

FES 2022

Call for Evidence

A summary of responses from stakeholders

October 2021



Introduction

The FES 2022 Call for Evidence was open during September, providing all our stakeholders with the opportunity to contribute to FES 2022 via this online consultation. We posed a range of questions asking for evidence, insight, and research that we can consider for FES 2022. We have provided below short summaries of the responses we have received.

Many thanks to all those that took the time to respond to the survey throughout September.

The Call for Evidence is the beginning of our engagement programme for FES 2022 and compliments 1:1 engagement, focus workshops and other meetings.

We will consider the insight we gather from all our engagement and will share how we will take it forward in the FES 2022 Stakeholder Feedback Document that we will publish in spring next year.

If you have any queries, please email: FES@nationalgrideso.com

Contents

Communications and engagement	Page 3
FES 2021 documents and launch	Page 3
Net zero	Page 4
FES 2021 scenario framework, assumptions & analysis	Page 4
Regional FES	Page 4
FES modelling	Page 6
Demand	Page 6
Electricity generation and technologies	Page 6
Natural gas, bioenergy, and hydrogen	Page 7
Flexibility and whole system	Page 7

Communications and engagement

Communication

Positive comments were received in the responses regarding our communications, in particular highlighting the numerous opportunities stakeholders are given to contribute to FES and our engagement.

Areas for improvement include:

- Making our newsletters and email more interesting by including more graphics
- Consider hosting short interactive webinars on specific topics
- Using more accurate graphics for FES 2022
- Utilising an API for accessing data in the workbook
- Providing engagement updates for the rest of the year post FES launch

Website

The changes we made this year to the FES website were well received with comments in the survey stating it was useful, clear, coherent, well laid out and with good accessibility.

There were a couple of suggestions for ways to improve:

- Include some headline findings rather than broad key messages; analysis snapshots would be welcome
- There are numerous ways to access the same information, the website could be simplified with better use of navigation

FES 2021 documents and launch

FES 2021 documents

The survey responses provided positive comments regarding the suite of FES 2021 document with the data workbook highlighted as containing the necessary base data, making for a solid foundation. FES in 5 continues to be a useful summary document.

As in other areas of the survey, we received areas to explore for improvement for FES 2022:

- Ensure the non-interactive version is available at time of launch as the interactive version does not allow for copy and paste
- Be clear that the main report is an interactive version
- Provide varying levels of granularity for varying audiences
- Improve the navigation of the main document as it can be difficult to follow, current perception is that it is full of links and jargon
- Provide more detail regarding nuclear energy and how its role varies in scenarios
- Consider numbering the scenarios in the future if they remain unchanged (for example CT20, CT21) to enable referencing aspects that have changed since last year.
- Could FES be split by technology like the CCC's 6th Carbon Budget – to provide more technology specific analysis
- More visual description
- More concise summary of key changes from FES to FES to include assumptions, drivers, policy changes, views, decisions, and publications used.

FES 2021 launch

We received positive feedback for the FES 2021 launch with stakeholders citing that we provided a good overview of the analysis, helpful deep-dives, and Q&A sessions. There was a good balance during the week between presentations and Q&A. It was appreciated that all the questions raised during the launch week were included in the Q&A document after and a common feedback thread is that many of the presentations were excellent.

For improvement:

- More advance notice of the launch event – 3-6 months in advance would be ideal
- Ensure links are sent out after the event for viewing the presentations
- Spread the sessions out more so it is easier to attend all of them
- Launch sessions to include more analysis insight rather than repeating FES – explain more of the implications and modelling
- Host breakout sessions on specific topics
- Consider an alternative online launch platform as there were security issues with restricted access

Net zero

In relation to how we incorporate the 2050 net zero emissions target in FES, and more generally around how we account for emissions, we received a range of feedback on specific topics associated with net zero.

This included general suggestions around what should be added to the scenarios, for example including sensitivity analysis around the net zero target and ensuring all scenarios reach net zero. There were specific suggestions around potential different carbon accounting methodologies. There was also affirmative feedback that the current approach used was broadly correct.

FES 2021 scenario framework, assumptions & analysis

Many respondents supported retaining the scenarios from FES 2021 for FES 2022 with year-on-year consistency being a key theme. Some respondents supported the removal of non-net zero scenarios, whereas others questioned whether some aspects of the net zero scenarios were too ambitious.

Therefore, based on this feedback our initial proposal to retain the FES 2020 scenario framework for FES 2022 remains unchanged.

We also received some specific feedback on assumptions in areas including underlying demand reduction, aviation, commodity prices, tidal energy, heat pumps, hydrogen demand, nuclear plant and carbon capture and storage.

It was highlighted that resolutions at COP26 could change the energy landscape and could result in the need to make changes to the scenario framework to account for this.

Regional FES

What additional aspects of the whole energy system do think would benefit from a more bottom-up regional modelling approach like our new spatial heat model?

Stakeholders provided a variety of responses in the survey:

- Hydrogen use for heating
- EV take up based on recharging availability and urban and remote uptake comparisons

- Heat network development
- Customer engagement
- Electricity generation technologies and how they may alter over time
- Solar heating and heat storage technologies
- More on distribution-connected electricity generation
- Inclusion of large tidal range projects and schemes
- Deployment of hydrogen
- Demand forecasts and generation capacity projections

We introduced a new visualisation of our regional breakdown of FES electricity data. Do you have any comments or suggestions on how we can improve?

We received positive comments about the visualisation, stakeholders citing that it is useful, infographics presentations are spectacular and being able to sort the data based on the NUTS regions or GSPs is welcomed.

For us to consider, it would be helpful if the FES document shows a regional breakdown of potential future emissions considering all types of current and future generation technologies. And for us to think about the end user of the visualisation to ensure it meets the needs and benefits stakeholders.

What would you like to see us change, focus on, or prioritise as we develop regional whole energy system scenarios?

We received a wide range of responses for this question covering the following:

- FES tool kit for local deployment
- Different spatial scenarios in terms of economic, demographic and transport demands and infrastructure
- Role of nuclear power in regional decarbonisation, for example advanced nuclear technologies, given their deployment in the 2030s. And more on nuclear hydrogen production.
- Planning for the very long term with no fossil fuel generation
- Top to bottom communications and interfaces, for example: customer-DSO/Suppliers + Aggregators - ESO/Market
- Tidal stream resource
- CO2 storage and CCUS deployment
- More sharing of datasets / assumptions being made and greater understanding of how ESO assumptions / modelling differs to others. Understanding any modelling differences between the DFES and FES and looking to see if they can be bought together
- Focus on demonstrating where granular regional modelling can improve the accuracy of forecasts for what FES is used for – including a more granular view of gas scenario projections as gas DFES equivalents to do not exist.

FES modelling

Are there any data sources you are aware of that you feel could be useful in our modelling?

Some respondents provided suggestions for additional data sources that we could incorporate into our future modelling. These include suggestions for tidal resources and the outputs of other studies that have been conducted in areas that overlap with our modelling of future energy use along with regional data from Distribution Network Operator's DFES publications.

FES modelling: are there any areas in which you feel our modelling could be improved to better meet your requirements?

Many respondents offered suggestions to help enhance the modelling we perform. Suggestions include:

- Improvements to the modelling of tidal streams or ranges
- The importance of integrated modelling across sectors. A further respondent suggested building on existing work on hydrogen production from nuclear sources to also consider wider industrial processes.
- Inconsistency between data formats published in different years has made it more difficult to use the data. A suggestion was made to use standard database formats without spaces or other formatting as this would make it easier for 3rd parties to use the data.
- Modelling of uncertainty in extended periods of low renewable output and the use of long duration storage
- Inclusion of a combined CO2 storage profile across all technologies and sectors
- Increasing regional modelling and reflecting economic geographies

Demand

Electricity and natural gas demand: do you have any views on the annual and peak demand ranges used in FES 2021? What should we consider changing for FES 2022?

Most stakeholders were comfortable with the demand ranges. Some respondents were interested in finding out more about the differences between FES demands and other modelled demands, such as in the CCC Sixth Carbon Budget modelling.

There was interest in exploring peak demands further, with reference to the recent volatility in the international natural gas market and what steps could be taken to reduce the impact of extreme peaking events on the scenarios.

There was some concern about uptake rates of key technologies and how these could be realised.

Electricity generation and technologies

Electricity generation and technologies: what are your thoughts on the electricity generation results in FES 2021? Is the technology mix accurate and what should we change for FES 2022?

There was acknowledgement that the technology mix was broadly right, as well as responses which emphasised that the FES scenarios should remain as scenarios covering a range of possibilities and not try to become forecasts.

Most of the remaining responses were focused on suggestions relating to specific technologies. These suggestions included:

- A larger potential role for tidal energy and a distinction between tidal stream and tidal range technology.
- Alternative assumptions around BECCS/CCUS relating to cost, load factor and total deployment.

- Increased storage and flexibility provision.
- More positive assumptions around nuclear to reflect recent Government ambition/policy. They should also include small and advanced modular nuclear reactors.

Natural gas, bioenergy, and hydrogen

Natural gas: to what extent do you see a role for natural gas in Britain's decarbonising economy and what will be its key use(s) if any?

Responses spanned a full range of opinions. A minority of respondents felt that natural gas is essential because alternatives would be expensive and slow to implement. Some people felt strongly that burning of natural gas must stop in the same way that we largely phased out the use of coal generation. Most people felt that continued use of natural gas would be dependent on the effectiveness of sequestration technology or our ability to repurpose it. There was specific interest in our projected reliance on gas imports – stakeholders would value continued analysis in this area to help them understand risk and opportunities presented by increased exposure to price changes.

Many respondents highlighted the opportunity to use the enduring transmission assets for large scale storage and movement of energy around the country, either as hydrogen or as natural gas.

Several respondents believe that complete phase out of natural gas is unlikely, citing the cost of complete abatement/sequestration and its utility for high temperature industrial processes and for security of supply during periods of low wind and solar generation.

Bioenergy: what role do you see for bioenergy in the future? Do we need to consider changes for FES 2022?

We received a range of opinions regarding bioenergy, with some unsure about its potential applications. A third of respondents believe bioenergy will, or should, have a minimal role in the future energy system citing concerns about the sustainability of the feedstock, the process of importing feedstock, concerns about the effectiveness of sequestration and concerns around growing trees to burn them (i.e. a preference to grow but not burn the trees). Less respondents saw a role for bioenergy in the future, mainly for negative emissions and for mitigating hydrocarbon use in transport (bioethanol, sustainable aviation fuel (SAF) etc.)

Specific recommendations for FES 2022 include:

- At least one net zero scenario with no bioenergy/BECCS. Biomass use in scenarios should be limited to a 'technology of last resort' and scale of use should be based on the amount of residual emissions which need offsetting rather than on bioenergy supply.
- Exclusion of SAF from crops grown specifically for that purpose, in line with the consultation for the potential SAF mandate (<https://www.gov.uk/government/consultations/mandating-the-use-of-sustainable-aviation-fuels-in-the-uk>)

Hydrogen: how and where do you envisage hydrogen making the biggest contribution to decarbonising the GB economy and how much of an overall contribution will it make?

Some respondents explicitly stated concerns around the production of blue hydrogen in large quantities with another respondent suggesting it should be used, but only as a means to transition to hydrogen which would be produced in other ways in the long term. There was a concern that blue hydrogen may increase fuel poverty and maintain fossil fuel revenues for oil and gas companies rather than forcing them to support electrification (which could be beneficial for them if done early enough) and decrease the total cost of decarbonisation.

Green hydrogen was seen by most respondents as being essential for leveraging renewables to their full extent and for maximising export potential. There were also respondents strongly advocating for more hydrogen to be produced using nuclear power, given the government's published intent to grow nuclear generation capacity.

There were many suggestions for applications of hydrogen in the whole energy system with the caveat that it would ultimately depend on:

- How electrified the country's energy system is: as well as
- Available infrastructure, support mechanisms and wider policy developments (both in the hydrogen space and in other correlated markets, such as gas, CCUS, heat networks and other sectors that may form part of future hydrogen business models).

One respondent made the point that the government's hydrogen strategy envisages 20-35% of the UK's energy demand in 2050 to be met by hydrogen, mainly for transport and industrial – but also that there are differences of opinion. There was a consensus that this should be explored further in FES 2022.

Suggested applications are in line with current FES modelling and include:

- Chemical processes and high heat industrial processes
- Fuel for transport (road, air, and shipping)
- Heating, though this would be dependent on our ability to transport it safely and efficiently, which is a major challenge with the current infrastructure
- Electricity generation
- Storage/flexibility for peak power generation and inter-seasonal changes in supply/demand. There was a suggestion that a further 10TWh of hydrogen storage would be needed over and above the 15TWh already assumed in Leading the Way (FES 2021) to provide the long duration storage needed during extended periods of low renewable generation
- Decentralisation – local generation and use
- Production of other chemicals such as 'green methane' (hydrogen with sequestered carbon dioxide) as well as ammonia – both of which enable other activities in the energy industry in the UK and abroad.

Flexibility and whole system

Which technologies will be the main providers of system flexibility in the future and what are their key features?

The responses included:

- Open Cycle Gas Turbines
- Batteries (Thermal, Electrical, Potential Energy Stores/Pumped Storage, Liquid/Compressed air storage) with capability for long duration and large-scale electricity storage
- Electric vehicle batteries through smart charging and vehicle-to-grid, though there were some respondents who were sceptical this technology and infrastructure would be deployed in time or at the right scale
- Heat pumps with thermal stores allowing for central demand management
- Hydrogen production (all types) and storage with existing combined cycle gas turbines converted to run on hydrogen for peak demand periods or low renewable periods
- Decentralisation: greater flexibility where there is a need for it
- Regulation and policies which incentivise activities to help flexibility such as production in times of excess renewable supply
- European interconnectors and long-distance interconnection (i.e. with Africa - something we don't currently model)
- Rooftop photovoltaics (PV) generation combined with domestic storage and smart meters to eliminate the evening peak electricity demand
- Network heat pumps with load shifting algorithms, which weren't part of the modelling for FES 2021

- Continued use of natural gas for system flexibility
- Better understanding and capability to respond to market price signals on the consumer side to allow effective demand side response.

Some of these were highlighted as enabling technologies, while others were presented as interim solutions though there was not any strong consensus about which would be intermittent solutions, and which would be enduring.

Whole energy system: finally, thinking about the whole energy system, do you have any other further insight or data that would be helpful for us to consider for the Future Energy Scenarios?

One recommendation for future FES analysis was to consider which non-linear relationships and feedback loops amplify the system outcomes we want to see for net zero and how we can incentivise those.

There was strong agreement among respondents that a serious, integrated solution was critical, and many organisations/people responded in detail with commitment to follow up with further discussion or sharing of reports. We are very grateful for these insights and offers to collaborate and plan to reach out to individuals for discussion in the coming months.

Many thanks for taking the time to read the Call for Evidence summary document.

How we are taking this feedback forward will be shared in the FES 2022 Stakeholder Feedback Document published next spring on the FES website.

If there are any comments or questions then please contact: FES@nationalgrideso.com