less efficient than offshore" or that they "produce small amounts of energy compared to their claims." Others suggested that the "tech could be improved if made smaller – there's inertia with the bigger turbines needing more wind." One assembly member noted "I have a local windfarm and power generation is listed in energy by household (it produces energy for 1000 homes) which is nothing compared to the amount of houses in the area."

Cost, the economy, and jobs

Some assembly members said they disliked the "**cost**" or "costs of manufacture." Others said that the "price for electricity generated should be lower" or that there was "some suggestion that maintenance costs are high." One assembly member disliked that "**many [turbines] are made abroad**", although another countered that "there is a lot of production in Hull."

Public support

Some assembly members said that they "can result in **local controversy**" particularly because of the visual impact and suggested that "local communities should be more involved in deciding whether they are located near them or not – who makes the decisions." Others said "**public acceptability** is a limitation" and they are "not seen as popular with the public", with some noting "personally, I don't dislike them, but I understand that others don't want them in their area."

Some assembly members raised **issues about living close to wind turbines**. Some noted that "living close to them means you get reflections from them like mirrors" or that they "can be distracting to look at at times – maybe better away from roads." Others said there is "noise if close but not that bad" or "noisy – but you do get used to it." Some felt the "noise impact" and "noise pollution" were more serious particularly if "scaled up": "a friend lives close to a windfarm and it makes their life miserable. Constant humming sound which can drive you bonkers." Others said that "delivery of the turbines...[is] unsuitable for small roads – disruptive."

Safety and risk

Some assembly members said onshore wind turbines are "not capable of handling **strong winds**" or "can be damaged by high winds so need to be turned off above a certain wind speed." Others asked "can blades be dangerous if they come off?"

Other

Some assembly members worried that turbines are "**unfair** on rural communities who have them while urban dwellers benefit." Others said they were "concerned about the development of large-scale wind farms in Scotland, which benefit England..., but have a negative impact on the Scottish environment and landscape."

Some assembly members said onshore wind "is **not as good an option as building off-shore**."

Conditions

Some assembly members noted conditions that they would want to be in place for onshore to be used, or that they felt would help its use. They highlighted a need to:

Think carefully about location

Some assembly members felt that "they have a place, but should not be located everywhere." What constituted a suitable or unsuitable place was different for different assembly members, for example:

"As long as it's in the right areas, so not on natural beauty areas, but better on useless land."

"Use land that cannot be used for other things e.g. agriculture."

"Onshore wind can also be built on marginal land without much other use, and can be integrated with other solutions for reducing our emissions (such as new forests) or placed next to other construction projects so the land required for onshore wind can be reduced even while it is massively scaled up."

"As long as not outside your house."

"...they need to be dispersed.... Don't have to be huge farms."

"There is plenty of sparsely populated land (e.g. in Northern Ireland) where you could site turbines."

"Put out of the way, e.g. motorways."

"Need to be placed in best places to ensure UK has access to the energy."

"Focus where maximum benefit and least damage."

Look at small scale uses and better visual design

Some assembly members stated a "preference for personal, small scale" as opposed to "large developments", while others suggested that there "would need to be measures put in place to minimise the size of on-land turbines as technology develops (i.e. not as big as off-shore ones)" or suggested "more focu[s] on the models without sails that have less visual impact on the landscape." Some noted that they "don't seem to have variations in the design – could it be miniaturised (i.e. on aircrafts don't have massive blades)." Some suggested that factories could "have their own windfarms to power their plants? e.g. Nissan plant has its own windfarm." Others asked whether they could "have these on our personal homes, i.e. wind trees?" or said "we could consider the use of household wind trees (aeroleaves) for household power generation. They are small and can work at low wind speeds."

Tackle public acceptability

Some assembly members felt there would be a "need to change public perception" and made suggestions about how to win round the public.

"If the public knew wind turbines are a low cost option, they might become more acceptable."

"If they were all over the place and people could see the cost benefit analysis that might help."

Consider land use

Some assembly members said that their support would "depend on how the land is used, i.e. farm around [them]" or suggested that you could "use the land for two different things" or that the UK should be "combining onshore wind turbines with other things e.g. tree cover."

Make them in the UK

Some said they would be "in favour if they were made in [the] UK – better for local jobs".

Sort out storage and infrastructure

Some assembly members said that "battery storage needs to be good and with infrastructure to support this." Others said we "need the infrastructure to get the energy to the grid and avoid wasted energy (sometimes more is available than can be used)". Some asked how we plan to dispose of the batteries.

Manage impact

Some assembly members suggested that "commercial businesses need to be managed to ensure that they don't damage the landscape" or that onshore wind needs "needs proper assessment of environmental impact."

Reinstate grants

Some assembly members said that "grants from government were stopped and need to be renewed" or that "Government support pulled for them and it needs to come back to then lower cost and give support for renewables."

Ensure security

Some assembly members suggested that we need to "protect against foreign ownership/ outsourcing to ensure supply and protections."

Relax planning rules

Some assembly members suggested that "[l]ocal authorities need to be more flexible with regulations and rules relaxed."

As seen in Section A, assembly members expressed significant support for onshore wind in their votes.

B.2 Offshore wind

Offshore wind means wind turbines that are located at sea. Assembly members discussed this technology in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about offshore wind.

⊕ Environment impacts and land use

A significant number of assembly members commented that offshore turbines are "**out of the way**", "can go a long way out in the ocean" or are "out of sight, out of mind". Some assembly members suggested this had visual benefits in not "spoiling the landscape", with some saying you "don't have unsightly turbines on the land" or that you "get the benefits of onshore turbines without the disruption of [the] natural landscape." One said "this is the proper place for wind turbines" while another noted the "aesthetic – visually nicer and appealing [than alternatives]." Other assembly members suggested offshore wind "**affects fewer people than onshore**", is "further away from people's houses", or "doesn't intrude in any way– away from people so no one will have issues with noise etc". Others said they are "not in people's back gardens / in the countryside."

Some assembly members suggested that there would be "**minimal disruption to wildlife**", only "[l]ow impact (on the environment)" or that this the technology that is "least disruptive to nature." Some assembly members expanded on this theme stating:

> *"Despite some disruption to marine habitats during construction they could actually help preserve marine life by creating 'safe haven' areas eg no fishing, no shipping."*

> *"Overall good for environment – may have disturbed marine life when built, but then keep ships away once installed. Mussels grow on the base etc."*

Some assembly members described offshore wind as "**clean**", "healthy," "green energy", "**renewable**", or an "unlimited source of energy." Others said it creates "no pollution" and does not produce CO_2.

Some assembly members suggested offshore wind is a "better use of our resources...which in turn **frees up the land."** Others felt it "saves the land for other uses" or that the "land management issues associated with onshore are gone."

Practicality, efficiency, readiness and scale

Some assembly members said that there is "**more space at sea**", "lots of space around our coastline" or that we've "got lots of water [to put them in]." Others suggested that we "could power the whole country by using just a small percentage of the seabed", that it would be "easy to increase numbers" or that it "**can be scaled up massively**."

Some assembly members said offshore wind **produces a "great amount of power**", has "more potential than [we] realised," or has the "capacity to provide a lot of electricity – e.g. Woley Windfarm generates enough electricity for 600,000 homes." Some suggested that it "could meet most of ... demand, it can play a big part, just need something for reliability when no wind." Others said turbines are "able to be a lot larger [at sea] and produce more electricity" or that offshore turbines are "**more efficient**" than onshore ones. Some assembly members suggested that "offshore ones [turbines] are a lot a bigger. ...[fewer] offshore produce the same amount of energy.... Means that we want to put more offshore – and reduce the onshore."

Some assembly members commented that we **"already use it, know it works"** or that it is "reliable" or "more reliable than other technologies." Individual assembly members suggested that it could be "a good long term solution", is "manageable" or that "we have the technology to potentially install in [a] less disruptive way e.g. oil platforms."

Some assembly members felt we should "**use a resource we have plenty of – wind**!" while others said there are "stronger winds at sea" or "always wind at sea". Some liked the fact "they are **floatable**" with some noting that "they can be moved to where the wind is (we understand that some are on platforms and can be towed)."

Cost, the economy, and jobs

Some assembly members felt that offshore wind could "create a lot of jobs", including "well paid high skilled maintenance jobs" or jobs in "making them/ installing etc." Some suggested that there would be "job opportunities for people formerly working on oil and gas platforms in [the] north, [meaning a] negative becomes a positive, transition of the industry." Similarly, some noted that "we have many seaside towns supporting the oil industry and so can repurpose these which is **good for jobs / economy**." Others suggested we "can start exporting once its built" or that it has "export potential."

Some assembly members said offshore wind is "**cheap**, and getting cheaper to install" or is "cheaper than fossil fuels." Others suggested that "strategically sited they could reduce transmission costs as very few parts of the country are very far from a coastline."

Public support

One assembly member commented that "people are used to them."

⊕ Safety and risk

No assembly members made comments in this area.

⊕ Other

Some assembly members said offshore wind has "no major negative", has "very, very few disadvantages", or has "fewer disadvantages (than onshore wind)." Some labelled it the "best option by miles" and a "brilliant idea", saying "I'm all for it." One assembly member commented that "we are doing it a lot in the South East of England. It is a variable source and best to generate electricity. All positive."

⊖ Cons

Assembly members identified the following areas as points that they disliked about offshore wind.

⊖ Environment impacts and land use

Some assembly members disliked the **visual impact** of offshore wind, saying it is "intrusive" or an "eye sore" and noting you "can see [them] from the land." A few members made comments about one particular wind farm:

> *"It can still be an eye sore offshore (e.g. just been built off [the] beach in Aberdeen), it's a massive change but you get used to it, it's not a huge problem for me but can see an issue for others."*

"Donald Trump tried to stop them – he was the only one who complained! The problem was the views from his golf course. Locals didn't mind that."

"Trump didn't like it in Aberdeen. Complained to the Local Council. Did go ahead despite taking the Council to Court."

Some assembly members were concerned about the **impact on "marine animals", "sea creatures", "sea life", "migratory birds" and of "drilling into the sea bed."** Some noted particular concerns about the "cables and where they come onshore and impact on things like sand," or the "construction phase...but also possibly ... the wind currents they produce." Some assembly members suggested that the "impact isn't well tested/understood" or that we "might want to see more assessment of that damage." Other assembly members caveated their concerns, for example:

"Going to have some impact on marine diversity but 'you can't make an omelette without breaking eggs.'"

"Concern about affecting marine life (but like what was said about initial disturbance but overall good for marine life)."

"Potential impact on birds (but of limited concern because if sited off migration routes should have limited significant impact)."

"There are minimal ecological impacts. The wildlife comes back in 20 years. Not a huge downside for me."

Some assembly members highlighted **issues around pollution and ethics**, noting the "use of heavy metals in the development of the batteries [for storing electricity]" and asking "how can we ethically build them." Some assembly members highlighted "mining/metals and minerals and the negative impacts they create in building the turbines – local energy better." Some assembly members felt there is a "high pollution risk, which is harder to control offshore than onshore."

Individual assembly members said they "worry about drilling underground" or had concerns about the "human impact on people that live nearby, but research is needed."

⊖ Practicality, efficiency, readiness and scale

Some assembly members felt that offshore turbines are "**harder to maintain**" or "difficul[t] to build", noting issues with "accessibility to install and maintain. " Some assembly members suggested that "you need big infrastructure to get out and maintain them." Others said that "increased maintenance costs...[are] not just because of [the] location but also because of the harsher environment."

Some assembly members questioned turbines' **durability**, asking whether the turbines would be "affected by storms, eg strength of wind", whether they are "safe, strong and durable" or whether the turbines will "last as long" as onshore turbines.

Another concern for some assembly members was **intermittent supply and issues around storage.** Some said it was "not guaranteed energy" or commented on the "unreliability of the wind", suggesting that "with Britain's changeable weather it won't work all the time." Others said it is "only efficient when windy currently – need to develop battery storage or share it with other countries." Other assembly members mentioned "concern about the storage of electricity." One assembly member highlighted **"**the amount of backup generation, spare capacity we have to build…", suggesting "we need almost as much spare capacity as we need generating capacity, for when the wind drops. This needs to be also a green technology or we have to sacrifice 'greenness'."

Some assembly members wondered if there would be "difficulty transporting electricity from offshore to where it's needed?" or suggested there would be a "loss of power as it's transferred."

Cost, the economy, and jobs

Some assembly members said there is a "**big upfront cost** which would take a long time to recoup [and] means people are reluctant to do it." Others said there are "big expenses/costs associated with drilling into the seabed" or said they disliked the "cost to install and maintain, compared to onshore turbines." Some assembly members highlighted "**maintenance costs**": "if they go wrong would have to send a boat out specifically for that windmill. Would be quite expensive." Others commented that we "would need a lot of them and therefore [it] would cost a lot."

Some assembly members said we "need to be careful we do not have too many…[i]mpacts on fishermen." Some assembly members worried about "shipping routes" or "danger to shipping". Others commented they were "worried about the **adverse effect on shipping and fishing**, but Chris [Stark] confirmed that [offshore wind] only uses 1% of space so now [we are] not worried."

One assembly member disliked "paying rent to the Queen (via the Crown Estate) – one of the richest people in the world."

Public support

No assembly members made comments in this area.

Safety and risk

Some assembly members voiced concerns about "**safety during installation and maintenance** – similar conditions to offshore oil and gas industry which is dangerous." Others said they "don't know the downsides, not a deep sea diver, don't know the **risks** of building offshore turbines" or asked more generally "[w]hat happens if something goes wrong?" Some assembly members said they were "concerned about **security**: vulnerability of the cable that brings the power to land being attacked."

Conditions

Assembly members also noted conditions that they would want to be in place for offshore wind to be used, or that they felt would help its use. They suggested a need to:

Consider environmental impacts

Some assembly members suggested we "need to factor in [the] impact of this on [the] natural environment still" or said they "would like reassurance that this is being considered", querying whether we "fully understand their environmental impact yet." Others said we "must choose sites that don't interrupt migration routes or breeding sites for marine/bird life" or that "siting must be properly assessed with regards to environmental impacts – birds etc." One assembly member commented:

> *"I...think offshore wind comes with its own environmental issues, such as habitat degradation of the sea bed. It affects bird populations, particularly juveniles. So, I do think it has to be implemented correctly and the effects to the natural world need to be strongly considered whenever sites are being selected."*

Resolve issues with storage

Some assembly members said there needs to be "good research into energy storage" or that we "need storage or [an]other back-up solution."

Put them out of sight

Some assembly members asked to "keep them away from [the] coastal environment / resorts" or commented "why not put them all out of sight?"

Understand risks better

Some assembly members said we "need to find out more about the risks associated with installing offshore turbines."

Integrate offshore wind with other elements of the energy mix

Comments included:

> *"Need to integrate [offshore wind] with other elements of [the] energy mix – e.g. float barges making synthetic fuel by turbines, and then plug this into [the] existing fuel system which is better than having to build extensive cabling back to shore. Can also add in solar, wind and wave. By 2050 this would be cheaper."*

Promote UK construction and ownership

Some assembly members said they "would like to see an emphasis on British construction and ownership to ensure they are making a wider contribution to the economy."

Use floating turbines

Some assembly members particularly liked the idea of floating turbines.

Individual assembly members said their support would "depend on [the] volume (of turbines) required", that it "would be good to keep perfecting them, make them better and better" or that "there could be trade deals done with France & Ireland to share offshore wind energy consumption."

As seen in Section A, assembly members expressed very strong support for offshore wind in their votes.

B.3 Solar

Solar refers to solar panels that are located on homes and other buildings, or at a larger scale on land (e.g. in fields). Assembly members discussed this technology in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about solar.

⊕ Environment impacts and land use

Some assembly members said they liked that solar is a "**natural** source of energy" or that "we have what it uses already – sunlight!", with some commenting that "it's a good idea to use the sun." Others described it as an "infinite supply of energy" or a "**regular source of energy**, especially as [it] doesn't require full sun all the time, just light." Some said that "the UK has significant periods of daylight everyday", although they acknowledged differences between the north and south. Others suggested that "it's reliable and will last." Some assembly members said solar is "very **clean**" or a "clean form of energy." Others said there is "[n]o pollution during energy production."

Some assembly members said that it's "a simple method and a **good use of land.** I have experience of it and it's great!". Others suggested that you "can still use fields where solar panels are located – including for grazing. It allows a habitat to remain intact." Some said solar is "environmentally friendly" or that there is "no impact on wildlife."

Some assembly members suggested that solar panels are "**not an eyesore**", are "clean looking" or "look okay." Others said that they are "less of an eyesore than turbines (particularly when located on buildings)." Some liked the fact solar is "silent" or "not in people's way", with some suggesting there is "**no disruption to anyone.**"

⊕ Practicality, efficiency, readiness and scale

A sizeable number of assembly members said that they liked the fact that solar is **flexible –** that it "can be put anywhere" and used for many things:

+ **Many places:** assembly members talked about locations including "rooftops, fields, homes, businesses", "buildings, land and sea", "new buildings", "older properties and buildings", "public buildings", and "cars". Some noted that you can "use it in places we don't usually use or usually waste, eg roofs, windows" and that it's "good to make use of that space." One assembly member said that "they are about to put solar farms onto [my] local park and ride scheme." Another commented that "unlike onshore wind technology and the implication for space..., solar can make use of all the existing urban environment that we have got. Some assembly members said they had "heard of roof tiles being made of out of solar panels" or said that the "technology can be "applied diversely, eg in windows, and the tech is improving all the time."

+ **Many uses:** some assembly members said they could be used to "heat water" and "power homes."

Other assembly members asked "why can't all roofs have solar panels" or suggested solar panels "could help if they were on everyone's houses." Some suggested that solar "can be done at scale" or is "**scalable**" because it "can be put anywhere." Others liked the fact that it "could go up to 10% (of our electricity needs)."

Some assembly members said that solar is **proven** – that it "is used a lot around the world already", "works" or is a technology which is "established and well developed." Others said it has "established efficiency." Some described it as a "**simple technology**" that is "**easy** to develop both at large and small scale." Others suggested that it is "easy to install and maintain and can be upgraded quite easily." Some assembly members approved of the fact it "**can be local to you**" or is "located near homes…[so] no power loss." Others suggested that a "localised direct supply… [would] remov[e] the need for transport."

Some assembly members felt that solar "**works well in partnership with other existing technologies**" or "could be a (smaller) part of future energy", with "variable demand covered if combined with wind." Others suggested that it "can be combined with storage." One assembly member said it "can be integrated with existing systems." Others commented that there "is always sun somewhere in the world so it lends itself to **export/import."** Some wondered if we should "outsource to the Sahara where there is lots of sun" or suggested that we "could power share with other countries."

⊕ Cost, the economy, and jobs

Some assembly members said that solar is "**getting cheaper",** "not too expensive" or that the "lifetime cost is low." Some suggested that the "decreased cost of manufacture compared to when the technology was originally developed (has dropped exponentially) makes this a feasible technology." Others noted the "low cost of installation" or said that it's "free once the technology is installed."

Some assembly members pointed out the **potential to make and save money**. Some commented that "people can use them to lower [their] own bills" or that some people generate "so much energy that [they] can sell it back to the grid." Others noted that it can "save people who have them on their houses a lot of money" or that in the "long term [it] can be a good investment for domestic bills." Some assembly members said that "there are schemes available to support it, you can sell back to the grid/energy provider." Others said that "loans are available from (some councils) for installation on households" and one assembly member noted that they "like the concept of renting roofs to the "Council" for solar generation." Another individual assembly member shared that "when I sold my house the solar panels definitely contributed to the sale of the house (it made it easier to sell)."

Some assembly members particularly liked the idea of **solar farms**, suggesting that they could involve bulk buying and therefore reduced costs. Others felt that solar panels are "expensive as [an] individual cost, but solar farms [are] ok as long as they are in the right place."

⊕ Public support

Some assembly members suggested that solar "gives people **individual autonomy** to generate power" or that you "can choose and manage your own power supply – **sense of control**." Others said it "can be individual; on own property and you can control [the] energy coming in." Some noted that you can be "independent of the national grid."

Some suggested that solar is a "a **recognised** technology" or that "the public understands how solar works". Others said that it is "**accepted** by people."

⊕ Safety and risk

Some assembly members suggested there is "**no risk**" or said that that they "can't see serious side effects (other than the rare earth point...)."

⊖ Cons

Assembly members identified the following areas as points that they disliked about solar.

⊖ Environment impacts and land use

A significant number of assembly members expressed concerns about **land use**. Some said that solar panels can "take up space" or that "solar fields could be put to better use." Some suggested that they could have an impact on "land for food and on habitat." Others said that there is "no space below" so "you can't have sheep", or suggested that "we need our fields for trees and plants" or for "biofuels." Some assembly members commented that "it's not good to be covering hectares of land – "**big solar farms** can increase the risk of flooding in areas: stops water going in[to the] soil and increases run off. Can put pressure in certain areas. Can't be used on its own." Others commented that they "don't like fields of panels" or "don't like it so much on land."

Some assembly members felt that solar panels are "**not very attractive**/look ugly on houses" or are "not aesthetically pleasing." Some said that "on some modern houses they look fine, on others they look anachronistic/silly – can spoil the look of a street."

Some disliked "**polluting** PV manufacturing", noting the "reliance on lithium and cobalt for the battery technology" and the mining of them as their particular concern. Some said there were "**ethical issues**" in these area and that these "apply to other variable renewables too." For other assembly members concerns centred on the "**impact on [the] local environment and biodiversity** ...primarily because of the surface heat produced."

Practicality, efficiency, readiness and scale

A sizeable number of assembly members suggested that "**we're not a sunny country** all of the time – shortens the timespan for being able to generate the electricity, particularly in winter which is when we need the most energy for heat/light." Others said that we're a "miserable overcast country", "power output [is] not when people use most electricity", or that solar is "not viable because of reliability." Some suggested that "solar does have a place in the Sahara desert…[c]ould put huge farms [there], but not so much a place for it in the UK." Others objected to the fact that solar only works "during daylight" or lamented the "lack of night-time generation, i.e. if no battery storage."

Some noted the potential for particular problems in the North, suggesting that "shortened daylight hours in the North may make it less viable to rely on / more subject to variance and may require substantial transmission of the energy generated (including loss and cost factors)."

Some said there "are limits to its scale in UK" or that "when productivity is low (e.g. winter) [we] would still need a baseline supply from another non variable source." Some assembly members caveated their dislike, suggesting that "if storage is possible in batteries for later use, then there is potential." One assembly member said it "can't be the only solution."

Relatedly, some assembly members said that **there would need to be "investment in batteries/ storage problems**" or suggested that "questions remain about storing the excess – needs to be efficient in storing energy." One assembly member commented on "**grid capacity** – more energy being produced than can be used / stored and therefore creates wastage."

Examining suitability from a different angle, some assembly members suggested that solar panels **wouldn't work for every building** because they "cannot work for people in flats or high rises – so there is an equity issue". Others said that "not every house is suitable (don't have south facing roofs)." Some expressed **doubts about how much electricity solar generates or its efficiency**, suggesting that they "only generate a small amount", that "amount of electricity they generate is questionable", or that they are "not powerful enough to power the house." Others suggested that they are "less efficient than wind", or that people are "struggling to improve [them] and make [them] more efficient."

Some assembly members suggested that "installations **only have a short life**", "**need to be kept clean**" or "need [to be] upgraded every few years."

Cost, the economy, and jobs

Some assembly members disliked the "**cost** of installations", suggesting the solar panels are "expensive to put in at the moment" or that "installation costs are something people have to pay up front which could be a barrier." Others suggested that solar panels represent "poor value for [the] average person in a house as there's a slow payback." Some assembly members said that they "can't afford the capital outlay to pay for them," noting that the price "has come down over the last ten years" but is still "£10k for the panels and then more for battery storage." Some reported that the "batteries to store the solar power are expensive – this is a disincentive". Other assembly members said that installing solar panels results in an "increase of business rates and [is] therefore not cost effective"; they suggested that "government needs to step up and change that."

Some assembly members noted a **lack of incentives**, saying that the "reduction in feed in tariffs has become a disincentive", that "government has stopped giving you money to have it on your house" or that "deals used to be available but aren't any more."

Some assembly members said there were "**potential implications when selling houses**" or talked about "problems with insurance/ selling houses", suggesting that "legislation needs to change on this."

Individual assembly members said solar is "underfunded and needs more research: or asked "how will it get paid for? Should not be only homeowners who need to pay." One assembly member suggested there is a "danger that developers who can't get planning permission to build on green belts are building solar farms to earn money."

Public support

No assembly members made comments in this area.

Safety and risk

One assembly member expressed "concern about outsourcing to areas (Sahara example) as we don't want to be dependent on others."

Conditions

Assembly members also noted conditions that they would want to be in place for this technology to be used, or that they felt would help its use. They suggested a need to:

Resolve issues around batteries and storage

Some assembly members said they "do not have to be chemical batteries, other methods are available and should be considered," or that "there needs to be suitable ways of managing batteries and the materials in them (concerns about hazardous materials and recycling)." Others said battery storage being available "is a condition" of their support for solar and that "battery research is needed." Some assembly members disagreed with points about batteries, saying that "our task is carbon emissions, so the battery concerns are a smaller issue."

Make it cheaper

Some assembly members said it needs to be cheaper: "if the price comes down, people will put them on their homes." Others suggested "incentivis[ing] the buildings that use electricity during the day to have solar panels (offices, factories etc)." On a similar theme, some assembly members commented that you "need to invest to make it cheaper" with some noting that there "should be government subsidies again as people were benefitting from them", or grants, or "interest free [government] loans." Conversely, some assembly members said they had "concerns about whether subsidies should be put here", querying "is it worth it" or suggesting it "should only be done where there is enough sun, i.e. in the South." Others suggested "mass production (if there were panels on every home) the cost would come down a lot."

Change regulations

Some assembly members said "at the minute you have to get approval to fit panels (we think from Building Control) – should be reversed so that it is a requirement (or at least incentivised)." Others said we should "chang[e] building regulations to ensure that every new build has to have solar panels fitted although 2016 legislation to have solar fitted to homes was rescinded because of pressure from developers." Some assembly members said that they "also like Tesla roof panels, which are cheaper and act as a roof."

Look at who pays

Some assembly members suggested that "power companies should pay for installation, not homeowners (rent a roof schemes)." Others agreed saying it "should not be only homeowners who need to pay."

Think about different types of building

Some assembly members commented on different types of building that could have solar panels. These included new builds with some suggesting that "...solar panels should be mandatorily installed on all new buildings to feed into the grid", that "new housing in the South should all have solar panels fitted when they are built as part of the planning permission", or that "solar panels should be made compulsory on all new house builds. Government can set a date and costs will tumble." Comments about other types of building included:

"Should be government guidance that suggests every public building should have it... [This] seems like a sensible, logical solution."

"Need to be putting them on commercial buildings in the south."

"Make it mandatory for commercial buildings to use roofs for solar capture."

"Any building that could have solar panels should have them on it and community and public buildings should have panels on them that can be shared with the local community."

"Solar panels should be installed on all possible roof areas, private homes & business. This should be installed & managed by the energy companies with a small roof rental fee paid to the owner of the building. No expense to home owner and all electricity uploaded to the national grid."

Target the right areas and houses

Some assembly members said that "solar is more variable than wind and therefore probably most suited to certain parts of the country. Therefore support would be conditional on it being developed in the right areas where the technology will work best, rather than [it being] a default option." Others said that whether it's a good idea "depends on orientation of [the] house (better when south-facing) – you can get solar panels with motors on them which move around to catch more of the sun as the day goes by."

Consider land use

Some assembly members had opposing views about land use. Some asked to "avoid farming land", with some saying they would "rather have wind if [we're] going to use farm land for electricity generation." Others said that we "should make better use of solar panels in fields, e.g. where sheep are already grazing" or that "solar farms should allow for crops or animals e.g. sheep to graze underneath and possibly more direct light to enable grass and quick growing crops to grow." Some assembly members asked "whether it would be possible for solar and wind power sites to be co-located (a layered array) as this could be a more efficient use of land." Other assembly members asked whether it is possible to "attach solar panels to windmills?"

Promote equality

Some assembly members said they "would like to see more equal availability, e.g. people who live in high-rise flats can't put up panels."

Improve visual design

Some assembly members said solar panels would "need to be visually good looking – more presentable as part of the building e.g. solar roof tiles." Others asked if there "are ways to make them look nicer" or wondered if there could "be better control of how they're administered so they fit in visually a bit more?" Conversely, some assembly members said we "have to accept that things aren't going to look nice to deal with climate change" or that we "need to take a holistic view on whole impact."

Improve efficiency and scale

Some assembly members said that "efficiencies need to be improved, ideally getting more energy out of smaller solar [panels]." Others said it "needs to be scaled up to meet demand and part of a combined solution with wind."

Conduct more research

Some assembly members said it's "underfunded and needs more research."

Two assembly members made further points:

> “Our lifestyle behaviour would have to change to accommodate using renewables efficiently (which appliances get used at which time in the day etc).”

> “Alternative solar – i.e. focusing sunlight onto a hotbox (i.e. a dark box to absorb heat). These are cheaper to construct and can be used to generate energy.”

As seen in Section A, assembly members expressed significant support for solar in their votes.

B.4 Bioenergy

Bioenergy means burning wood or crops to generate electricity. Assembly members discussed this technology in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about bioenergy.

⊕ Environment impacts and land use

Some assembly members liked “the cycle of carbon capture and release and the balance” or the “**cyclical nature** of the process.” Others noted that it “takes CO_2 out of the atmosphere, but then puts it back out, but this is a balanced system.” Relatedly, some assembly members described bioenergy as “**carbon neutral**” or suggested it “can be carbon neutral if done right.” Others said it “emits little to no net greenhouse gas emissions” because of the “cycle”.

Some assembly members liked that bioenergy is “**renewable**”, suggesting that “with fertile soil we should always have a renewable source.” Others said that “pellets are a straight replacement for coal and therefore [a] more **reliable** form of electricity. We know exactly what we can produce.”

Some assembly members said that they “‘love [the] idea of **growing more crops**” or “**growing trees** to absorb CO_2.” Some noted that “crops like willow are native/indigenous trees.” One assembly members said it’s “better for environmental health as no radiation …[unlike] nuclear.”

⊕ Practicality, efficiency, readiness and scale

A sizeable number of assembly members liked when bioenergy “uses waste” saying it “makes sense when it’s an off product” or “if it already exists and [we] need to get rid of it, that’s great.” Assembly members talked about different kinds of waste:

+ Some focussed on timber and forest management, saying they liked the idea of "**using waste from the timber producing process** – so bits that are not normally used can be used up", or we "have to cut down forests which creates natural waste that isn't of any use – needs to be disposed of so producing biomass from it is good." Some suggested we can "can use parts of trees that aren't being used for other purposes e.g. branches" or said it's "good to use forest residue as if [we] don't take trees away forests become clogged up and trees don't grow properly – need to take trees away anyway for management.";
+ Some mentioned "**unused crops**", or proposed that "**councils could collect garden waste and burn [it] for bioenergy (some are)**";
+ Others talked about using "**rubbish that can't be recycled**", suggesting it would result in "less rubbish in landfill", or wondered if we could "also burn sewage / plastics etc." One assembly member commented: *"recycle our waste bins, domestic sewerage, farming and commercial waste to make biofuel. Landfill sites cannot accommodate all of the waste in the future";*
+ Some said they felt that "landfill is a worry so [we] like the idea of using **methane from landfill** for energy purposes." Others suggested that "**chicken waste products**...[are] a better option than burning trees" or that "taking any waste is a good idea, but why do you have to grow [things for] it."

Some assembly members liked that bioenergy can produce **useful by-products**. Some said you can "use heat as a by-product" or "use waste as fertiliser at the end." Some suggested that producing heat "could be especially positive if developed in localised ways – providing both [heat and electricity] to communities." Others noted that you can also create "fuels (e.g. ethanol from sugar beet."

Some assembly members liked that "**existing power stations can be converted to use biofuels**." Their reasons included that:

+ It "reduce[s] construction costs and redundant sites";
+ The "refit [of] existing coal power plants [allows you to]...keep jobs in communities that would otherwise lose jobs." Some noted that "coal plants ... are often located in areas of deprivation" and suggested that the "current skills power plant staff have are transferable to biomass technology";
+ Others said that "...chang[ing] from coal to wood" creates "less CO_2" and is "cheaper." Some assembly members said that they "liked that 58 factories have already converted to use their own biomass for electricity and this made it cheaper for them (cut power costs from 80%)."

Some assembly members suggested that bioenergy "**could be useful" in "some places**...e.g. waste products, handling food waste BUT [is] not [the] main solution for energy." Others said it "has its place in aviation or other areas where we usually use fossil fuels" or that it "provides a good back-up supply." Some assembly members said that "because it's constant...it could partially fill a gap for when other renewables are being variable (e.g. wind and solar)."

Some assembly members suggested that it's "**scalable**", "could produce a high percentage of our energy" or "generates lots of energy." Some said they liked its "**efficiency**" or noted that it "**only takes two years**."

One assembly member said "when a tree decomposes it will release the carbon..., so when burning it you're making use of something that's going to happen anyway." Other points made by individual assembly members were that "it is doing well so keep doing it", that you "could use abandoned or derelict land e.g. former mines" or that "you can produce this in different ways." One commented "you are storing energy."

⊕ Cost, the economy, and jobs

Some assembly members suggested that bioenergy creates "income for farmers" or is "good for second generation farmers that don't want to be investing time in land management – can grow crops easily." Others said that it "could be **beneficial for farmers** looking to change land use as we move away from as much animal farming."

A number of assembly members said that it's "**cheaper** than extracting fossil fuels" or can be "stored with minimal energy costs." Some said that it "**employs a lot of people**."

⊕ Public support

No assembly members had comments in this area.

⊕ Safety and risk

No assembly members had comments in this area.

⊕ Other

Some assembly members liked the fact you can do it "locally" or that it offers "**local solutions**." Others said it is "a solution that works at a small scale" and gave an example of where bioenergy is already being used on an estate. One assembly member said the "overall impact is positive, despite potential for pollution."

⊖ Cons

Assembly members identified the following areas as points that they disliked about bioenergy.

⊖ Environment impacts and land use

Some assembly members suggested that it "**could be worse for the environment** if not done effectively, sustainably", that "in some circumstances it's worse for climate change, so it depends on what you're growing and where, and what you're burning", or that "getting people to stick to the sustainability criteria might be a challenge if the incentives aren't there." Some worried about the "**impact on biodiversity**" including querying whether there was a "risk of a monoculture possibly if planting lots of these crops?" Some talked about the "USA experience of growing corn for ethanol" suggesting that the "environmental impact was high" and that they had "similar concern about palm oil and associated deforestation."

Others felt there was a "danger that it incentivises farmers to overwork the land, apply fertilisers to promote growth for bigger yields and destroy the soil." Similarly some said there was a "danger that soil doesn't get a rest." One assembly member noted that "I don't like anything that is going to destroy the environment for animals (habitat destruction). When cutting down trees – this causes a lot of disruption to animals." On a similar theme, some assembly members suggested there are **"too many incentives to cheat and for bad behaviour"** or that "bio fuels seem too easily exploited."

Some assembly members suggested that bioenergy "doesn't so much reduce carbon as recycle it" or "**putting CO_2 back into the atmosphere is not good**." Others said that it is "not carbon neutral" or "do[es] not reduce the CO_2 and potentially uses up a lot of land which could otherwise be capturing and storing carbon." Some assembly members queried what happens to the carbon footprint "when [you] factor in harvesting, shipping" or suggested that it can be "carbon intensive" because "some emit a lot of carbon e.g. wood pellets exported from US to Europe to burn." Others suggested it "produces more CO_2 than coal and fossil fuels (produces in burning 5% more CO_2)" or that it's a "red herring to say that it was more carbon friendly." Others noted mixed messages, saying "wood [is a] common cooking fuel, but [we're] being told [we] shouldn't use wood and coal, seems a backward step, still emitting carbon."

Expanding on a point touched on above, some assembly members suggested that bioenergy "**doesn't seem like the best use of land**":

- Some felt that we "need more **land to grow trees**" or that it's "inefficient if we use land for it, when we need land for other things (farming/trees etc)";
- Others expressed concerns around **food production:** "How much land will we need to sacrifice to growing bio-fuel crops, instead of using the land to grow food?" Some assembly members said that "food production is more of a priority for land use (especially in light of COVID-19)" or asked "couldn't we use the crops for food instead rather than growing soy in a different country and bringing it in?" Others said that "growing crops specifically for this is not a good use of limited arable land."

Some assembly members said that they are "concerned that we will keep using more and more bioenergy and this will have a negative impact on land use."

Also developing points already mentioned, some assembly members said that they disliked "**transporting things long distances**" or that the "transportation and equipment needed for bioenergy leads to pollution." Some said specifically that "importing other waste products increases [the] carbon generated by transport." Some assembly members made more general comments about **importing**, saying they disliked that "wood chips are being imported rather than produced locally" or questioning "will it be done in [an] environmentally friendly way."

Some assembly members expressed concerns about **burning waste**, with one assembly member saying that a local incinerator that had been built for pellets subsequently started to burn household waste as well. Others said they "worry about the big chimneys from the plant... particularly when burning waste...." Relatedly, some assembly members suggested that there would be "**pollution** from the smoke" or that it's "not good for air quality or lungs." Others described it as "not clean", or said that it "releases carbon monoxide" or that there is a "risk of harmful toxins."

Some assembly members worried about the "**chemicals used to grow the crops and also side effects of growing new crops**." Some assembly members said they had personal experience of "allergies from expansion in growth of oil seed rape" and asked "might miscanthus have a similar impact?"

Practicality, efficiency, readiness and scale

Some assembly members said that it's "**strange to burn something you grow**" or that it's a "shame to keep planting trees and chopping them down." Others asked "how many trees do you have to chop down to get enough energy" or suggested it would be "difficult to get the [right] balance of growing trees and burning [them]." Some said it was "strange to balance [it] with something that is so damaging e.g deforestation", or suggested it "could lead to deforestation" or that we would have to be "careful [we were] not contributing to deforestation – need replanting." Others said that "using forest by-products doesn't seem right" or that they disliked "crops being grown to burn." Some assembly members felt that burning trees "defeats the object" because "a young tree does take a lot of the carbon out of the atmosphere but by burning it we put it back in so we don't get away from the existing cycle." Others said "we should plant forests instead, to store carbon, and leave them where they are not burn them for electricity."

Some assembly members suggested that bioenergy "requires a lot of organic matter and water – **have we got the resources**?" Others noted that it "requires space and water." Some suggested that "it's **not efficient**" or "doesn't contain a lot of energy compared to fossil fuels." Others questioned, "can we get all our needs from this?"

Some assembly members said they had questions about "**scalability**", suggesting that the "capacity for development isn't clear." Others wondered if it was possible to do it at scale "without growing crops specifically to fuel a plant."

A number of assembly members suggested that **other technologies are better**. Some asked "why bother putting money into something that might not work?" when there are "already other established technology options (wind, etc...)." Others noted the need for "transportation for what is going to be burnt, which doesn't apply to wind/solar" or said that only "10% [is] used for electricity the rest for fuel – so is it worth using it for electricity? – think there are better options." Some commented simply that we "have better ways of producing the energy."

Individual assembly members commented that it's "complicated to do", that it "won't work in long term" or that you "need to wait some time before wood can be harvested." One assembly member said we "should use bioenergy for other things besides electricity, e.g. materials."

Cost, the economy, and jobs

Some assembly members said it is "**expensive** to set up bioenergy plants", "more expensive to generate energy in this way" or suggested that bioenergy is "expensive and makes a small contribution to energy supply." Some suggested that it's "a lot of money for something that could be worse for the climate." Other assembly members expressed concerns about "**cost effectiveness** for the farmers who will be growing the trees – will they get extra money for doing so?" One assembly member referenced the "...experience of NI government losing lots of money on subsidies."

Public support

No assembly members made comments in this area.

Safety and risk

Some assembly members said that they disliked the "**need to capture the carbon**" or expressed "concern that it might be storing up problems for the future."

Conditions

Assembly members also noted conditions that they would want to be in place for this technology to be used, or that they felt would help its use. They suggested a need to:

Look at what is being burnt

Assembly members made points including:

"Less keen on growing crops specifically to burn"

"Depends what is burnt, has to give carbon neutral effect"

"Must not burn natural trees/forests/woodland, but only burn waste or what is left"

"It's an advantage if reusing waste, not adding to it"

"Don't cut old growth forests for biomass, only use fuel from plantations"

"Got to plant a lot of trees, and forestry management to get to net zero. This forestry management will have bio side-products as they manage the woods. Can't let this decay and using this for small amounts of bio-generation makes sense."

"Could we also harvest kelp offshore? Why only think about this onshore?"

Make sure it's done sustainably

Some assembly members suggested that "strong regulation would be needed to ensure it's not more polluting than fossil fuels" or that it "needs strict rules to ensure that it is done sustainably." Others suggested that it "needs to be done correctly to make sure it works" or "needs to be managed." Some said you need to "balance…the 36 [sustainability] factors on the graph in the presentation [by Patricia Thornley]." Other comments included:

"There are a wide variety of forms of bioenergy and each must be considered carefully based on its overall carbon emissions at all points in the supply chain and consumption. Currently wood pellet energy production is causing mass clear cutting of old growth forests in the United States so this supposedly carbon neutral form of energy is actually causing more carbon emissions than fossil fuel. Any adoption of bioenergy needs to be carefully considered against its entire carbon picture."

"I disagree that biofuels should be used if the fuel sources are being transported from great distances – as they are now from North America."

Create a balance with other energy sources

Some assembly members suggested that bioenergy "needs to be balanced with other energy sources" or that we "need a little bit of everything."

Individual assembly members suggested a need to think about "where it's sited" or provide farmers with subsidies. One commented: *"Native trees should be grown rather than non-native so that natural habitats are created which is far better for native wildlife and restoring our countryside."*

Some assembly members suggested that "globally, people will need this."

As seen in Section A, assembly members expressed limited support for bioenergy in their votes.

B.5 Nuclear

Nuclear means using heat from nuclear reactions to make electricity. Assembly members discussed this technology in small groups, noting pros and cons.

Pros

Assembly members identified the following areas as points that they liked about nuclear.

Environment impacts and land use

Some assembly members felt that nuclear is "**clean**" or clean in terms of emissions, commenting that it is "currently one of cleanest in emissions so good as a short term solution." Others said it is "clean (if we can dispose of [the] end products)", or that it "doesn't produce any greenhouse gases at all." Some noted that there is a "low carbon footprint from production." Some assembly members said it creates "no pollution" or "less pollution than other technologies." Some assembly members described it as "**sustainable**." One assembly member suggested that there is "no effect on water/land/ecosystems if [there are] no accidents."

Practicality, efficiency, readiness and scale

Some assembly members commented on **scale**, suggesting that "it could supply up to 75% of our electricity needs", "can generate a lot of electricity", has "massive potential" or is like "turning on a tap." Others talked about the "sheer volume that this technology can produce...", saying that the "scope is vast" or "at [the] levels we need in the future." Some suggested that "it would take 300 turbines of 10MW to produce the same amount of electricity as Hinkley Point C. In fact, three times that as a turbine only operates at 30% capacity." One assembly member said "if done correctly, [it] could be a total solution."

Some assembly members liked the fact it is a "**constant** source" that is "available all of the time" or is "not a variable source." Others described it as "**reliable**" or "consistent", or said that it produces a "stable supply" of "guaranteed energy." Some branded it the "only reliable (constant) source of carbon neutral electricity" or "an effective source of power." For some assembly members it "seem[ed] **efficient**" or is "extremely efficient." Others said it "gets more energy faster, compared to the other technologies." One assembly member commented that it "lasts a long time."

Making a somewhat related point, a number of assembly members suggested that nuclear could **provide a** "**baseload**" of "stable" energy "which works hand in hand with wind and solar, [and which we] can crank up to address peak times." Others commented on the "ability with a small number of sites to provide a good baseload that can be topped up with variable sources." Some liked the fact you can "control output."

Some assembly members suggested that nuclear "**use[s] [the] existing infrastructure** available" or uses "systems already in place." Others said it "could continue to use sites with existing connectivity infrastructure in place even when decommissioned."

Some assembly members liked the fact it is "**proven**" or an "**existing technology**." Some approved of the fact it **"doesn't use fossil fuels"** or is **"not reliant on fossil fuels."** Others saw a "role for the nuclear plants that already exist to make up for that [fossil fuel] gap (so we don't have to use more oil and gas), but [said they were] not sure about building new ones."

Cost, the economy, and jobs

Some assembly members said it "can create **jobs** in remote areas" or "creates a lot of jobs in Cumbria." Others said there would be "jobs in the building and management of it" or "lots of high skilled jobs." Some assembly members suggested that "where nuclear power stations already exist, people want them because of the jobs."

For some assembly members nuclear was "**cheap** to run once built", "cheap to operate" or just "cheap." Others said "once it gets going it's cheap (although not cheap to build)."

Public support

Individual assembly members said there are "no complaints from locals near Sizewell" or that they "like idea of smaller plants, depending on local people and whether they want it and the waste from the smaller plants."

Safety and risk

Some assembly members said that they were not overly worried about **safety** for a variety of reasons:

> *"Safety is paramount even on the build. Checked and checked again. We have a good record, can't see building a new one being a source of concerns."*

> *"Growing expertise in managing nuclear waste means risks should be able to be managed."*

> *"I used to be anti-nuclear, but I've now changed my view. As a resource, it can be used in a safe way. The waste can be managed better than carbon capture and storage."*

One assembly member said "when it goes it wrong it goes badly wrong, but equally we accept other risks in our daily lives, when statistically nuclear isn't as bad." Another assembly member gave the example of "air pollution from fossil fuels which cause[s] deaths and is accepted as normal."

Some assembly members made international comparisons, suggesting that "France is a good model of how it works safely" or that "Three Mile island or Fukushima used a different type of reactor." Others suggested that "if France can be confident in running nuclear sites safely surely we can (and given parts of France are closer to the UK than other parts of the UK then their risk is our risk anyway)." Other assembly members said more broadly that it can be "made safe" and that the risk of something "disastrous" is "low." One assembly member said "I appreciate the environmental dangers but on the other hand we need it."

Other

Some assembly members expressed varying views on **imports**, either seeing it as a plus that we "could import from other countries", or alternatively liking the fact of "not having to." One assembly member said it "uses brainpower and knowledge, employs intellectual thought."

⊖ Cons

Assembly members identified the following areas as points that they disliked about nuclear.

⊖ Environment impacts and land use

Some assembly members suggested nuclear is **"not clean"** or has a **poor overall carbon footprint**. Some said that there are "no greenhouse gases but it does produce nuclear waste which could be worse than a greenhouse gas. It's low carbon but not clean." Others said that "mining uranium uses a lot of energy" or that "there are huge amounts of embodied carbon in the concrete used to build a nuclear power station and to decommission it." Some assembly members said that nuclear is "not actually renewable."

Some assembly members worried about "half-life – what **impact on wildlife**." Others said more generally that they were concerned about "environment impact" or whether it will be "harmful to [the] environment in the long term."

⊖ Practicality, efficiency, readiness and scale

Some assembly members said that the "**timescales are too long** compared to wind and solar", suggesting that it "takes 20 years to build...[and] wind can be cranked up much more easily." Others said it "takes a long time to develop" or that the "timescales for building are unknown and unpredictable".

Some assembly members raised **practical issues around nuclear waste**, suggesting we will "need new sites for storing waste" or asking whether it is "moral to store [waste] outside of this country." Some declared "doubts about ...[the] efficiency of waste management."

Some assembly members suggested that nuclear is "**outdated**" or said they are "huge plants... the technology is backward thinking." One assembly member disliked that it "uses lots of space." Some asked "why use nuclear when we can generate power from wind?" For some assembly members, the "need to keep it going all the time" was a disadvantage, with others suggesting it "takes 3 days to start and 3 days to stop so **isn't flexible**."

⊖ Cost, the economy, and jobs

A sizeable number of assembly members described nuclear as "**expensive**", or "incredibly expensive", with some suggesting that the "costs are astronomical". Some specifically mentioned the "huge expense to build new plants", commenting it is "twice the costs of other plants" or "twice that for a wind farm." Others highlighted "expensive decommissioning", the "costs of management", the "very expensive steam train – very harmful by-product", or said that "safety makes it cost a lot." Others noted the "costs of waste management" suggesting that "waste needs managing over 100s of years" and that it's "not worth it when we have wind to use." Others labelled nuclear "the most expensive technology available", said that "the costs go up once you start to build" or that costs are "unknown and unpredictable."

Some assembly members said "wave isn't being pursued because of the cost, so why are we focusing on nuclear? I.e. there are so many other options." Some suggested that "the huge amounts of money needed for nuclear could be spent on renewables...."

One assembly member said nuclear "doesn't employ as many people at plants." Another said "unlike other options this is unlikely to bring down individual bills."

Public support

Location and public acceptability – some assembly members predicted "location issues" with some saying "they've got a bad reputation similar to Onshore Wind for example – build-it, but not near me!" Others talked about "not wanting to live next door to something like this, whether it's a plant and/or a waste site..." or said that "no-one wants one [a nuclear power station] nearby." Others said that the "risk of accidents means public acceptability might be low." Some assembly members said that "the smaller models described are still quite large industrial units and identifying appropriate sites might be difficult." Some assembly members said that the "small scale option is a nice idea but with NIMBYISM...."

Weapons connection – some assembly members talked about the "possible use for weapons – big danger" or said it is "seen to exist originally for nuclear bomb[s]."

Safety and risk

A sizeable number of some assembly members said there have been "too many disaster stories, and they are massive disasters." Others said nuclear is "really **dangerous**" or that it would be "incredibly scary, if something happened." Some noted that the "impact of a nuclear disaster (e.g. Chernobyl, Fukushima) can be terrible." Others used words including "cataclysmic" or "catastrophic." Some assembly members talked about the "risks" being "too large" of "unpredictability/ leak/ accident." Some assembly members said they "don't think they can make it safe", suggesting there's been "a disaster every 10 years." Others felt "climate change and rising water levels" bring new concerns, or said that "building them on the coast is ridiculous – especially in times of rising sea levels." Others said that nuclear was "not worth the costs and risks comparatively." One assembly member said that a "beach is radioactive in my area. The dangers are not appreciated. House prices have fallen." Another commented that "all the materials at the plant are irradiated."

Another sizeable number of assembly members raised a range of **concerns about "nuclear decommissioning / waste storage":**

- Many worries centred on the **long-term impact** and whether we are "kicking the can down the road – [a] big no no." Some assembly members asked "what happens after a hundred years" or suggested that "storage facilities don't last forever." Others said that it would "adversely affect my children and grandchildren due to the long-term waste." Some commented that "some of the waste can be radioactive for thousands of years. Where are you going to put that and how can you be sure someone won't dig it up at some point and have an issue?";

- Some assembly members said storage was "**dependant on geology to be stable** – what happens if [there's] a big earthquake and waste leaks?";
- Others discussed **current examples**. Some argued that waste is "being managed quite well at Sellafield" but others disagreed saying that "it's only being temporarily stored." Others suggested that "there are 20 nuclear submarines in Plymouth waiting 30 years to be dismantled. It hasn't been done as there is no safe way to do it. There will be more in the coming years."

For some assembly members there was "obviously no solution to the waste issue or it would have been found already." For others "UK designs for new builds are faulty." One assembly member said they had concerns about the "transport of nuclear fuels."

Some assembly members commented that "the generation process is more scientific and complicated compared to others, so can't completely understand how it works. Makes it harder for us to be confident that its use it OK."

Conditions

Assembly members also noted conditions that they would want to be in place for this technology to be used, or that they felt would help its use. They suggested a need to:

Phase out nuclear

Phase out nuclear "as their life span ends" in favour of renewables

Build a minimum amount

"Build a minimum amount to provide a baseline but focus on variable options in the main." Others said that nuclear "should only be a backup when needed."

Sort out the waste

Some assembly members said we "need to work a lot harder on nuclear waste management to ensure safe and secure storage to manage the public perception for what is an efficient technology."

Import it (possibly)

Some assembly members said that you could "build in other countries, where there's more support/acceptance with [the] public (e.g. France) and import energy BUT [there are then] worries then about security and international relations."

Reuse sites

Some assembly members suggested that "if we can repurpose the sites and reuse them that would be good."

Be self-reliant

Some assembly members said that we will "need to import energy if we cannot make out own, so nuclear may be needed."

Some assembly members added an additional thought:

> "How much of a consideration, really, is the cost? We are told that we can't afford things as a country, but coronavirus has shown that we can spend money when we need to. The point is that the politics of these decisions is important and relevant."

As seen in Section A, assembly members expressed limited support for nuclear in their votes.

B.6 Fossil fuels with carbon capture and storage

Fossil fuels with carbon capture and storage means capturing and storing around 90% of the carbon dioxide released by burning fossil fuels like gas and coal. Assembly members discussed this technology in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about fossil fuels with carbon capture and storage.

⊕ Environment impacts and land use

Some assembly members liked that you "can capture 90% of CO_2" or said it "**seems to tackle head on the challenge of reducing the carbon in the atmosphere** through storage." One assembly member commented that "we learned that the chemicals (amines) used to capture the carbon can be recycled and reused."

⊕ Practicality, efficiency, readiness and scale

For some assembly members, the **potential to use existing markets, technology and infrastructure** was a plus. Some noted that it "use[s] fossil fuels therefore [we] can use existing markets" or that "we know the technology [for fossil fuels]." Others said they liked that we can "use existing power stations," that the "facilities [are] already there" or that we "already have the power stations, all we need is to capture the carbon that's coming out of them." Some said we have "evidence that fossil fuels work." Relatedly, some assembly members suggested and that we are "not limited in supply [of fossil fuels]", that we "**still have fossil fuels to use**" or that this "uses fossil fuels while we still have them." Others were much more muted in their praise, suggesting that there are "no positives – except familiarity."

Some assembly members felt this option could be **used short-term or as part of a transition**. Some said if we are "still burning fossil fuels [it's] important to consider how can do that while still working out how to improve renewables." Others said there's a "possibility that it could be the least disruptive, as [we] could continue to use fossil fuels, at least in the transition phase." Some suggested that it could "be used…[in the] short-term where there's no other solution", or that this is the "same technology as we use currently so [it] can be adopted as an intermediate solution to give us time to work on other alternatives."

Some assembly members said that fossil fuels are "**easily found**" or that "we're doing it already and can access it easily (i.e. it's onshore I think)." Some assembly members said it "**can be done"** or "can be done quickly." Some commented that we "need to balance the grid – if [we] have sporadic wind/solar energy, [we] need something **reliable** like CCS to balance it with." Others described is as "more reliable (no seasonal/weather effects)."

Some assembly members focussed on the technology for carbon capture and storage, suggesting it is **proven** and **viable:**

"CCS has already taken place at industrial scale in America. It is a proven technology. It is not just being trialled."

"Norway has been doing that for 10–15 years. Not as scary as we think it is. Seems like a possible alternative."

"CCS is a valid technology for when making cement or things that we really need to use large amounts of electricity for and for which there is no alternative."

Others commented that "CCS [is] underway and oil wells [for storage are] a viable option...." Also in relation to on carbon capture and storage, some assembly members said that it's a "good idea to put carbon underground", that it's "easy to put away under the sea" or "quite safe once stored (we believe)."

Individual assembly members suggested that it could "generate lot of electricity from single location", or that the CO_2 "doesn't take up much space (as it's converted to liquid)." Another said that they liked that it's a "switch on / switch off electricity source." One assembly member commented that I "wondered in the past – when not knowing so much about climate change – why it wasn't possible to get a giant space hoover to suck all the carbon out of the atmosphere, this technology sounds a little bit like that!"

⊕ Cost, the economy, and jobs

Some assembly members suggested it "could create **jobs** if it led to re-opening some coal mines" or that it would be "good for UK regions with coal mines." Some felt it would be "**cost effective**" or "**cheaper.**" One assembly member said "if we are well placed for geological storage sites we may be able to sell off storage space to supplement investment in other technologies in the short term."

⊕ Public support

Some assembly members suggested we could "carry on [our] lives as normal, able to burn coal/wood" or that there would be "**little change to our way of life.**" Some assembly members suggested that there "is a reason people are looking at it as it allows us to keep our way of life."

⊕ Safety and risk

Some assembly said they are "**more favourable towards this than nuclear**" or liked it more than nuclear "with regard to potential waste leaks as [it's] not going to kill people immediately."

⊕ Other

One assembly members said that they "trust that technology will come up with answers."

⊖ Cons

Assembly members identified the following areas as points that they disliked about fossil fuels with carbon capture and storage.

⊖ Environment impacts and land use

A sizeable number of assembly members said that they disliked the **continued use of fossil fuels**, suggesting that "carrying on as normal, doesn't do much to help climate change", or that it "just sidesteps the issue." Others said it is "not real change – doesn't address the... need to change energy production long-term," or commented that "we're already too reliant on them [fossil fuels]" – "it is not a future proofing solution." Some assembly members said that this "feels like the lazy option. Fossil fuels will run out eventually, so hesitant to carry on as normal if we can invest in other technologies." Others agreed:

> *"Fossil fuels – their time is up. Let's move on to clean energy, don't go back to fossil fuels."*

> *"Investing in this is money that is not invested in renewables – just invest in that instead. This is delaying doing what we will have to anyway."*

Other assembly members said they do not want to "suppor[t] a dirty industry" or suggested that fossil fuels have "lots of negatives that aren't attributed to the carbon" including that the "harvesting of fuels causes disease" or the "impact on [the] environment when [they are] extracted." Some commented "burn but capture seems illogical when there is no need to burn, why not just leave fuels where they are." One assembly member suggested that "there is a big lobby pushing for this which points to business as usual." Another said that "current CCS is used to increase production of fossil fuels (to extract more oil / gas from reserves)."

Some assembly members disliked that you "only get some of it out when capturing carbon" or noted that "**still 10% of carbon dioxide from fossil fuels [is] going out into the atmosphere.**" Others said they "don't like [the] idea of **creating waste** and just putting it aside. Renewables don't have that problem."

For some assembly members fossil fuels with carbon capture and storage was a "time-bomb for later." Others said it "**reeks of short-termism**", "doesn't protect future generations", "moves the problem to the next generation", gives the "future generation headaches" or is a "short term answer, not [a] long term [one]." Some assembly members commented that "if the intention [is] to make use of one main technology, [the] cost of carbon capture feels like an expensive way to go, and seems like it's taking a burying 'head in the sand' approach' – oh we've got this space, let's just put it there!" Some branded it "a selfish approach" or said "out of sight out of mind." Others said it seems "like a sticking plaster / temporary solution" or a "magic unicorn people are chasing when simpler solutions are in front of us." One assembly member suggested it was "not sustainable."

Practicality, efficiency, readiness and scale

Some assembly members suggested it "seems unrealistic", is "not viable", "not reliable" or is "nowhere near being ready." Others said that the "capturing process is new" or that "carbon capture **isn't ready** as a technology at the moment compared to others which are better options." Some said that the "technology is at an early state, not yet ready" or asked "why invest in the unknown if other options are available."

Some assembly members suggested that this way of generating electricity is **"not that efficient"** or that there are "limits to where this could efficiently be undertaken due to storage sites." Some assembly members disliked the "energy required to do the CCS" or the "energy cost." Some noted that "**a lot of energy is required** to run the CC process (10% of the electricity being generated at a power plant)."

Some assembly members suggested that "storage capacity is limited – it's 100 years so it's only a short term solution." Individual assembly members commented that it "takes more land to build pipes", or branded it "old fashioned." One said:

> *"In the future I think the only use of fossil fuels should be for when there is no current alternative such as air travel. And since carbon capture has limited space – though there is a lot – it should also be reserved for other circumstances, such as industrial processes that produce a lot of CO_2 but that can't be done another way."*

Cost, the economy, and jobs

Some assembly members suggested that that it is an "**expensive** process", "ridiculously expensive" or that it "doubles the costs of new power stations." Others said that the "initial cost is high", "seems prohibitive" or "will require a lot of investment." Some suggested that for it "to be viable to pipe the stored carbon to offshore repositories ... expensive new infrastructure would have to be built along the coasts." Others noted that "tech for CCS is expensive...[but] might get cheaper."

Some assembly members commented that "**wind [is] cheaper** than fossil fuels, then add cost of CCS and [it's even] worse."

Public support

Some assembly members recalled that "a Speaker during one of the early weekends said that we don't want to push CCS. **Might make people feel we don't need to change** as we have that to fall back on. There are lots of other options that don't carry risks." Others agreed saying "a lot of people don't want to have to change their lifestyles: if presented with CCS, you can carry on doing what you are doing, people are more likely to do that."

Safety and risk

A sizeable number of assembly members said they were worried about **risks with carbon capture and storage**. For some this was about the **"risks of leakages during storage**" including "major leak[s]." Some asked "how can you be 100% it's never going to leak or something's not going to disturb it?" or "what happens if there's an earthquake with lots of carbon stored under the sea." Others worried about **risks during transfer**, noting "the CO_2 is transferred to its destination under high pressure – this creates a huge risk if [a] pipe fails". One assembly member commented "I'd rather have a turbine fall over in the sea."

Others queried how carbon dioxide "can be stored without damaging **water supplies**" or suggested there's a risk of it "turning to acid if mixed with water." Some asked about the **impact on "marine life", or the "soil and the sea** if the carbon leaks out."

Some assembly members expressed concerns about the **involvement of big business**: "What happens if the carbon leaks out – do we pay them to capture it again?"

For some assembly members, their conclusion was that "they [those responsible] have no idea what the implications are", won't "know [the] impact until something happens" or that there are "too many unknowns about safe storage and the impacts of leakage." Making a slightly different point, some assembly members said that CCS "is a gamble and we don't know if it will work."

Other

Some assembly members said that fossil fuels with carbon capture and storage "should be [a] last resort and phased out by 2050."

Conditions

Assembly members also noted conditions that they would want to be in place for this technology to be used, or that they felt would help its use. They suggested a need to:

See it as a transition only

Some assembly members said they'd support this technology "if we see it as a transition, not as a long term solution. It will take time to switch to 100% renewables." Other assembly members suggested that "we're not going to be able to build the wind/nuclear technology capacity we need within the next 30 years. So, we need to convert these plants to get to net zero – using carbon capture feels like a necessary interim solution."

Bring the costs down

Some assembly members said that "if [we] could get cost down [we] would be more favourable."

Regulate and monitor

Some assembly members said that "CCS needs [a] high level of regulation and monitoring to ensure it is being done safely and that it remains safe when buried."

Develop the technology

Some assembly members said that the "technology needs further development before it can be widely used."

Find more storage space

Some assembly members said that we "need more space to bury the CO_2 than the original fuel that was extracted (we think)."

Look for alternatives to storage

Some assembly members suggested that "if it is stored in volcanic rock it becomes a solid, if put into [the] north sea it remains a liquid – why not capture it and turn it into plastics or gravel rather than putting it underground where it might leak." Others said we "should absorb the carbon in more natural ways."

Bear hydrogen in mind

Some assembly members said that "if we use hydrogen from gas in the future, then CCS is essential" or that we should "use the CO_2 generated to produce hydrogen, as opposed to capturing and storing it."

Availability of fossil fuels

Some assembly members said that their support for this technology would "depend on how much fossil fuels the UK has left."

Use it where needed

Some assembly members suggested that you "could use this option for [synthetic fuels for] bigger machinery, eg HGVs, aeroplanes and agri-machinery."

Tax it

"I would like to see an end to use of all fossil fuels, but if the technology is not yet there, then high carbon taxes to deter and reduce their use would also help pay for more research."

As seen in Section A, assembly members expressed little support for fossil fuels with carbon capture and storage in their votes.

C. Other technologies

Assembly members had only heard a very small amount about other technologies – hydro, wave, tidal and geothermal – in one of the presentations. The ballot paper nonetheless gave assembly members the opportunity to leave comments on these options, if they wished to do so. Seventy-two assembly members wrote down their thoughts.

C.1 General comments

Some assembly members made general comments about all four technologies, or several of them at once. Most comments were **positive**, with very few assembly members mentioning points that they disliked. Some assembly members noted conditions that they would want to be in place for these technologies to be used, or that they felt would help their use.

Pros

Consider in the right areas

Several assembly members suggested using these technologies in targeted local areas. Remarks included:

"I think all these options should also be considered in ... areas of the UK where they have the natural resources to be able to use these technologies."

"In the locations where the special conditions exist (e.g. appropriate topography) these alternative technologies need to be applied – we shouldn't focus only on the few mainstream low carbon technologies."

"I think there is an opportunity for local areas to explore these smaller forms of electricity generation where these are viable options but that the majority of the nation's resources should focus on the technologies described ...[earlier]."

Stability and a mix of renewables

Some assembly members emphasised the need to use a mix of renewable technologies:

"I think we need to maximise all possible sources of renewable energy to ensure all year round electricity."

"Despite the cost, hydro and tidal power should be expanded wherever possible as they can provide a more stable source of energy production. A large mix of clean renewable energy sources can meet most of our demand and must be heavily invested in."

"Resources should be natural, have longevity, and be reasonably predictable. We should not ask if we can afford to do it but if we can afford not to do it. Tidal, Geothermal and Hydro are front runners."

Support for tidal, wave and hydro

Several assembly members expressed support for tidal, wave and sometimes hydro in particular:

"I prefer tidal, wave and hydro as they are renewable as well"

"Tidal and Wave should be considered more."

"Money used for Nuclear should be transferred to Wave and Tidal development. I think it's crazy we are spending so much money on a hazardous energy when we can essentially power the UK on clean safe renewables."

"I think tidal and wave power are worth more consideration – they are natural resources like the wind and sun, but whilst the last two are variable according to the weather, tides and wave power are a constant and powerful source of energy."

"...consideration should be given to tidal and wave technology. These could be operated in conjunction with offshore wind installations."

"Tidal, wave & hydro needs to be developed since as an island we need to take advantage of that...initially it will be expensive but hopefully will become more competitive compared to other forms of production."

"As we are an island I thought more would have been made of both tidal and wave power generation. I understand they may be more expensive but so was wind power in the beginning."

"Given we are an island, with access to our coastline no greater than 70–80 miles from anywhere in the UK, shouldn't we be looking at wave/tidal energy especially for communities that rely on oil for heating and/or are not attached to the national grid."

Individual assembly members made the following points:

"I like all these options a lot, they all provide very clean energy. I think that all forms of clean energy should be used in the areas they are applicable."

"These should also be considered as they are also minimally detrimental to the environment"

"All these types are currently quite expensive but I believe, as with everything, the more people adopt them and the more research is done, the cheaper they will become. I like the idea of all of these technologies especially Hydro and Tidal/Wave and would like to see them implemented in some capacity in the future."

Cons

Unproven

Some assembly members said that these technologies are "interesting but relatively unproven" or "all largely untested and would require significant investment." Some suggested that the "technology for some of these may not be so mature."

Too slow

Linked to the above, one assembly member said that "time is a major factor", suggesting that "we need to prioritise technologies that are already established and proven, and not on tidal, wave, etc."

Conditions

Protect the environment

"I think there is a small place for all of these but with stringent controls. The natural environment, wildlife and biodiversity should always be considered and given priority. A decommissioned nuclear plant on the coast, which has already had its environment devastated, could be a consideration for tidal or wave power and once in place the environment vastly improved and enhanced." Another assembly members said that "the environmental impacts of these schemes must be properly assessed."

Continue research and development

Some assembly said that we should "continue to investigate these other options as the reduction of climate change is as important as apparently high financial cost. " Others said "if they can be shown to work in reducing global warming, they should be tried" or they "...nee[d] to be researched more and will play [a] part in the future." Some assembly members said "tidal and wave are being tried, but need more research to scale up" or "tidal and wave technologies seem like good options for an Island nation like the UK, but I think there needs to be more investment and incentives to continue R&D in these areas."

Develop storage options

"Other technologies such as wave and tidal would be good options for the UK especially, but only if we would be able to store the power and transport it/use it at a later time."

Work together internationally

Some assembly said we need to "work internationally and exchange research programmes especially with countries with similar geographic and geological terrains" or suggested that "with emerging existing technologies an international effort would yield greater results." Some assembly members commented that it is "important to look at international collaboration regarding all these different technologies and their use in the best geographical locations", particularly if "we can invest further in, and make use of, more efficient emerging technologies available to transfer electricity in a suitable way...."

Promote local energy

Some assembly members suggested that **"**the government should look at options to create more energy locally than nationally" or that "devolution is required for local government to take advantage of localised energy generation." Some gave the example of Southampton, which "can use geothermal as it suits their geography."

Individual assembly members suggested that "study of the estimated efficiency should be the key factor to what technology needs to be chosen in every case", that technologies should be considered "only if they contribute to reducing [the] domestic cost of energy to the consumer" or that "we have to look at the resources available here in the UK, costs and long term sustainability." Another assembly member said it "would [be] great if technology could harness both wind and hydro power in the same unit."

Some assembly members suggested that another technology, hydrogen, was the "way forward."

C.2 Hydro

The assembly members who commented on hydro specifically mostly made positive comments:

- **General support** – "I love the idea for hydro … where it is possible"
- **Suitability for the UK or particular local areas** – one assembly member said "I've seen and am very impressed with the micro-hydro scheme at Old Walls near Widecombe in the Moor. This scheme generated about 400 MWh/year of electricity, equivalent to the energy consumption of about 90 homes. These could be promoted in many, many villages around the country with moorland and hillside stream run-off. With surpluses feed back to the grid to offset maintenance. Need to overcome established planning regulation – i.e. reason for saying no!" Others said more generally that hydro has "a bigger part to play in local areas where the location would allow these technologies to thrive."

One assembly member voiced a concern about hydro, suggesting that it "may need the building of dams resulting in **loss of land**."

C.3 Wave

Assembly members who commented on wave technology specifically all made positive comments:

- **General support** – "would love to see wave tech develop"
- **Combine with offshore wind** – one assembly member said "I believe wave energy is seriously under utilized in offshore wind farms. Having fixed pillars in the sea provides the basis for utilizing vertical oscillations (wave energy) for effectively unlimited energy generation." Another assembly made a similar point: "If we're building offshore turbines which are fixed to the seabed, why not attach wave turbines to these?"

C.4 Tidal

Assembly members who commented on tidal technology specifically mostly made positive comments:

- **General support** – some assembly members expressed general support. One said they "really feel that Tidal is a possible way to look. I know it isn't cheap but the more it's invested in the cheaper it should get like solar/electric cars.... Hopefully it's something we start to see being talked about more." Another said "I feel tidal should be backed more", a third that "[I am] quite interested in tidal technology";
- **Suitability for the UK** – some assembly members said "as we are an island, it makes sense to continue to look into tidal generation... As this would be a consistent source of energy" or that "I think serious consideration needs to take place on British estuaries to establish whether tidal power can be harnessed";
- **Better than nuclear** – "I would prefer tidal to nuclear, if the construction costs were comparable, as it's less risky and requires less future maintenance";
- **Local potential** – "Tidal …[has] a bigger part to play in local areas where the location would allow these technologies to thrive i.e. Swansea tidal lagoon…";
- **Stable supply** – "Tidal systems in the right places would give a regular twice a day power generation and as the tide varies around the coast some could be working while others are not – wave generation depends on the wind to create the waves so you might as well use wind power."

Some assembly members said there were **points they disliked** about tidal or were unsure about:

> "Not sure tidal is a great idea as it can affect nearby wildlife and [has] very expensive start up costs."

> "Tidal may be expensive to set up and not provide enough energy."

> "Tidal would generate immense energy, but it's intermittent, and is not convenient"

One assembly member "this [can] be taken to other areas beyond the Severn? Would want to make a judgement and would need to know about cost and [the] impact on [the] marine environment, but interested."

C.5 Geothermal

Only a small number of assembly members commented specifically on geothermal. Most comments were positive:

- **General support** – some assembly members said "I love the idea for … geothermal energy production where it is possible" or that "geothermal could be a good option";
- **Proven and low impact** – one assembly member said that "geothermal for me is the way forward. UK currently using it [in] Southampton – drilling only 1800 down so not impacting the earth's crust and [it provides an] endless supply of heat energy…";
- **Good for some areas** – one assembly member said it could have a "bigger part to play in local areas where the location would allow [it] … to thrive."

One assembly member expressed doubts, suggesting that **"geothermal could possibly release more CO_2 into the atmosphere."**

D. Cross-cutting considerations

Assembly members' ballot papers gave them the opportunity to add 'anything else' they wanted to say about where our electricity comes from. Some assembly members used this space to make additional comments about individual technologies, in which case their thoughts have been incorporated into the tables above. Others however made cross-cutting points.

Some assembly members noted the need to **pursue a combination of technologies**. Some made general comments, saying "I think we should use a mixture of them", "I feel that all options presented/discussed should be considered as a combination to get the best from each option", or "I don't think that one option is a 'cure all' however I feel that a combination of the options would allow us to bring net zero much closer to becoming a reality." Others' made more specific suggestions or included key factors they would want borne in mind:

> "I think we should provide most of it by offshore (e.g. 55%), then 30% by both solar and onshore (15% each), then provide a base load through nuclear (10%) and finally the remaining 5% could come from bioenergy, wave and maybe tidal. Also I believe there should be ways to transport electricity from one part of the country to the other so that if it's extremely windy in one part of the country and not the other then the electricity supply will remain balanced."

> "All options should exist symbiotically and constant sources like nuclear and bioenergy are necessary to supplement variable sources like wind. Ultimately using variables will change to way we consume electricity (as a service – using it when it's windy is cheaper) making us more flexible as a society."

> "I don't think any one option is the solution, they all have their strengths and weaknesses, therefore we should use a few different solutions together. I do believe that we should move away from fossil fuels entirely, we will run out eventually anyway if we keep consuming them at the rate we are…."

> "The UK should aim for a combination of low risk low impact technologies."

> “It cannot be a singular solve-all solution, different communities will be able to harness and use different types of electricity.”

> “It needs to be a mixture. Not reliant on one source – different for homes than industry.”

> “Not enough thought has gone into integrated energy production. So for example, I believe the UK should concentrate on offshore energy production with energy plants simultaneously taking advantage of wind, solar and wave energy and using this unlimited energy to produce synthetic fuels at source from air mining. The energy plants could be static (akin to oil platforms in the North Sea)… or floating vessels much like ocean going fuel tankers, albeit that floating vessels would be less efficient at capturing wave energy.”

Some assembly members stressed the need to **keep our options open and/or conduct further analysis, including looking a new technologies.** Comments included:

> “I think the UK should keep its options open. When it chooses an option it should do a cost benefit analysis (if it can) on each technology. I don’t know if this is possible but could two small projects be compared when a new option is considered?”

> “Lets keep our options open and look at new energies. If we have come this far there must be more we can do. Capturing cow methane? More use of waste from household for energy? Hydrogen?”

> “Continue to research and utilise advancing technologies.

> “The pros and cons should be constantly under review. We must have a holistic view of what is good for the planet as well as humanity.”

Others said there **should be a focus on storage solutions for variable energy**:

> “I think the main thing is to find a way to store the power created from wind turbines, solar panels, etc. so it doesn’t go to waste and we can use it efficiently.”

> “Due to the variable amounts of energy produced by wind & solar, energy storage will be key. While the production of batteries has an environmental impact there are other energy storage options that we need to invest in as well. This includes pumping water and lifting weights to store energy when we have an excess [and] … to generate energy when we have drop in supply. This will be key to invest in while also rapidly scaling up our onshore and offshore wind capacity.”

> “I would like to see electricity storage technology developed. So that the excess generation of electricity can be stored.”

Some assembly members felt is “**important to differentiate the renewable energy with no waste product to the low carbon alternatives that may create a potential problem for the future generations.**” Similar comments included: “if we can achieve net zero and produce the energy we need without having to resort to technologies that have a waste product at the end of it why risk it no matter how small the risk….” or “the generating of electricity which leaves waste, nuclear or stored carbon, for future generations is irresponsible. “

Some assembly members highlighted the **principles or criteria that they felt should underpin how the UK generates its electricity**. Some assembly members said it is “important to consider

costs and effects to the environment", or that "achieving net zero is pretty pointless if you're going to wreck the environment with nuclear or fracking", while others cautioned "think carefully about risks to people. Not all about costs." Some suggested "we should be investing in tech we already have in order to meet our targets on time", or that we should "utilise the science we have and know works on a national scale rather than methods still being tested or [that have]… no real life evidence (e.g. CCS on a national scale)." Others said we should "prioritise resources we have, not resources which have to be imported." Other suggestions included:

> "The way forward should be based on the principles broadly agreed to in week one. This situation is a unique opportunity to reconfigure not only our energy systems but also our human inter-reaction with our environment and fellow human kind. An unseemly rush to get back to business as usual will be catastrophic for generations to come."

> "I am concerned about our energy security considering a lot of our generating capacity is owned by foreign (often state controlled) companies. I think all the nuclear power capacity is owned by EDF for example, and wind power contracts in Scotland all seem to benefit Denmark's Ørsted, Sweden's Vattenfall, China's Red Rock and France's EDF, as well as some German state-owned installations. The transition to renewables needs to have UK societal and economic benefits as well as environmental."

> "I would like to see the energy produced in the UK and creating jobs for employees most affected by energy production change."

> “ The price of electricity does not matter so long as it is a similar price as our competitors so it does not put our manufacturing at a disadvantage and it is a level playing field against other European countries.”

> “ Cost, benefits, pros/cons of all options need to be highlighted and documented leading to end user fair and affordable outlays.”

Some assembly members said “we should look at usage and ways to reduce it”:

> “ There are two fundamental ways to reduce our emissions. The first is by switching to renewable energy sources, however this has costs and takes time. The second is by reducing our energy demand. And we will need to do both to meet our targets. Reducing our energy demand is the quickest, easiest, and cheapest way to reduce our carbon emissions. Reducing our energy demand while quickly transitioning to already existing widely-scalable clean renewable energy (such as wind) will allow us to get to net zero quickly and cost-effectively.”

Relatedly, others noted that “the choice of which generating technology to choose and at what level is to some extent dependant on how electricity is used. For example if we had many more electric vehicles, there would be greater potential for off peak usage and more available battery storage and this would get over some of the disadvantages of solar and wind generation.”

Individual assembly members said that “commercial interests should be managed within national interests e.g. potentially renationalise”, or asked “are Hydrogen power plants an option?”

Conclusions

Assembly members expressed clear preferences for how the UK should generate its electricity.

Large majorities of assembly members ‘strongly agreed’ or ‘agreed’ that three ways of generating electricity should be part of how the UK gets to net zero:

- **Offshore wind** (95%);
- **Solar power** (81%);
- **Onshore wind** (78%).

Onshore wind scored slightly more highly than solar power in the Borda count, suggesting that assembly members slightly preferred it to solar power overall.

Assembly members identified **multiple points that they liked about each of these technologies**. Overall, they tended to see wind-based options as suitable for the UK, low cost, proven, clean, and good for the economy and jobs, among other advantages. They saw offshore wind as having key additional benefits, particularly being “out of the way”, but also in terms of the space available for turbines and its minimal impact on wildlife. For solar power, assembly members listed a wide range of positives including flexibility of location, the potential for individual autonomy and profit, and the recognised, proven and clean nature of the technology.

For all three ways of generating electricity, assembly members suggested a range of points to bear in mind around implementation.

Assembly members also discussed and listed their dislikes about offshore wind, onshore wind and solar. However they overwhelmingly felt that the advantages outweighed these points.

Assembly members were much less supportive of bioenergy, nuclear and fossil fuels with carbon capture and storage – although, particularly for bioenergy, significant numbers of assembly members were unsure about its use:

- 40% of assembly members 'strongly agreed' or 'agreed' that **bioenergy** should be part of how the UK gets to net zero, 36% were 'unsure', and 24% 'strongly disagreed' or 'disagreed';
- The equivalent figures for **nuclear** were 34%, 18% and 46%;
- **For fossil fuels with carbon capture and storage** the results were 22%, 22% and 56%; a majority of assembly members 'disagreed' or 'strongly disagreed' that this way of generating electricity should be part of how the UK gets to net zero.

Assembly members' comments on **bioenergy** suggest that, for many, their view would depend on how it is produced, including what is being burnt, how production is regulated, and therefore what the environmental and CO_2 impacts are. Some assembly members said they also found the evidence on bioenergy hard to follow. Assembly members' dislikes about bioenergy included concerns around burning trees and crops, land use and environmental effects, and a feeling that better alternatives exist.

Assembly members had three main concerns around **nuclear**: its cost, safety, and issues around waste storage and decommissioning. Their dislikes of **fossil fuels with carbon capture and storage** centred on safety risks and the continued use of fossil fuels, with assembly members also suggesting that it only provides a "short-term", expensive solution, when better alternatives are available.

Assembly members did not hear detailed evidence about **tidal, wave, hydro and geothermal** technologies, but in principle many clearly felt positive about their use particularly in suitable local areas. Assembly members tended to be most positive about tidal and wave technologies, followed by hydro. They saw these as natural and logical given that the UK is an island, also suggesting that they could be combined with offshore wind. As with the other technologies, assembly members noted a range of conditions for decision-makers to bear in mind around their implementation.