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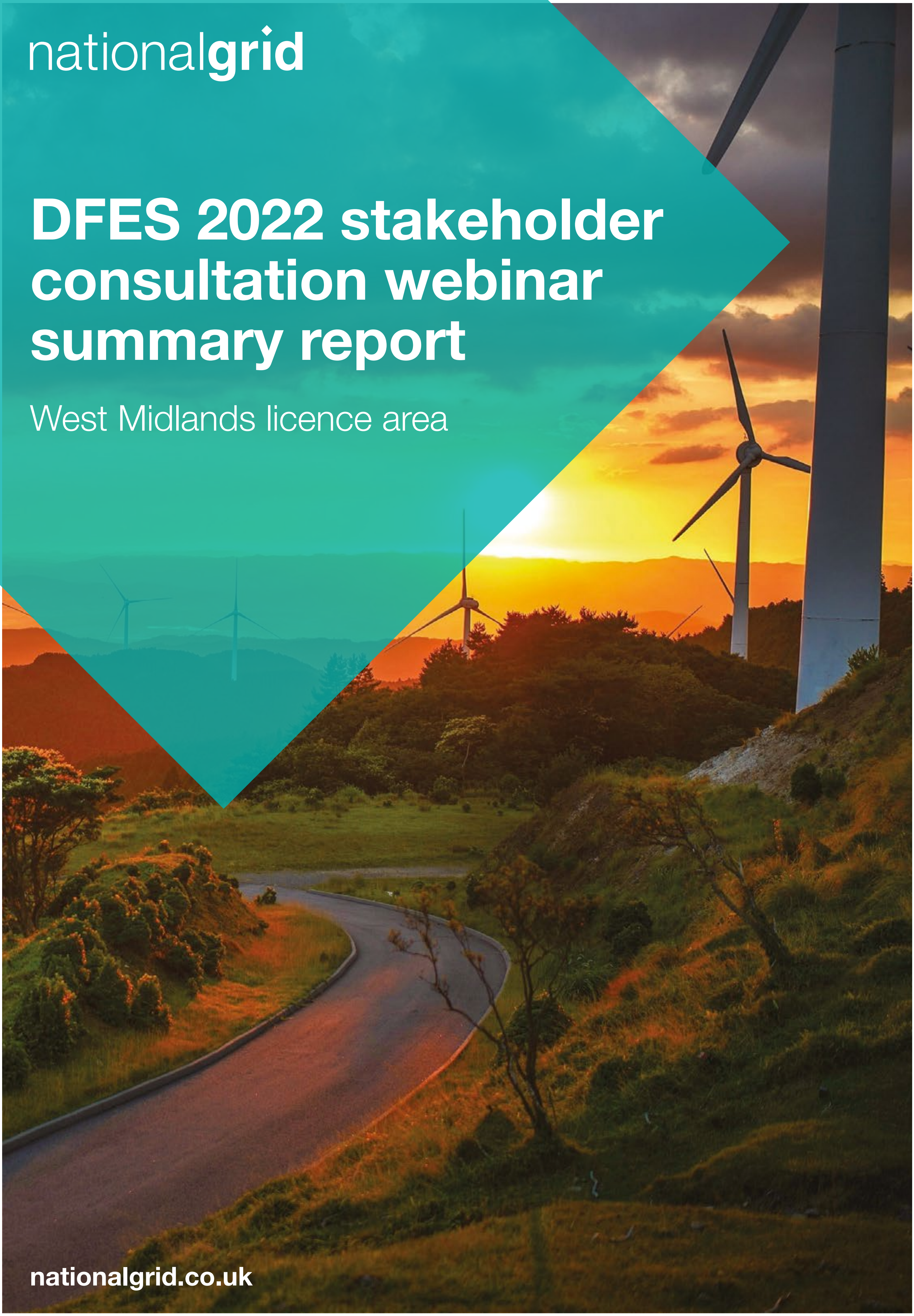

DFES 2022 stakeholder consultation webinar summary report

West Midlands licence area

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Introduction

Scope of this report

This report summarises the four stakeholder consultation webinars run by Regen and National Grid Electricity Distribution (NGED) as part of the 2022 Distribution Future Energy Scenarios (DFES) project. Comments and questions received from stakeholders who attended these webinars are presented, alongside the results of a series of poll questions that stakeholders were asked, relating to a number of future energy technologies. A summary of the stakeholders who were in attendance at each webinar is included, alongside an overview of the consultation evidence Regen received and the subsequent impact it has had on the DFES modelling.

DFES project summary

DFES is a key aspect of NGED's strategic network investment planning. Regen has worked closely with NGED since 2015 to develop the DFES methodology and analysis and is delivering the 2022 round of DFES analysis for NGED's four licence areas (South West, South Wales, East Midlands and West Midlands). DFES analysis models the uptake of technologies connecting to the distribution network in these licence areas.

These technologies include renewable, low carbon and fossil fuel power generation, electricity storage, low carbon heating technologies, electric vehicles (EVs) and EV chargers and hydrogen electrolysers, as well as analysing planned housing and commercial developments.

Towards net zero

Each region in Great Britain has unique characteristics and resources, and so, as part of the transition to net zero, each region will see unique deployment levels of renewable and low carbon technologies. The modelling adopts the scenario framework of the National Grid Electricity System Operator's (ESO) Future Energy Scenarios (FES) and is undertaken at a high granularity across over 2,000 geographic areas within the NGED licence areas, informed throughout by detailed local and regional factors and stakeholder feedback. This allows NGED to plan strategically and invest appropriately in the electricity distribution network in these geographic areas.

Stakeholder engagement

A key aspect of DFES is engagement and consultation with local stakeholders, to ensure local and regional factors are accurately reflected in our scenario analysis. Stakeholders engaged include: local and national government, project developers, technology installers, commercial and industrial consumers, academia, trade bodies, and community energy groups.

For 2022, Regen engaged stakeholders via a series of online workshops, as summarised in this report, as well as via targeted consultations with project developers, asset owners and other relevant industry representatives. Regen also engages with every local authority within NGED's licence areas to understand local energy strategies, climate ambitions as well as planned housing and commercial developments.

To find out more information about the webinars or the DFES project, or if you have any questions, please contact: **nged.networkstrategy@nationalgrid.co.uk**

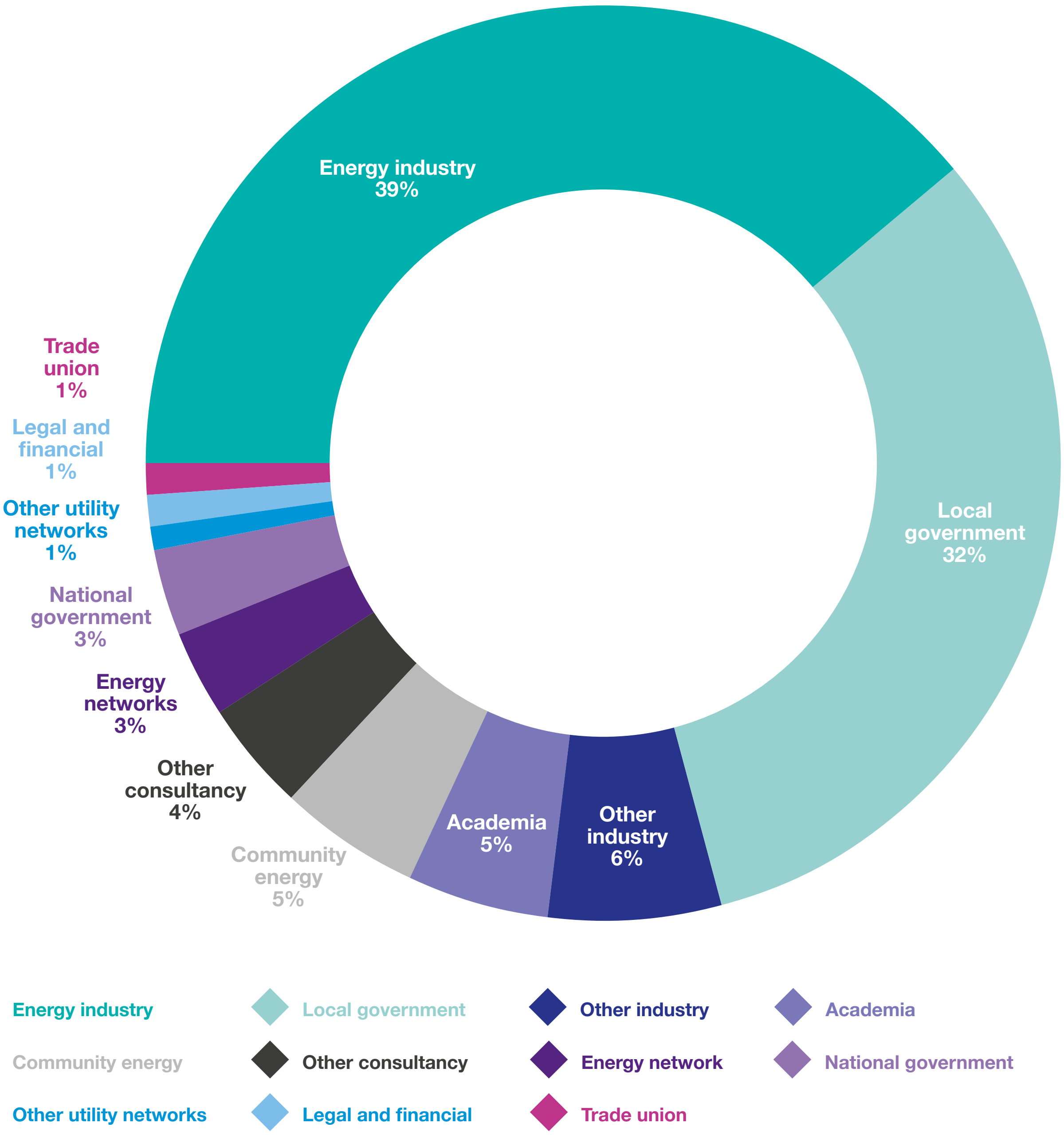
Stakeholders

The sectors represented by stakeholders that registered for the webinars are shown in Figure 1. Delegates from the energy industry and local government made up the majority of registrants in each webinar, with varying levels of representation from community energy groups, academia, utility networks and non-energy industries such as housing developers, technology companies and landowners.

Stakeholders were invited to attend multiple webinars if they had an interest or were actively developing projects across NGED's wider network.

As a result, the proportion of individual energy industry representatives engaged across the four consultation events in total, as seen in Figure 1, is lower than the proportion of energy industry representatives on each individual webinar.

Figure 1 Breakdown of total registrants across the four NGED DFES 2022 consultation webinars



West Midlands licence area

DFES stakeholder consultation webinar summary report

Date: 7 July 2022

Attendees: 54, including panellists

A link to the session recording is available on the **Regen website**.

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Regen contact: jhaynes@regen.co.uk

The engagement webinar aimed to provide stakeholders in the West Midlands licence area with an overview of the DFES process, as well as a summary of the key distributed generation, storage and demand technologies in the area, allowing stakeholders to feed directly into the DFES analysis. Stakeholder participation was facilitated through a combination of structured polls, open-form questions and a Q&A session.

This engagement was mainly focused on the near-term uptake of key renewable energy and fossil fuel generation, battery storage, as well as distributed demand in the form of EVs and electrified heat. The team also sought to engage attendees to further understand how the characteristics of the licence area could impact where these technologies may be located in the future.

Oli Spink, forecasting and capacity manager at National Grid Electricity Distribution, presented an overview of the role of DFES, how the process has evolved over time and explained the current suite of published outputs from the analysis. Oli also outlined how the Access and Forward-Looking Charges Significant Code Review could impact NGED's network planning and the role of the DFES within it.

The current NGED DFES interactive map application is available to explore here.

Jonty Haynes, senior analyst at Regen, provided some context for the West Midlands licence area, illustrating the pipeline of potential new connections and capacity. Stakeholders were asked for their views on how the licence area differed from other areas of the country.

Grace Millman, energy analyst at Regen, presented a series of maps detailing the scale and location of existing and pipeline renewable generation, thermal generation and electricity storage in the licence area. Stakeholders were invited to provide views on various questions around:

- the ground-mounted solar pipeline;
- which households might install rooftop solar PV;
- the fate of fossil fuel generation;
- drivers behind domestic electricity storage; and
- the potential locations of future hydrogen electrolysers.

Stakeholders were also invited to share any other thoughts they had on generation and storage in the licence area, to capture the broader sector knowledge from the attendees present at the event.

Jonty then covered domestic-scale technologies, detailing the relevant heat and transport policy that would heavily impact the DFES analysis in the near and medium term. The current location of operational heat pumps and EV chargepoints were presented to stakeholders, followed by a series of questions on:

- the uptake of heat pumps to achieve the UK government's 2028 ambition; and
- the possible solutions for charging of on-street parked EVs.

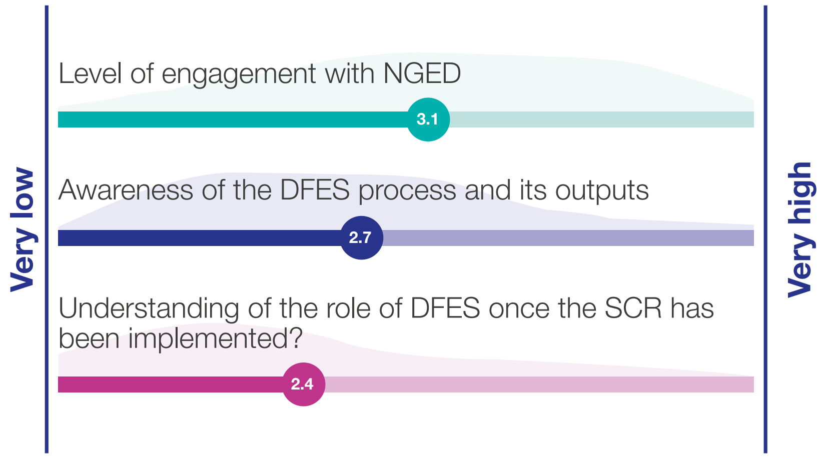
The webinar concluded with a Q&A session with all of the panellists. The poll results, stakeholder comments, questions posed, and answers provided from all four licence areas are summarised in the stakeholder feedback section of this report, categorised by theme. A summary of how the input and feedback provided by attendees from the webinar is to be used in the scenario modelling is also outlined in this section.

Initial feedback

At the beginning of the webinar, we asked stakeholders to rate their level of engagement with NGED, awareness of the DFES process and its outputs and their understanding of the role of the DFES once the SCR described by NGED had been implemented. The results of these questions are shown below.

This showed that overall stakeholder engagement from NGED was relatively good, awareness of DFES was moderately higher than seen in the 2021 engagement, but the awareness of the impact of the SCR on DFES analysis was fairly low. The latter is to be expected, with the SCR being a relatively specialist and specific component of broader reforms to future network charging. Stakeholders were also asked about the main characteristics of the licence area. The responses to this question, and details of how it will impact the modelling, have been summarised in the table below.

Figure 2 West Midlands licence area responses around the DFES, SCR and NGED



Your comments to us	Our response
The West Midlands features a significant manufacturing industry. Stakeholders also felt that this industry is across a number of smaller, energy intensive clusters.	The commercial and industrial features of each licence area are considered for a number of DFES technologies, including on-site thermal generation (i.e. diesel, gas, bioenergy), hydrogen electrolysis, battery storage and rooftop solar PV.
The West Midlands has a clear urban/rural split.	The urban and rural areas of the licence area will see different pathways for a number of technologies, particularly renewable generation and domestic technologies such as EV chargers and heat pumps.
The West Midlands features the West Midlands Green Belt.	The Green Belt is reflected in the location of the current pipeline of projects, and also considered in our spatial resource assessments for future large-scale solar PV and onshore wind deployment.
The West Midlands features a high proportion of conservation areas and listed buildings.	We will look to include conservation areas and listed buildings in our heat modelling where possible. This may include more instances of 'like-for-like' heating solutions being modelled in these types of buildings, such as biofuels replacing existing fossil fuel heating systems.
HS2 will strongly impact energy demand in the West Midlands.	Rail networks directly impact the DFES modelling for technologies such as the future location of hydrogen electrolysers for non-electrified areas of the rail network or the location of new commercial and industrial demand.

Figure 3 Breakdown of registrants for the West Midlands NGED DFES 2022 consultation webinar

Stakeholder feedback

Inputs into the DFES process

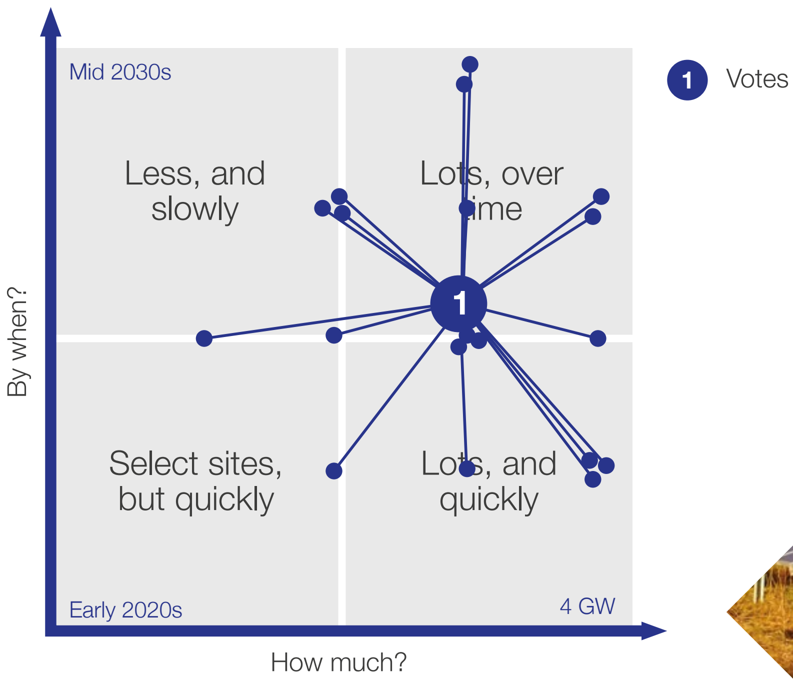
The following tables present feedback from the webinars for all four licence areas, categorised by theme. This feedback was gathered through the responses to the live polls and open-form questions posed by Regen, as well as comments and questions submitted by stakeholders during the webinars.

Ground-mounted solar PV

Your comments to us	Our response
Stakeholders felt that the majority of the solar pipeline capacity would be built out, with all stakeholders thinking at least half the pipeline will be constructed, and a significant proportion thinking the whole pipeline would be built out. The vast majority of stakeholders felt it would take some time for the solar pipeline to build out, finishing in the late 2020s or early 2030s. **Stakeholders in the East Midlands felt that a higher proportion of the pipeline would be built out relative to stakeholders from other licence areas, whereas West Midlands stakeholders were most optimistic around the speed of ground-mounted solar pipeline deployment.** **Stakeholders in the South West had the largest range of views on the ground-mounted solar pipeline but still averaged at a high level of solar deployment within a medium-term deployment timescale.**	The envelope of views around the solar pipelines from stakeholder polling will be directly reflected in the pipeline scenario modelling. This will be combined with site-specific research on individual pipeline project progress and direct engagement with project developers. The resultant projections for each licence area will be tailored for each region, based on the results of the stakeholder polling results.
Stakeholders suggested there is a lack of space for large-scale renewables in the West Midlands.	Our pipeline assessment suggests a high number of large-scale ground-mounted solar projects in the area. However, these are located where space is more available. Beyond the pipeline of known connections, our large-scale solar PV resource assessment is used to weight projections to areas of prospective land, accounting for land use, protected areas, network availability and built-up areas.
Stakeholders highlighted that large industrial-scale energy consumers could deploy solar PV to reduce electricity imports and costs.	Our solar PV modelling is split into three categories, one of which is commercial-scale solar PV (10 kW to 1 MW). The distribution of this ‘commercial solar’ capacity will include industrial sites and demand locations as key locational factors.

Figure 4 West Midlands licence area webinar responses regarding the pipeline of large-scale solar PV

How much of this 4 GW solar pipeline will connect, and how quickly?

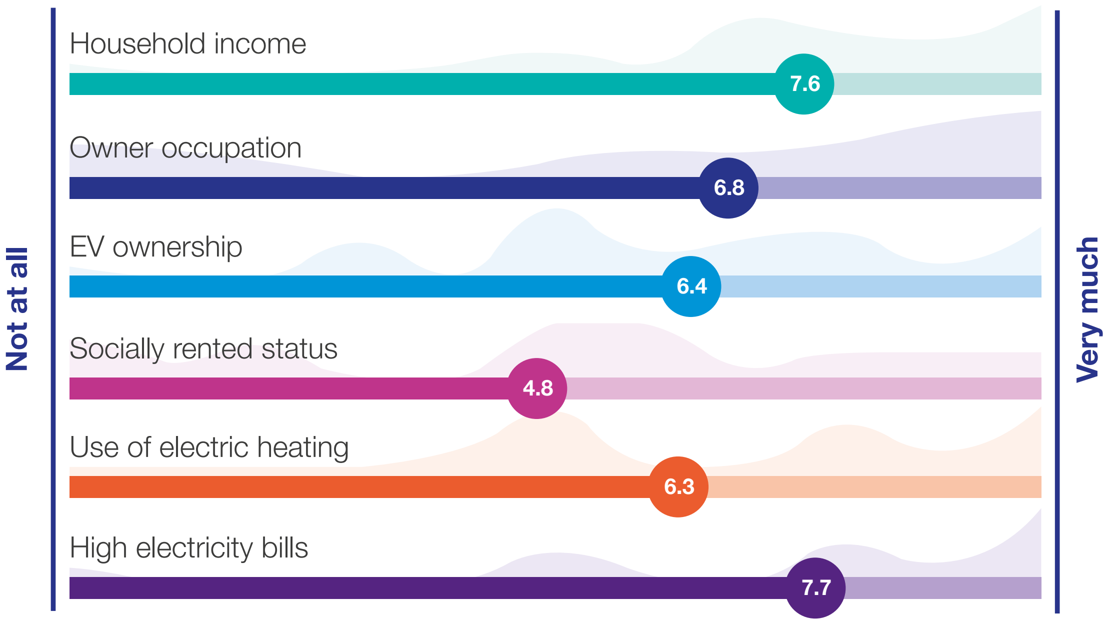


Rooftop solar PV

Your comments to us	Our response
Stakeholders across multiple licence areas agreed that household income, owner occupation and high electricity bills would be the main factors driving domestic rooftop solar PV uptake in the next near term, with a smaller impact from EV ownership and use of electric heating. Socially rented property tenure was not seen as a major factor by stakeholders.	We will directly use these factors to model the spatial distribution of domestic rooftop solar PV in the near term under all scenarios.
Stakeholders felt that all new developments should be required to fit solar PV as standard.	While this is not a current policy, the rooftop solar modelling assumes a high uptake of rooftop solar on new developments in the scenarios that achieve net zero, as feedback suggests this is a clear area for future solar PV capacity growth.
Stakeholders felt that high energy prices will drive the uptake of rooftop solar.	Rooftop solar uptake at both a domestic and commercial scale is currently increasing. In all scenarios, this trend will be modelled to continue, and an accelerated uptake will be modelled in Consumer Transformation and Leading the Way, the scenarios with the most ambitious consumer-driven decarbonisation pathways.
Stakeholders thought that the Smart Export Guarantee would not encourage export from rooftop solar PV.	In the analysis, rooftop solar PV uptake will be driven primarily by the potential for self-consumption. This is especially seen in homes with higher energy demand, due to the current export tariffs highlighted by stakeholders.
Stakeholders highlighted the Sustainable Warmth Grant and Solar Together schemes as potential drivers of domestic solar PV uptake.	The criteria for these schemes, focusing on households with a low energy rating and household income under £30,000 a year, will be directly considered in the near-term spatial distribution of rooftop PV across NGED's licence areas.
Stakeholders noted that solar PV could be installed by high-income households alongside other low carbon technologies such as an EV or heat pump, and also in lower income or socially rented households via government and local authority support schemes.	All of the criteria described are distribution factors that are used to spatially distribute small-scale solar PV (<10 kW) capacity in the near term.
Stakeholders noted that current Smart Export Guarantee rates were too low to encourage domestic solar PV uptake.	The uptake of rooftop solar PV in the near term is weighted towards households with higher self-consumption potential, due to the feedback around the Smart Export Guarantee rates.
Stakeholders thought that EV ownership might not be a key driver in solar PV uptake, as most EV owners access cheaper overnight tariffs for EV charging.	In the near term, EV ownership will not be a factor in the spatial distribution of rooftop solar.

Figure 5 West Midlands licence area webinar responses regarding near-term factors for rooftop solar PV

How might these factors impact households installing rooftop solar PV over the next 5 years?



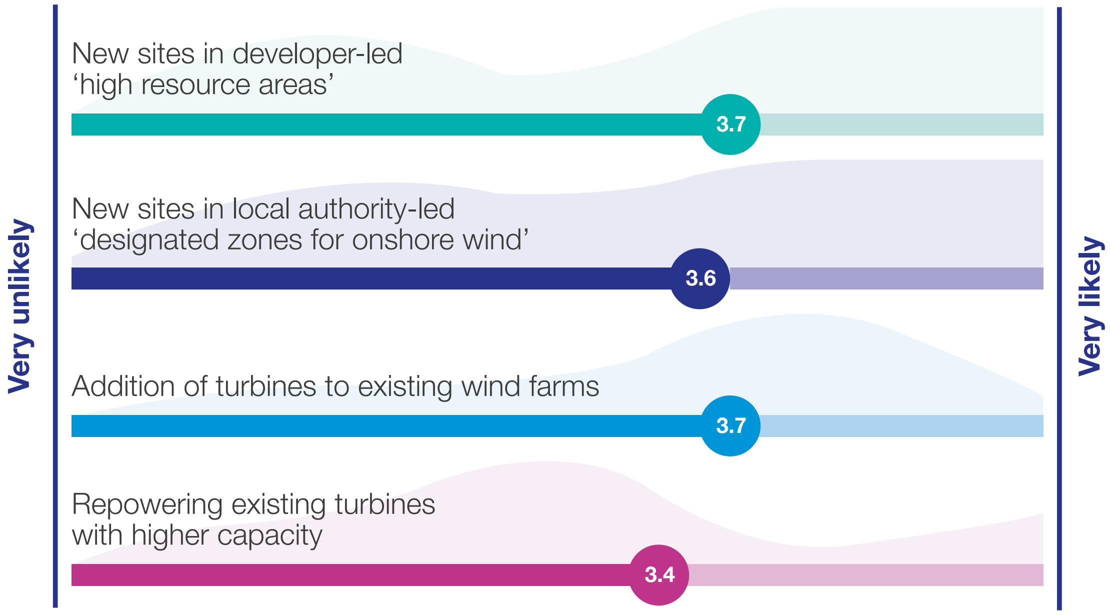
Stakeholder feedback

Onshore wind

Your comments to us	Our response
Stakeholders in South Wales felt that the onshore wind pipeline could be built out on a similar timescale to the ground-mounted solar PV pipeline, completing in the late 2020s and early 2030s; however, stakeholders also felt that only select sites would progress to commissioning, and suggested that, on average, less than half of the c. 750 MW pipeline anticipated to be built out.	The envelope of onshore wind pipeline deployment shown from the results of stakeholder polling will be directly reflected in the pipeline scenario modelling. This will be combined with research on individual pipeline project progress and direct engagement with project developers.
Views from stakeholders in the South West around the location of future onshore wind capacity were evenly spread across a number of factors. Polling results suggested that onshore wind could equally be located at new sites in high resource areas, zones for onshore wind development designated by local authorities, expansion of existing wind farms with new turbines, or repowering of existing turbines with higher capacity models.	We will apply an even weighting of these factors to model the spatial distribution of onshore wind in the English licence areas, specifically in scenarios where onshore wind policy and development in England is unlocked.
Stakeholders highlighted that community energy could be a route to enable onshore wind deployment in England.	We will assess the pipeline of prospective onshore wind projects individually to ensure that all routes to onshore wind deployment in the near term are accurately reflected.
Stakeholders noted that landscape designations in the South West limit onshore wind deployment relative to ground-mounted solar PV.	Our onshore wind resource assessment includes protected and designated areas to understand which parts of the licence area are less likely to host onshore wind.

Figure 6 South West licence area webinar responses regarding the location of future onshore wind development

If current restrictions to onshore wind development are unlocked, what types of projects are most likely to be developed in the next 5-10 years?



Other renewables

Your comments to us	Our response
There is a local interest in developing tidal technologies in South Wales.	We engage with local stakeholders such as Marine Energy Wales and the Marine Energy Council to gauge the potential for marine generation capacity potentially seeking to connect on the distribution network in South Wales.
Stakeholders noted that the South West has potential for marine energy, including tidal.	We will engage directly with marine energy representatives to assess the potential for marine energy connecting to the distribution network in the South West and other licence areas, including prospective or planned projects.
Stakeholders in the South West noted that biomethane from food waste, farm waste and sewage could be an area of future growth.	Our modelling of 'renewable engines' technologies includes analysis of biomethane resource from the three feedstocks mentioned, alongside analysis of known baseline and pipeline projects. The potential for electricity generation from biomethane is balanced against competing demands for bioenergy as a valuable low carbon resource, such as the injection of biomethane into the gas network or use for biogas transport, for example.

Stakeholder feedback

Fossil-fuelled generation

Your comments to us	Our response
Stakeholders across multiple licence areas felt that existing fossil fuel electricity generation was most likely to convert to electricity storage, somewhat likely to convert to hydrogen-fuelled generation, and unlikely to convert to bioenergy or continue to operate with strict emissions controls.	We will model a range of scenarios for the decommissioning of existing fossil fuel generation, with the majority of sites converting to battery storage, and conversions to hydrogen generation will be dependent on the wider scenario assumptions.
The majority of stakeholders across multiple licence areas felt that new fossil fuel electricity generation sites would struggle to achieve planning permission, this included some specific responses from local authorities and project developers. Of those who felt that sites could attain planning permission, the majority felt this would be over a much longer time frame.	Where fossil fuel electricity generation sites in the pipeline haven't yet attained planning permission, these sites will be modelled to only go forward to connect in one or two scenarios, depending on other evidence of progress identified through online and developer research.
Stakeholders said that gas-fired power will convert to hydrogen if it is cheap enough.	Our gas and hydrogen-fuelled generation modelling is based primarily on the conversion of existing fossil-gas sites to hydrogen, where a local hydrogen supply is anticipated to be available.
A stakeholder highlighted that some diesel sites are proactively being converted to battery energy storage sites, although this can be difficult to achieve.	In the DFES modelling, diesel generation sites are modelled to convert to battery storage, or hydrogen-fuelled generation in the longer term, depending on the scenario. This is also the case for fossil-gas generation modelling, but the conversion is modelled to occur in the longer term reflecting assumptions in on the overarching scenario framework.
Stakeholders felt that diesel generation would likely be decommissioned in the near term.	In all scenarios, commercial diesel generation capacity reduces from 2025 as a result of the Medium Combustion Plant Directive.

Figure 7 East Midlands licence area webinar responses regarding the fate of fossil fuel electricity generation

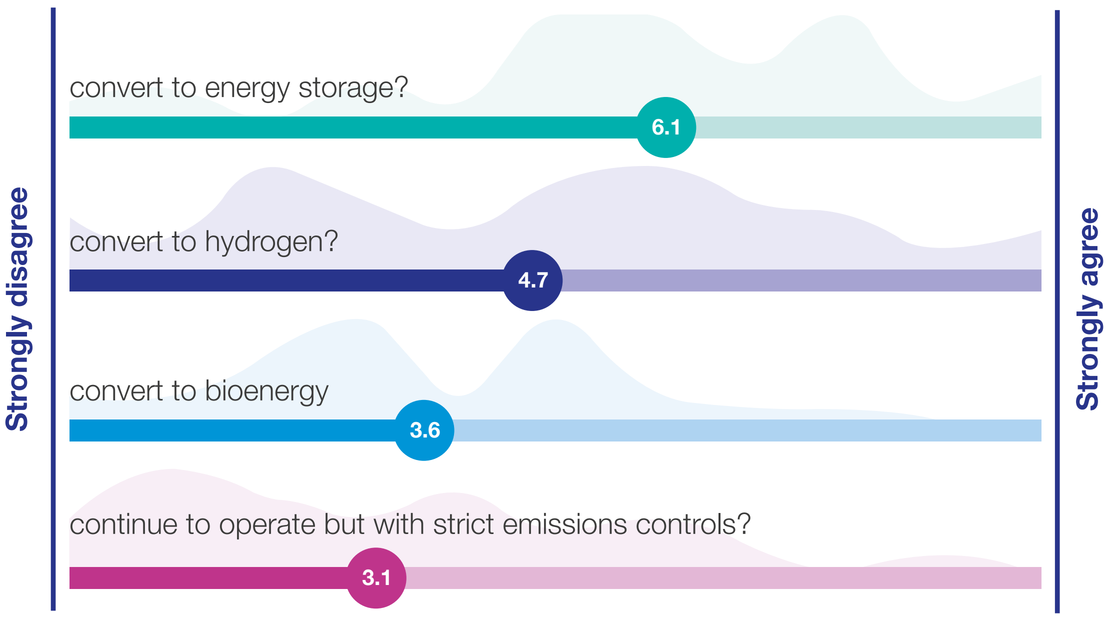
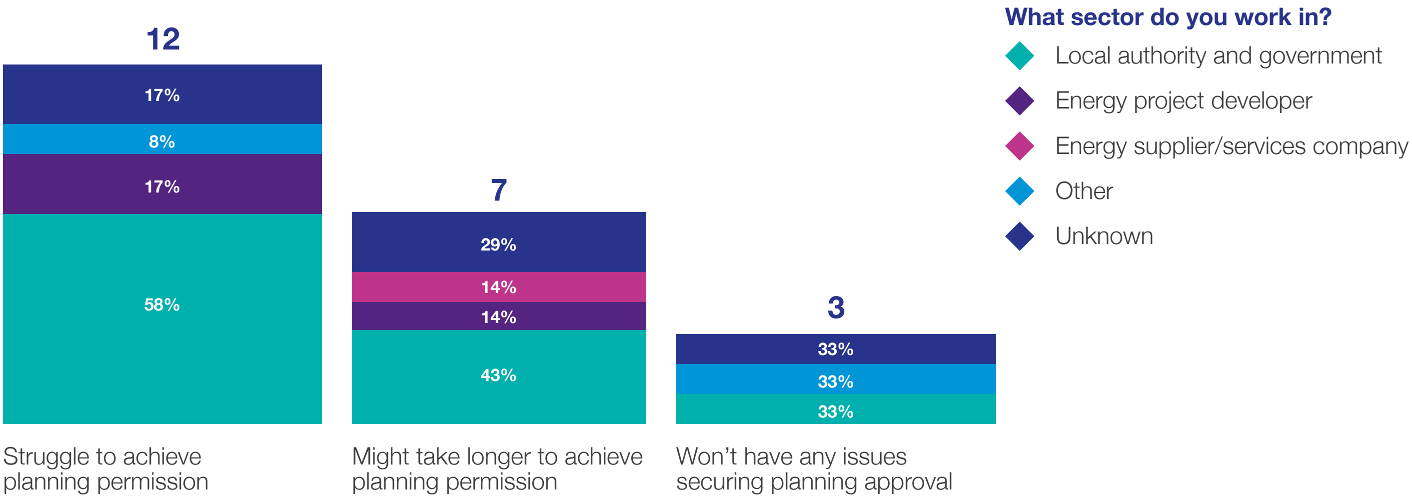


Figure 8 South Wales licence area webinar responses regarding the planning landscape for new fossil fuel electricity generation, categorised by the sector each stakeholder works in

In the near term, what do you think the planning landscape will be like for new fossil fuel electricity generation?



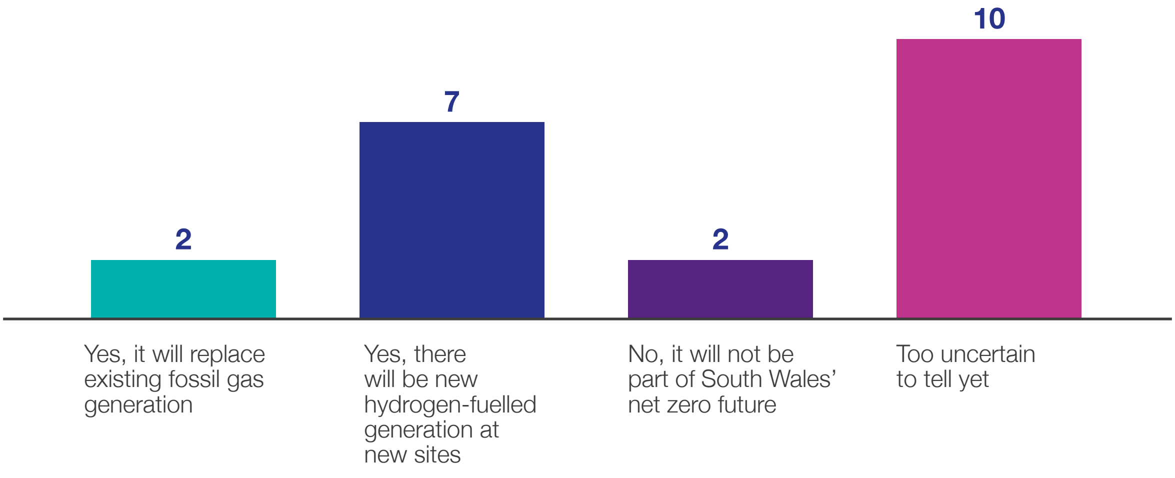
Stakeholder feedback

Hydrogen-fuelled generation

Your comments to us	Our response
Stakeholders across multiple licence areas felt that existing fossil fuel electricity generation was most likely to convert to energy storage, somewhat likely to convert to hydrogen-fuelled generation, and unlikely to convert to bioenergy or continue to operate with strict emissions controls.	We will model a range of scenarios for the decommissioning of existing fossil fuel generation, with the majority of sites converting to battery storage, and conversions to hydrogen generation dependent on the wider scenario assumptions.
Just under half of stakeholders in South Wales felt it was too uncertain to tell if hydrogen-fuelled flexible generation would be part of South Wales' net zero future. **A notable proportion of stakeholders also felt it could be a part of South Wales' future, with the majority highlighting that hydrogen generation would more likely be located at new sites, rather than converting existing fossil gas generation sites. Less than 10% of stakeholders said it would not occur in the licence area at all.**	The uncertainty around hydrogen-fuelled generation will be accounted for by a wide range of scenario outcomes. Currently, our modelling assumes a high proportion of capacity from the conversion of existing fossil gas generation sites. We will discuss with sector experts further to ascertain whether new build plant or conversions of existing plant could be more likely.
Stakeholders felt that generating electricity from hydrogen would be unlikely, due to the cost of hydrogen.	Hydrogen-fuelled electricity is a significant part of the wider electricity system generation fuel mix in the broader FES 2022 modelling, under some scenarios. Our DFES modelling, focusing on connections to the distribution network in NGED's licence areas, includes a wide envelope of hydrogen-fuelled generation capacity to account for notable uncertainties for this technology category. Where hydrogen-fuelled generation is present in the analysis, this is anticipated to be used as peaking plant, operating infrequently at only the highest periods of electricity prices, due to the aforementioned expected cost of hydrogen relative to fossil gas.

Figure 9 South Wales licence area webinar responses regarding the role of hydrogen-fuelled flexible generation

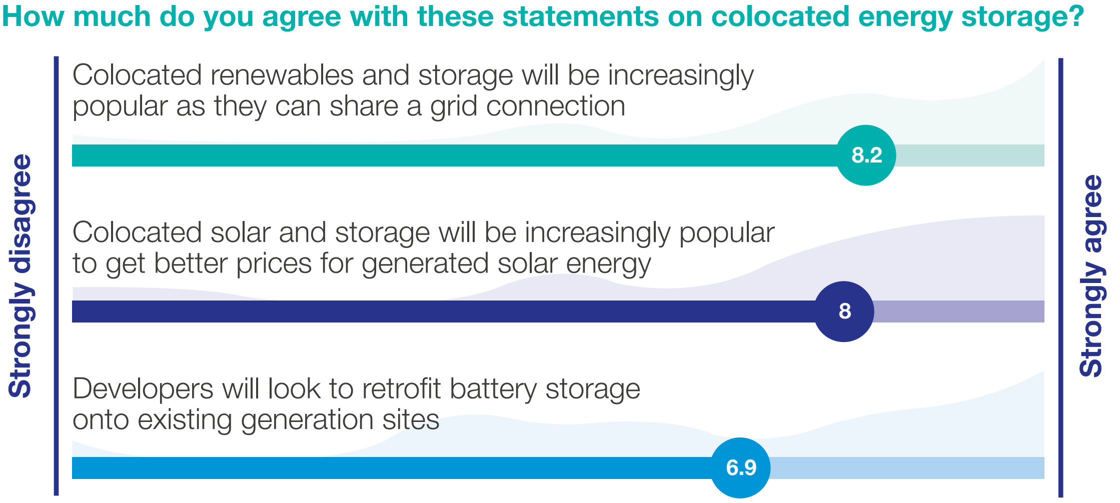
Is hydrogen-fuelled flexible generation likely to be part of South Wales' net zero future?



Electricity storage

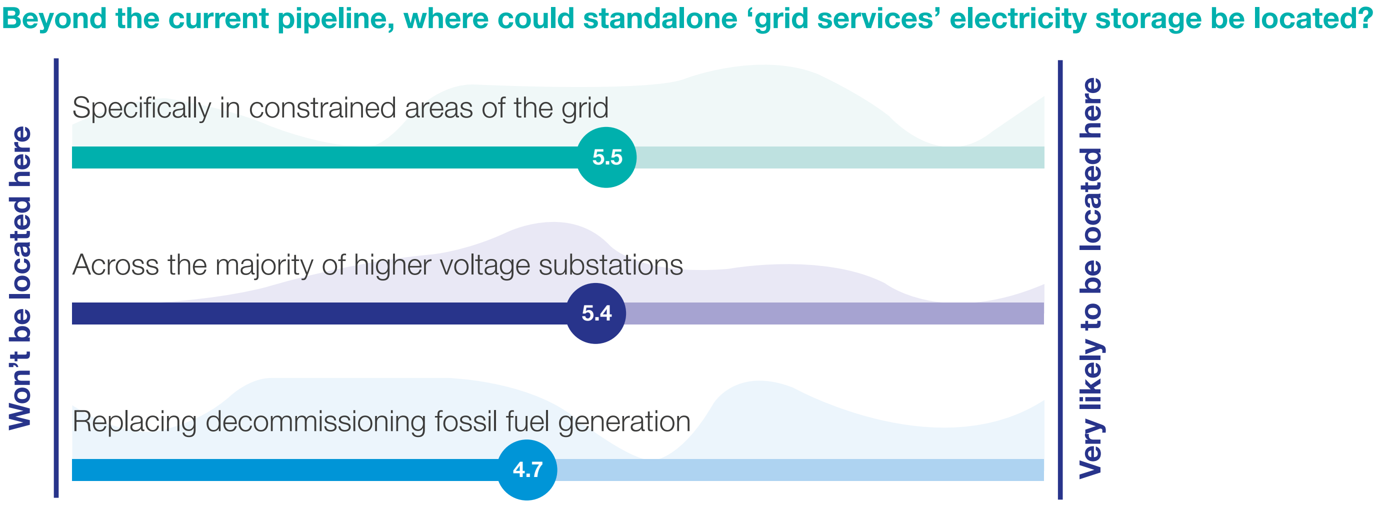
Your comments to us	Our response
Stakeholders across multiple licence areas felt that existing fossil fuel electricity generation was most likely to convert to energy storage, somewhat likely to convert to hydrogen-fuelled generation, and unlikely to convert to bioenergy or continue to operate with strict emissions controls.	We will model a range of scenarios for the decommissioning of existing fossil fuel generation, with the majority of sites converting to battery storage, and conversions to hydrogen generation dependent on the wider scenario assumptions.
Stakeholders across multiple licence areas felt that colocated solar and storage will be increasingly popular as a route to achieving better prices for the sale of solar generation. In addition to this, stakeholders highlighted that – to a lesser extent – some developers may look to retrofit battery storage onto existing solar and wind generation sites. **In the East Midlands, stakeholders felt that the ability to share a grid connection would make colocating renewables and storage particularly popular; however, in the South West, stakeholders saw this as a less important factor.**	We will model the colocation of electricity storage capacity primarily on the location of new large-scale solar farms, but we will also model some retrofit of colocated batteries at existing solar farms. Regarding sharing a grid connection, the pipeline analysis of colocated projects currently in development should reflect any regional considerations in the near and medium term. We also recognise that some battery projects sharing a connection point may be entirely siloed from the solar/wind generation asset. We will reflect this through the modelling of standalone battery capacity, as well as more directly colocated storage and solar capacity.
Stakeholders in South Wales had no strong opinions on the location of standalone electricity storage targeting grid services, beyond the locations of the current pipeline. Factors such as constrained areas of the grid, proximity of higher voltage substations and the displacement of fossil fuel generation all received moderate results from stakeholders.	Without a clear consensus around future locations, and with a substantial standalone battery storage project pipeline in all licence areas, we will look to base the location of future standalone battery storage primarily on the pipeline of accepted connections and the location of higher voltage network infrastructure.
Battery storage could be useful for electricity supply resilience, demand side response and as a backup for critical services such as hospitals.	Two of our battery storage business models, ‘grid services’ and ‘high energy user’, directly relate to the factors highlighted. These storage business models are modelled separately to ensure that all key classes of battery storage assets are considered at a regional and local level.
Energy storage through heat batteries or compressed air could play a role.	Currently, our modelling has large-scale non-battery energy storage such as compressed air energy storage almost entirely connecting to the transmission network. We do not foresee any compressed air sites connecting to the distribution network in NGED’s licence areas.
Stakeholders suggested that behind-the-meter storage could be used to help overcome grid constraints for demand customers.	The battery storage model features a ‘high energy user’ business model, which models the uptake of batteries behind-the-meter at demand customer sites. In addition to avoiding constraints or connection costs, another driver considered is the potential to reduce electricity costs through avoiding grid imports during high-cost periods of the day or maximising the self-consumption of onsite generation.
A stakeholder highlighted that diesel sites are proactively being converted to battery energy storage sites, although this can be difficult to achieve.	In the DFES modelling, decommissioning fossil fuel sites, including diesel generation in the near term and fossil gas generation in the longer term, convert to battery storage or hydrogen-fuelled generation to various extents based on the overarching scenario framework.
Stakeholders asked whether the removal of previous constraints at transmission level has resulted in more battery projects connecting.	The analysis of almost 2,000 pipeline projects has shown an increase in proposed projects in previously constrained areas, such as South Wales. This pipeline analysis guides the uptake of large-scale technologies in the near term.

Figure 10 East Midlands licence area webinar responses regarding colocated energy storage



Stakeholder feedback

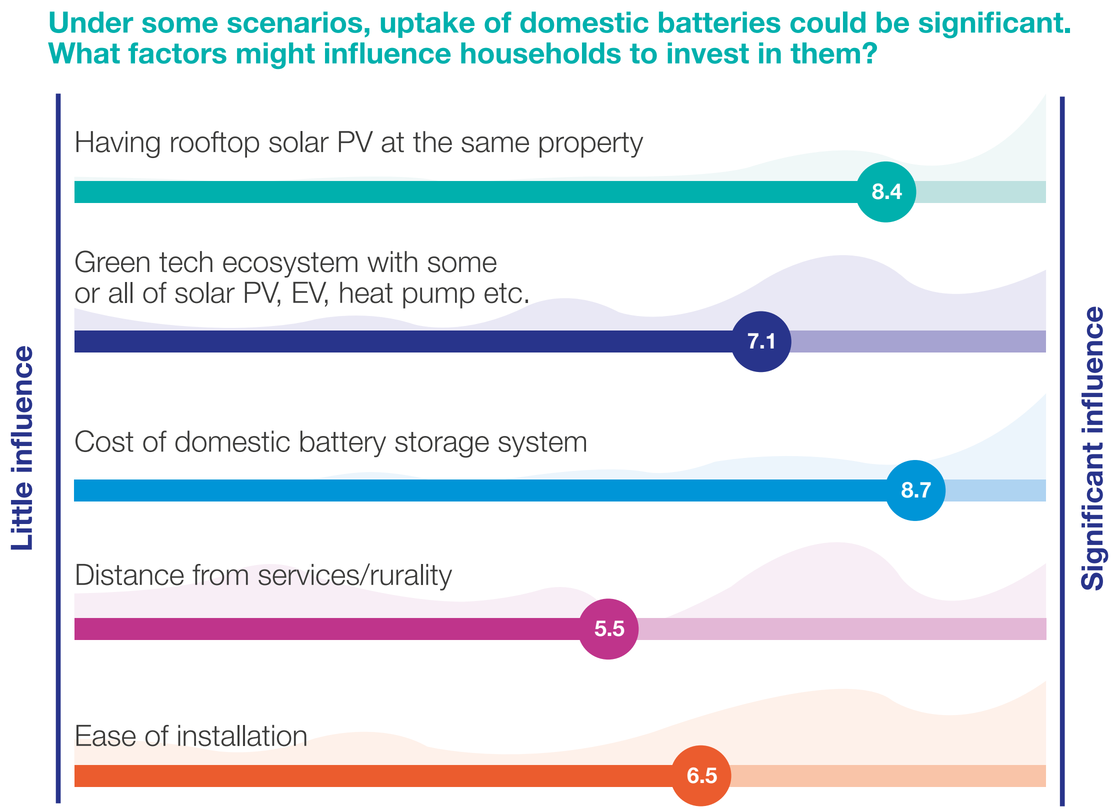
Figure 11 South Wales licence area webinar responses regarding the location of future standalone electricity storage



Domestic storage

Your comments to us	Our response
Stakeholders across multiple licence areas highlighted that the uptake of domestic batteries were affected most by factors such as already having domestic rooftop solar and the cost of the battery system itself. The presence of other low carbon technologies, such as a heat pump or EV, was also seen as fairly influential, but not to the same extent. Rurality and ease of installation were not seen as such important factors.	We will directly link the uptake of domestic battery storage systems with the uptake of rooftop solar PV in our modelling. In the near-term, we will also consider weighting the uptake of domestic battery systems towards higher income/affluent areas, due to the current high cost of home battery systems. However, as income is a factor in the uptake of rooftop solar PV as well, we will take care to avoid double counting this as a factor.
Stakeholders felt that all new developments should consider battery storage.	The domestic battery modelling primarily pairs domestic batteries with rooftop solar uptake. New housing developments are a key driver for our rooftop PV uptake, and subsequently will also be a key driver for domestic storage uptake.
Dynamic pricing is needed to encourage storage.	In scenarios that feature high levels of consumer engagement, domestic battery storage uptake will be higher, due to the prevalence of dynamic pricing and domestic flexibility services in these scenarios.
Stakeholders are seeing increased interest in domestic storage alongside solar panel installation.	The DFES modelling ensures strong linkages between domestic battery and domestic solar PV uptake.
Stakeholders thought that the Smart Export Guarantee would not encourage export from domestic battery storage.	In our analysis, domestic battery uptake will be driven in part by the potential to increase self-consumption of rooftop solar PV, reflecting the current export tariffs highlighted by stakeholders.
Stakeholders noted that payback length would be a key factor for domestic battery storage uptake.	In the long term, domestic battery uptake is higher in scenarios where dynamic domestic tariffs become popular, as payback periods would be expected to decrease. In terms of distribution, the presence of rooftop solar is a key factor for domestic battery storage uptake, due to reducing payback periods compared to using grid electricity. In addition to this, income is also used as a factor in the near term, reflecting the proportionally high costs of domestic battery systems. The weighting of this as a factor is reduced over time, as it is assumed that the costs of home battery systems will reduce.
Stakeholders noted that scenarios with high Vehicle-to-Grid (V2G) uptake may result in lower domestic battery uptake, due to both technologies fulfilling a similar role for the homeowner.	The analysis will consider the likelihood of a household hosting a V2G charger in the spatial distribution of domestic battery storage capacity.
Stakeholders noted that many domestic solar PV installers now offer domestic battery installation, resulting in increasing demand for domestic batteries.	Domestic battery uptake is strongly driven by domestic rooftop solar PV uptake in all scenarios.

Figure 12 West Midlands licence area webinar responses regarding the location of future domestic batteries



Stakeholder feedback

Hydrogen electrolysis

Your comments to us	Our response
Across all licence areas, stakeholders felt that major strategic roads like motorways and major A roads would be a relatively important factor for the deployment of hydrogen electrolysis. Contrarily, stakeholders felt that electrolysis was least likely to be located around airports, ports and densely populated areas with high energy demand. **However, across all licence areas, stakeholders felt that the most important factors for electrolyser siting were more specific to the geography and energy system within each licence area. This included the industrial clusters in South Wales and the West Midlands, offshore wind landing points in the East Midlands and South West, and potential large-scale hydrogen storage geology in the South West and West Midlands.**	We will directly use these factors to model the spatial distribution of hydrogen electrolysis under each scenario. Specific consideration will be given to the likelihood of larger-scale electrolysers in/around industrial clusters, near offshore wind and other large-scale renewables and near hydrogen storage connecting directly to the transmission network.
Stakeholders had a range of views on the colocation of electrolysis, electricity storage and renewable generation. Some thought that some sites could potentially include both electrolysis and electricity storage, while others felt it would more likely be one or the other.	Our hydrogen electrolysis and electricity storage models both consider colocation with future renewable generation capacity as a driver to deployment. Without a clear consensus, we currently do not prioritise the colocation of electrolysis over electricity storage or vice versa. Instead, our modelling will consider them independently with regards to colocation and the assumptions within each scenario being modelled.
Stakeholders noted that electrolysis is likely to be located at industrial hubs, and, therefore, would not require a wider network to distribute the hydrogen.	The location of industrial hubs will be a key distribution factor for hydrogen electrolysis in all scenarios.
Stakeholders asked how and where hydrogen is assumed to be generated.	Using stakeholder engagement, knowledge of trials and direct engagement with industry, the DFES analysis uses a variety of locational factors such as: • major transport routes • potential future hydrogen storage facilities • areas of potential hydrogen demand • colocation with renewable generation. These factors are used to assess where hydrogen is most likely to be produced and consumed across NGED's licence areas and in turn directly influences the modelled deployment of hydrogen electrolysis capacity.
Stakeholders noted that hydrogen could be used for heavy transport, as well as a storage vector for renewable generation.	The location of hydrogen electrolysis capacity modelled under each scenario will be influenced by HGV fuelling requirements and the location of renewable generation capacity.
Stakeholders noted that hydrogen produced via electrolysis could be used as a long-term energy storage vector.	The scenario projections and spatial distribution modelling for both hydrogen electrolysis (power-to-gas) and hydrogen-fuelled generation (gas-to-power) are considered together, to account for the potential use of hydrogen as energy storage.
Stakeholders noted the route of HS2 through the NGED area as a potential factor for the location of hydrogen electrolysis.	Strategic transport infrastructure directly influences the location of hydrogen production in the DFES analysis.
Stakeholders suggested that electrolysis would be colocated with renewable generation to ensure the hydrogen is truly low carbon.	Colocation with solar, wind and, to some extent, other renewable generation technologies is a fundamental spatial distribution factor for the future uptake of hydrogen electrolysis capacity.

Figure 13 South West licence area webinar responses regarding the location of future hydrogen electrolyser capacity

Where do you expect most hydrogen electrolyser capacity to be located?

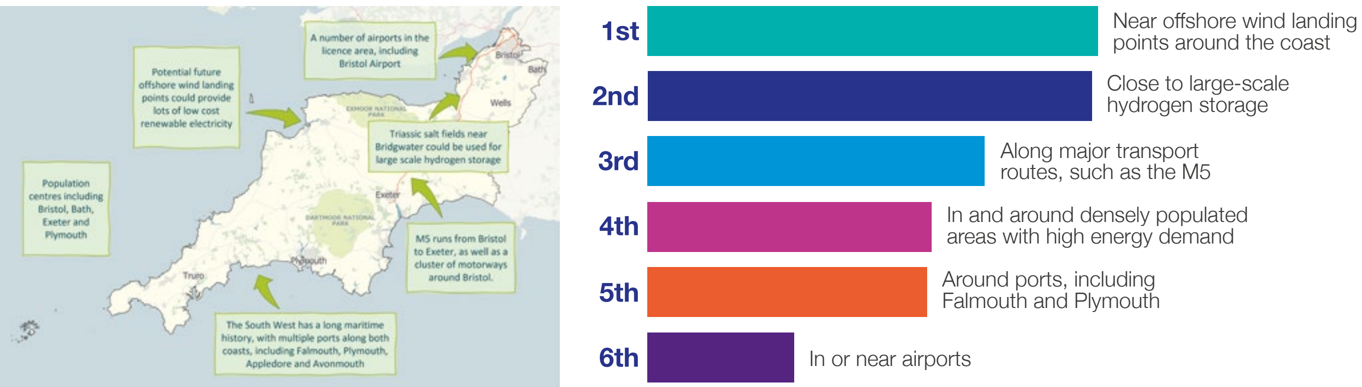
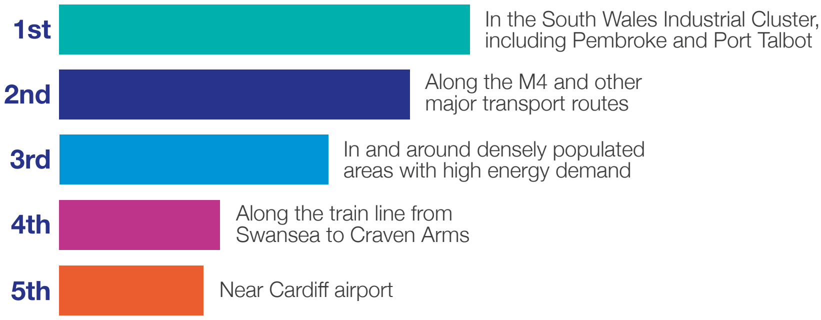


Figure 14 South Wales licence area webinar responses regarding the location of future hydrogen electrolyser capacity

Where do you expect most hydrogen electrolyser capacity to be located?



Heat pumps

Your comments to us	Our response
Across all licence areas, stakeholders felt that off-gas, fossil fuel heated housing and new build housing would be most likely to see heat pump uptake in the near term. Households in fuel poverty and socially rented houses were identified by stakeholders as a key secondary factor in near-term heat pump uptake. On-gas houses were consistently seen as unlikely to be targeted for heat pump installations in the near term.	We will directly use these results in the spatial distribution of heat pumps in the near term, focusing on off-gas fossil fuel heated properties and new builds. We recognise the potential for alternative heating low carbon technologies in on-gas areas under some scenarios.
Stakeholders in the East Midlands felt that, for on-gas households switching to a heat pump, the most influential factor would be an eventual ban on the sale of gas boilers for existing homes. The presence of thermal storage was seen as the second most influential factor. The ability to connect to a heat network or a shared ambient ground-loop were not seen as significant factors for heat pump uptake in currently on-gas homes.	The results suggest that switching from a gas boiler to a heat pump would not be strongly impacted by local or regional attributes, but instead a result of wider policies such as a gas boiler ban. We will, therefore, model on-gas houses as more likely to transition towards heat pumps with thermal storage than to ground source heat pumps (GSHPs) or heat networks.
Stakeholders in the South West felt that air source heat pumps (ASHPs) with or without thermal storage, or GSHPs, would be the most suitable electrified heating solutions for rural, off-gas homes. Hybrid heat pumps with oil or LPG boiler backup, and next-generation storage heaters, were seen as less likely options.	We will directly use the results provided to inform the spatial distribution of heat pumps in off-gas homes.
Stakeholders suggested that the East Midlands hosted lots of older homes that may struggle to install low carbon heating.	This will be considered in the heat modelling, including our analysis of EPC records to understand the age and level of energy efficiency of the existing housing stock.
Thermal storage as part of the flexibility mix must not be ignored.	Our modelling includes thermal storage paired with heat pumps and resistive electric heating. This includes smart, phase-change thermal storage technology alongside more conventional hot water tanks and storage heaters.
Knowing whether hydrogen will be used in the gas grid will be key.	The scenario framework specifically includes a range of scenario outcomes for hydrogen for domestic heating, from none at all to a full conversion of the existing gas network to hydrogen. The NGED DFES heat pump modelling reflects this envelope of future heating technology adoption.
The affordability of EVs and heat pumps is a key question in the current economic climate.	Disposable income and other measures of affluence are considered for all forms of domestic technology deployment, including EVs, heat pumps, rooftop solar, domestic batteries and air conditioning. This is mainly weighted more to inform the near-term projections, as low carbon technologies become more available, affordable and ubiquitously adopted in the longer term.
The electrification of heating will be gradual and fairly predictable.	We model electrification of heating based on replacement rates of heating technologies, which are around 5-7% per year. As a result, the decarbonisation of heating does indeed occur at a gradual and predictable rate in all scenarios.

Stakeholder feedback

Heat pumps

Your comments to us	Our response
The capital cost of a heat pump is far higher than that of a gas boiler.	Under the scenarios where heating is mostly electrified, on-gas homes are the slowest set of properties to convert to a heat pump, reflecting current heating technology costs.
Electrification of heat will not be cheaper than gas heating unless the cost of gas compared to electricity changes, such as through carbon taxation.	The three net zero scenarios feature increasing carbon prices, which encourage the shift to low carbon heat sources in the form of electrification, hydrogen and district heating.
The Access and Forward-Looking Charges Significant Code Review may delay heat pump uptake until after implementation in April 2023.	Our DFES modelling specifically includes a slight reduction in heat pump (and other demand technology) connections immediately prior to April 2023, followed by a short uptick immediately after April 2023, as an anticipated result of the SCR implementation.
Stakeholders felt that the capital cost of domestic heat pumps will be restrictive.	The overarching scenario framework reflects two scenarios where heat pump uptake is limited and two where electrified heat (dominated by heat pump adoption) becomes commonplace. This reflects the uncertainty around heat pump uptake highlighted by stakeholders. We have acknowledged the current high installation costs by partially weighting near-term adoption to areas with higher household income. This factor is reduced over time, as the scenarios assume technology costs reduce, resulting in a much wider adoption in the longer term.
Stakeholders noted that the retrofit of energy efficiency measures will be key if on-gas homes are to switch to a heat pump in the future.	The roll-out of energy efficiency is considered as a factor for the uptake of heat pumps under each scenario with higher levels of electrified heating. This is based on our analysis of EPC data.
Stakeholders stated that the retrofit of energy efficiency measures should occur alongside or ahead of heat pump installation.	
Stakeholders noted that rural, off-gas houses may require significant retrofit for heat pump installation.	
Stakeholders noted that heat pumps could be more expensive than fossil gas boilers, and, therefore, would not alleviate fuel poverty in on-gas homes. However, it was noted that this was based on the current balance of levies and taxes on mains gas vs grid electricity.	In the near term, the adoption of heat pumps in on-gas homes is modelled to be low, and not driven or linked to fuel poverty alleviation schemes. In the scenarios where electrification of heating is widened in the longer-term, assumptions around the accessibility and affordability of heat pumps are included, enabling heat pumps to become a more ubiquitous heating technology in the home.
Stakeholders felt the Boiler Upgrade Scheme is not substantial enough to encourage major heat pump uptake.	This is a key factor in the overall scenario framework, reflecting the uncertainty of heat pump uptake in the near term and the wider envelope of heat pump outcomes across the scenarios in the longer term.
Stakeholders noted that space requirement and higher capital costs were the key differences between GSHP and ASHP installation.	These factors will be considered in the distribution of heat pump technology variants, with standalone GSHPs distributed more towards larger homes and higher-income households in the near term. However, GSHPs on a shared ground-loop are considered separately in the analysis, requiring less space and with a lower installation cost per household.

Figure 15 East Midlands licence area webinar responses regarding the types of homes likely to be targeted for heat pump deployment in the near term

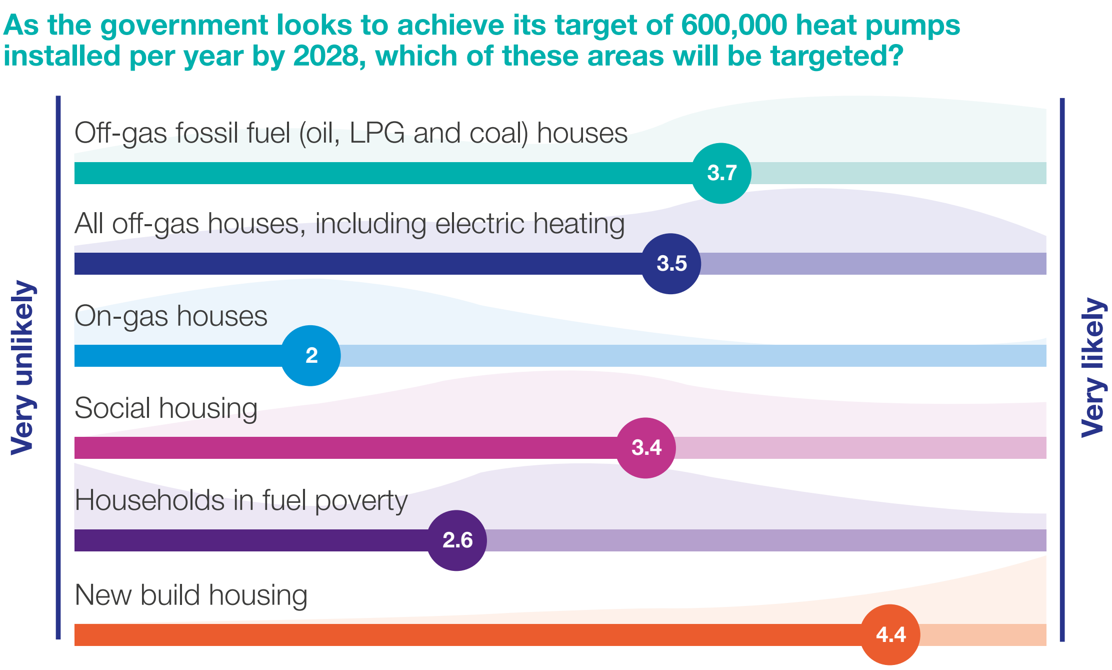


Figure 16 South West licence area webinar responses regarding the type of heat pumps suitable for rural, off-gas homes

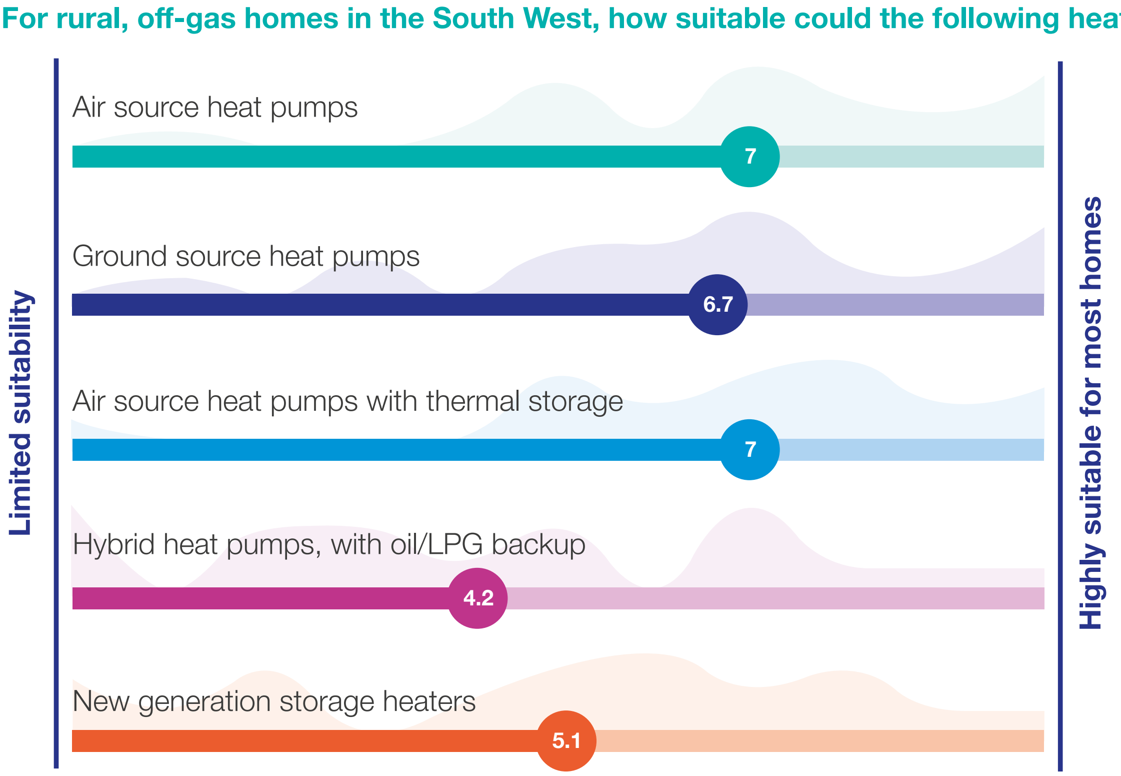
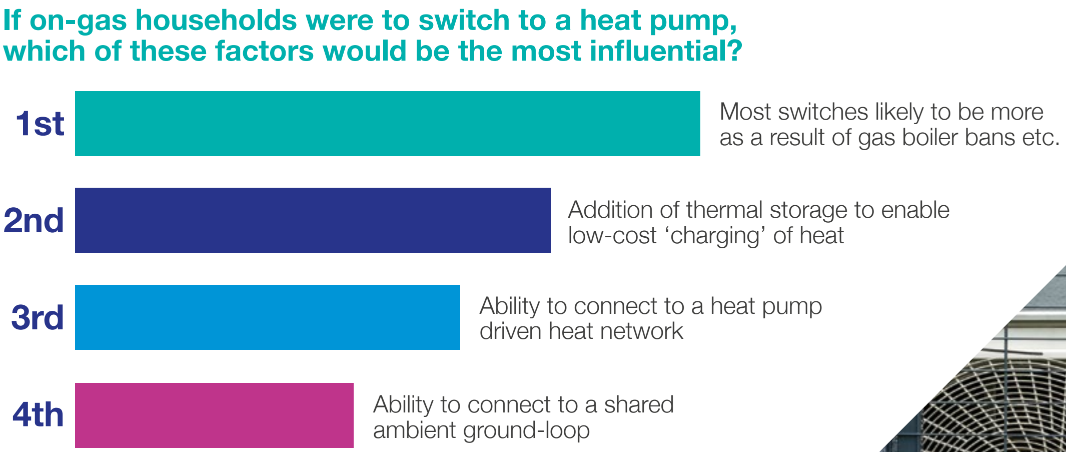
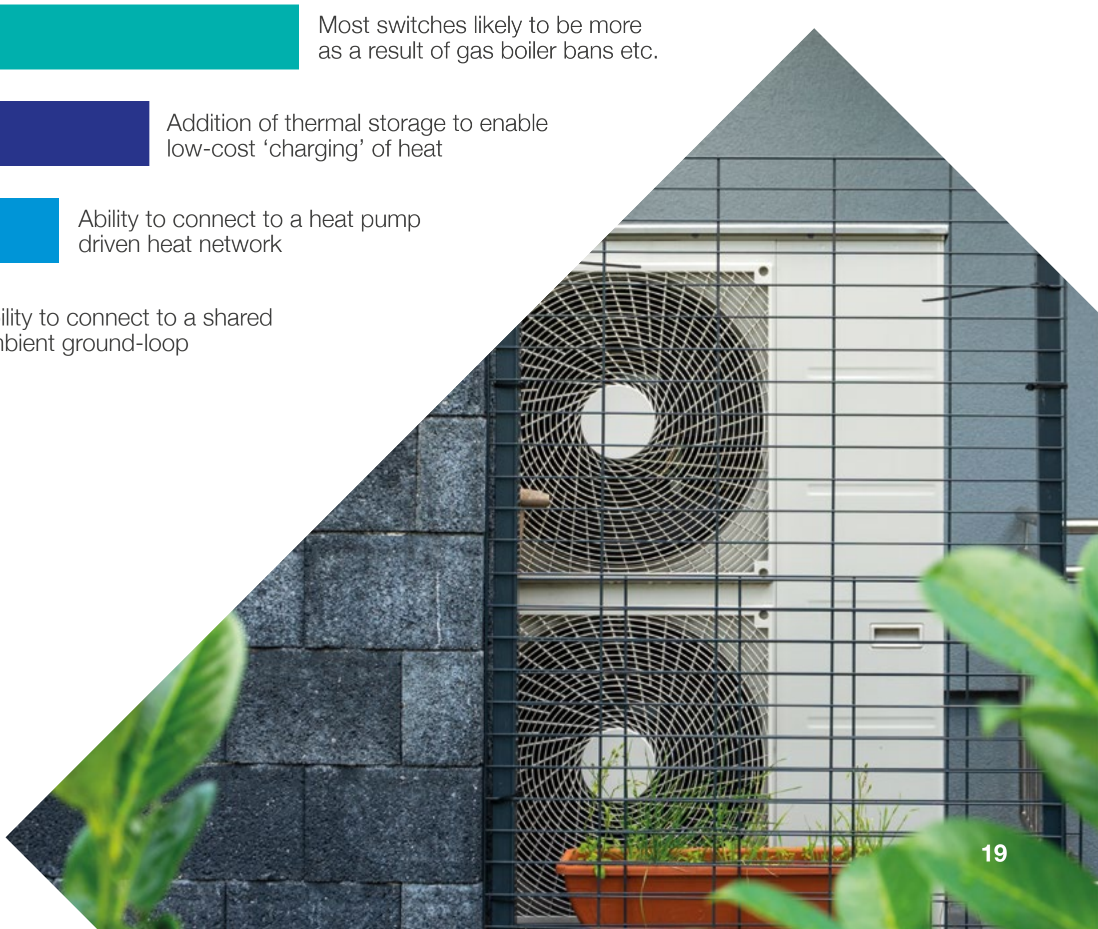


Figure 17 East Midlands licence area webinar responses regarding the factors influencing on-gas households to switch to a heat pump in the future



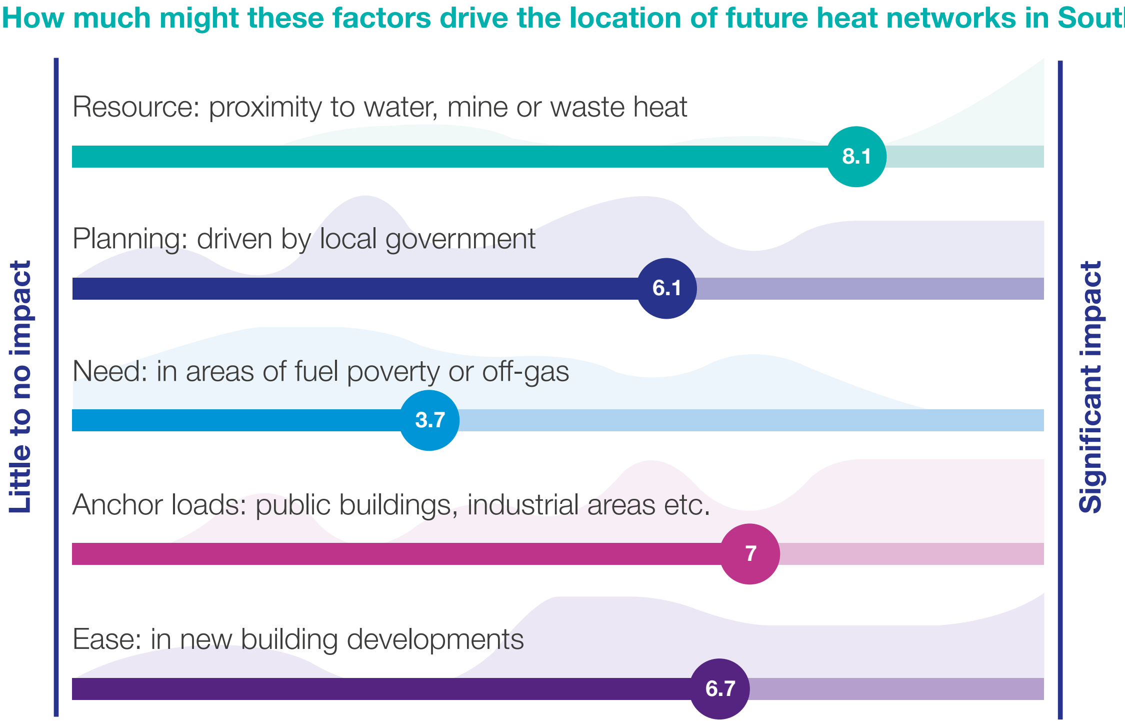


Stakeholder feedback

Heat networks

Your comments to us	Our response
Stakeholders in South Wales felt that the proximity to a specific heat resource, such as water, coal mine heat or industrial waste heat would be the most significant factor in the location of future heat networks. **Other considerations such as local authority heat network plans, the presence of anchor loads such as public buildings and new housing developments were also seen as key secondary factors.** **High fuel poverty or off-gas areas were not seen as significant drivers for the location of heat networks.**	We will directly use these results in the spatial distribution of heat pump-driven heat networks, focussing primarily on locations of heat resources as described.
Stakeholders highlighted existing CHP heat networks would need to change, due to being largely fired by fossil fuels.	We will consider the location of existing CHP heat networks for the distribution of future heat-pump-driven heat networks. As these are high-temperature heat networks, we also consider that these would more commonly switch to biomass or hydrogen CHP.
Stakeholders noted that heat networks could be a low regret technology for heat decarbonisation.	Our heat modelling includes heat-pump-driven heat networks, particularly in heat-dense areas that could support a heat network.
Large-scale heat networks could be difficult to deliver.	The scenarios encompass a range of outcomes for heat networks, and other forms of decarbonised heat, to account for the uncertainty and various pathways around heat decarbonisation as a whole.
Waste heat from industry should be facilitated.	Our heat network modelling includes waste heat sources, which could be upgraded by a heat pump to supply a district heat network.
Stakeholders asked whether waste heat sources are considered in the DFES.	Waste heat sources are included in the district heat resource assessment for the domestic heat technology modelling in the DFES.

Figure 18 South Wales licence area webinar responses regarding the location of future heat networks



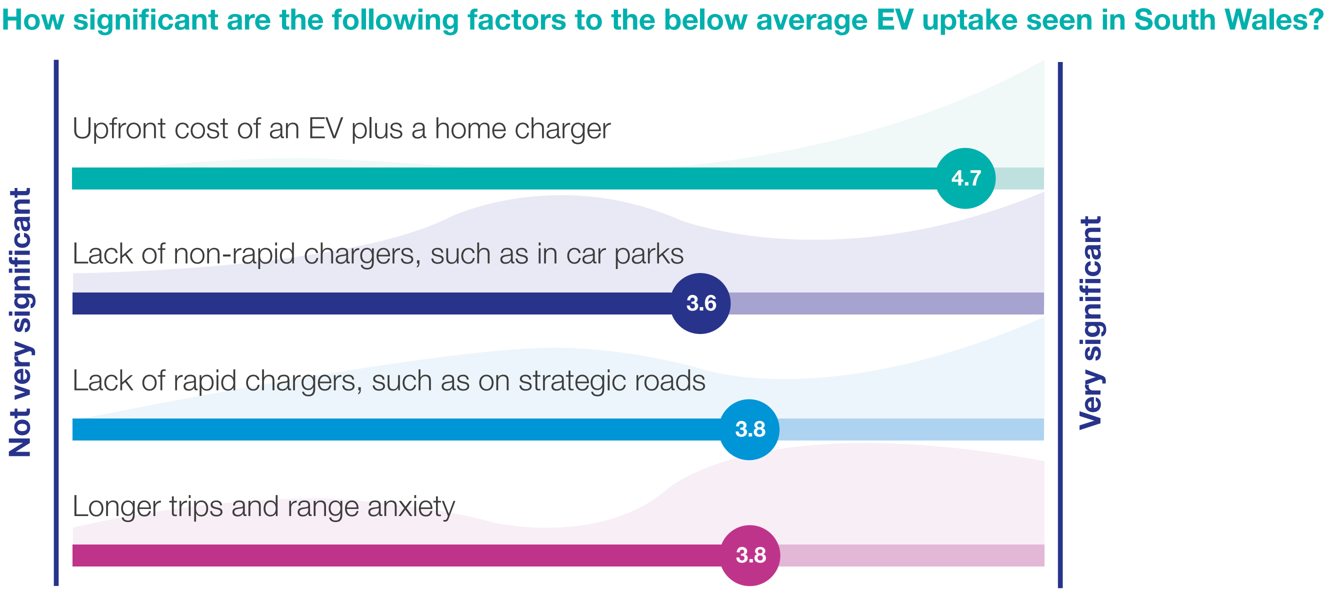
Air conditioning

Your comments to us	Our response
Stakeholders noted that cooling could become a bigger topic due to recent heat waves.	The DFES includes domestic air conditioning as a dedicated technology analysis, which sees a substantial increase in three of the four scenarios as a result of the potential appetite for active cooling in homes.

Electric vehicles

Your comments to us	Our response
Stakeholders in South Wales felt that the upfront cost of an EV and home charger was the main reason for the low uptake of EVs in South Wales compared to the rest of the UK. Lack of charging infrastructure and longer trips in rural areas were also seen as significant factors.	In the near term, we will use income as a key metric in the uptake of EVs in South Wales.
Stakeholders suggested that hydrogen-fuelled cars could replace electric cars.	This is not something we consider within DFES analysis out to 2050, due to the relative maturity of the EV and hydrogen vehicle markets and infrastructure. The wider FES 2022 framework and projections also have little-to-no hydrogen-fuelled cars projected nationally out to 2050.
Stakeholders noted that changing lifestyles, with more home working, could impact transport.	Our transport modelling encompasses a range of scenario assumptions, including falling vehicle mileage, changing levels of private car ownership and the use of autonomous vehicles in the much longer term.
Logistics companies could transition to hydrogen using imported hydrogen.	Our transport model considers the uptake of larger-scale hydrogen vehicles as well as electrified vehicles, although this is not an output of DFES. The uptake of hydrogen vehicles is not directly linked to hydrogen production in the region under the broader scenario framework.
Stakeholders felt that electrification of HGVs could be difficult compared to using biodiesel or hydrogen.	The uncertainty around the decarbonisation of heavy transport is reflected in the broad range of scenario outcomes for these vehicle types, this includes scenarios with low levels of HGV electrification.
Car clubs and public transport could replace private cars.	In all of the net zero scenarios, EV ownership peaks in the early 2040s, before decreasing as car sharing, public transport and active transport reduce levels of private car ownership.
EV uptake is currently heavily influenced by income levels.	We will use income as one of the factors guiding the local uptake of EVs in the near term. In the longer term, as EVs become more prevalent, the impact of income decreases notably as support, accessibility and costs all improve for a wider range of consumers.
Lack of off-street parking will be a factor in EV uptake.	Off-street parking provision is a key factor in the near term for domestic EV uptake in the DFES. In the longer term, solutions such as rapid charging hubs and on-street charging reduce the weighting of this factor.
Stakeholders thought that the switch to electrified transport could be rapidly accelerated by high petrol and diesel prices.	This trend is reflected in the Leading the Way and Consumer Transformation scenarios specifically, which see a more significant/accelerated uptake of EVs in the near term across all licence areas.
Stakeholders asked whether multi-car household data is used in EV forecasts.	Yes, data on car ownership from the Department of Transport and Census by household is a key factor in the EV and EV charger modelling.
Stakeholders noted that hydrogen could be used for heavy transport.	The overarching scenario framework has a range of outcomes for heavy transport decarbonisation, including hydrogen, electricity and a blend of the two, reflecting the uncertainty around how these vehicles may be decarbonised. This envelope of outcomes is reflected in the DFES modelling.

Figure 19 South Wales licence area webinar responses regarding the current low level of EV uptake in the licence area



Stakeholder feedback

EV chargers

Your comments to us	Our response
Stakeholders in the East Midlands felt that en-route charging would be limited, with the majority of charging for long trips taking place at home beforehand and at the end destination. There was no consensus as to whether en-route chargers would be located at a smaller number of large-scale charging hubs on major roads, similar to service stations, or across a greater number of small-scale charging stations, similar to petrol stations.	We will use these inputs to guide the proportions of charging delivered at each charger type in our EV charging model. The distribution of en-route chargers will be guided by a combination of existing service stations and existing petrol stations, likely varying across the four scenarios.
Stakeholders in the West Midlands felt that rapid en-route charging hubs, and charging at the end of journeys at supermarkets, workplaces and public car parks, would be the most popular charging solutions for on-street EVs. **On-street chargers outside of homes, and neighbourhood charging hubs, were still seen positively by stakeholders but were less popular.**	We will use these inputs to guide our analysis of on-street parked vehicles. Specifically, we will vary the proportions of EV charger capacity for each EV charger type in our modelling, reflecting the views shared.
Stakeholders in the South West felt that seasonal visitors were most likely to charge their EVs at en-route chargers on major roads and at their accommodation. However, rapid charging hubs around tourist areas, and top-up charging at car parks and destinations, were also seen as viable solutions.	We will use these inputs to guide the proportions of charging modelled for each charger type in our EV charging model, including specifically for excess electricity demand not supplied to vehicles registered within the licence area.
HGV charging is an important area to consider.	Our modelling of electric HGV uptake directly feeds into the EV charging modelling. Currently, the analysis features HGV charging at service stations and HGV depots. We will also consider whether HGV charging may more likely be connected directly to the transmission network in areas where it is available, under some scenarios.
Some stakeholders felt that ultrarapid charging would be expensive and used mainly by high-mileage users rather than the majority of EV owners.	The EV charging modelling features a number of charging types, including domestic chargers, on-street chargers, charging hubs, workplace charging and car park charging. These chargers are likely to be slow or fast chargers, rather than rapid or ultrarapid chargers. Rapid and ultrarapid chargers on the distribution network are expected to be located along major roads, and supplying a minority of charging events for most EV owners.
Stakeholders asked whether seasonal traffic in high tourism areas is considered in the DFES EV modelling.	Yes, the EV modelling includes the use of road mileage data to account for seasonal visitors and demand, rather than just vehicles registered in the region.
Stakeholders noted that the charging baseline includes chargers that may not always be available, such as at workplaces and destinations.	Access restriction for EV chargers will be considered in the utilisation rates used in the EV charger modelling when modelling future EV charger capacity.
Stakeholders felt that rapid charging would be mostly on strategic roads, whilst in urban areas and destinations slow and fast charging would be sufficient.	The current distribution of rapid 'en-route' chargers is weighted primarily towards major roads, using existing locations of service stations and petrol stations.

Figure 20 East Midlands licence area webinar responses regarding en-route charging for EVs

What is the future of en-route charging for EVs?

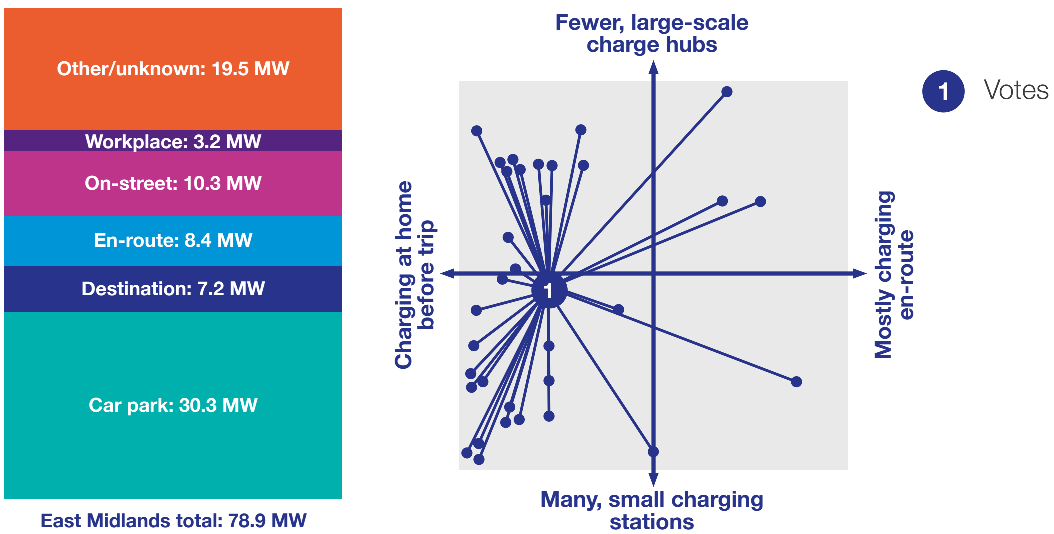


Figure 21 West Midlands licence area webinar responses regarding on-street EV charging solutions

How popular might these solutions be for charging of on-street parked EVs?

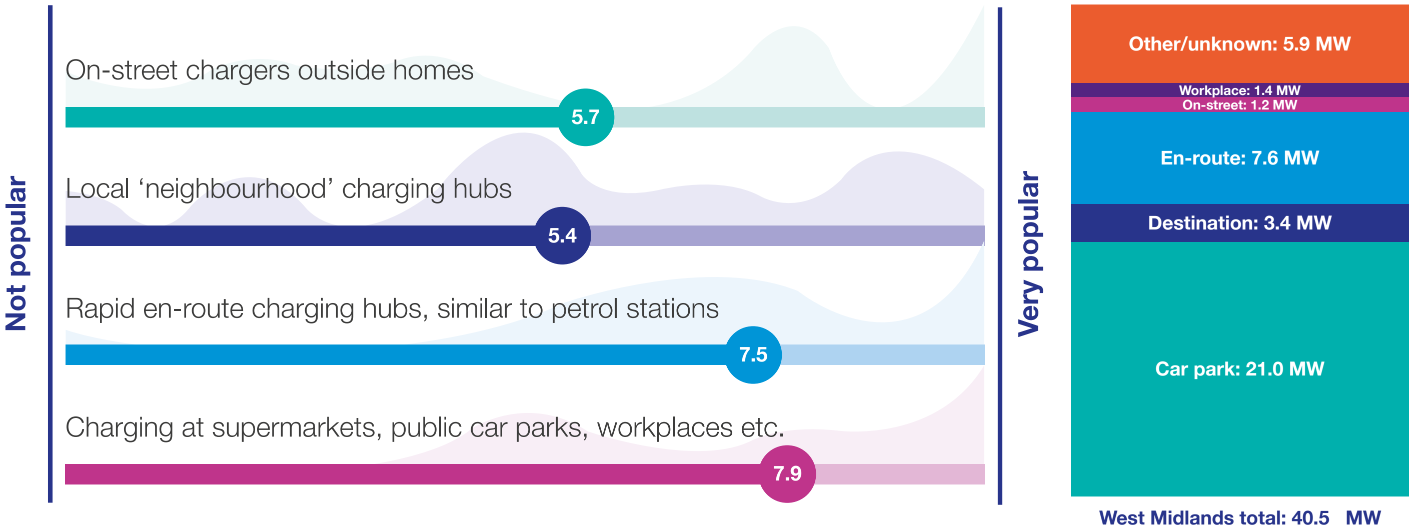
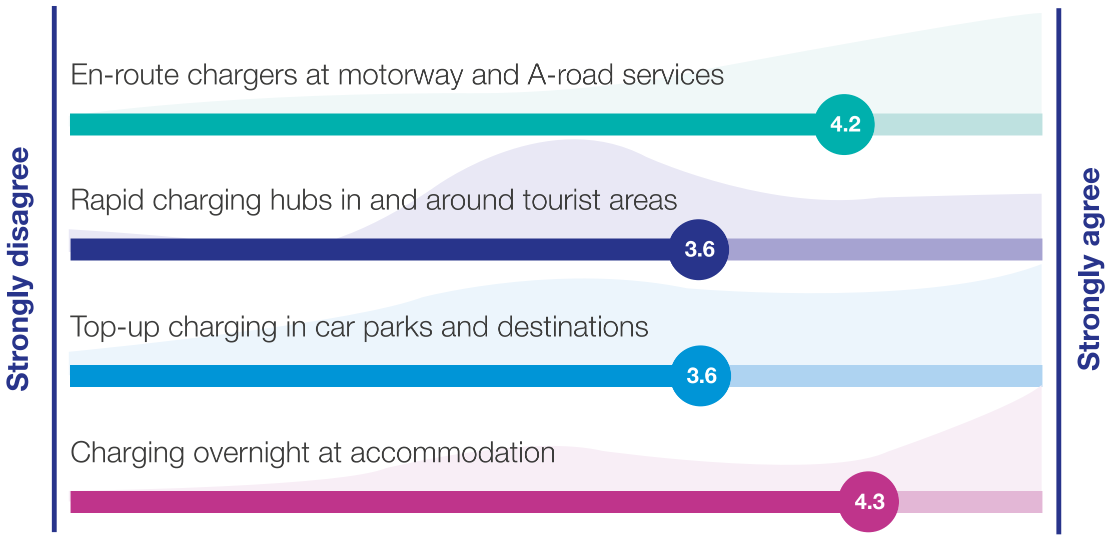


Figure 22 South West licence area webinar responses regarding EV charging for seasonal visitors

Where might seasonal visitors to the South West charge?



Stakeholder feedback

Local authorities

Your comments to us	Our response
Stakeholders noted that the East Midlands contained a lot of new developments, including Sustainable Urban Expansions.	Our new housing and new non-domestic development modelling is based on engagement with local authorities, including allocated land for future developments such as Sustainable Urban Developments.
Stakeholders asked whether LAEPs can support DFES analysis.	We engage with every local authority within NGED's four licence areas to account for existing energy plans, decarbonisation strategies and new building developments. As LAEPs are developed and published, they will be assessed to be able to directly feed into the DFES spatial modelling process.
Stakeholders asked whether DFES analysis can support LAEPs.	The DFES data is publicly available and can be used as a direct reference and data input for LAEP analysis, as well as a parallel dataset to compare, contrast and reconcile to. As more LAEPs are published, NGED and Regen will be exploring how they can be fed into the DFES process more directly, resulting in iterative improvement across the two parallel processes and more coordinated local planning.
Stakeholders asked how regional plans are integrated into the DFES.	Our local authority engagement approach seeks to reflect local targets for specific technologies or sectors as well as overall decarbonisation or climate change targets on a per-local authority basis. Where larger regional bodies also have relevant ambitions or strategies, these are considered where possible.
Stakeholders asked how the impact of new developments on the network is accounted for.	Every LA is engaged with to understand their latest allocations and supply of domestic and non-domestic new developments. This engagement is undertaken annually to provide as accurate data as possible.
Stakeholders asked whether existing and future demographics are considered in the projections of new housing demand.	The DFES analysis utilises local authority plans combined with ONS household projections, which encompasses a number of demographic factors, to model future new housing demand.
Stakeholders noted that longer-term local targets should be reflected in the DFES.	The local authority engagement looks to reflect local targets for specific technologies or overall decarbonisation.

Energy system

Your comments to us	Our response
Stakeholders suggested that hydrogen use will be limited and specific. **Stakeholders felt it was not clear how hydrogen would be distributed in the future.**	The scenarios encompass a broad envelope of future hydrogen uses, reflecting the high level of uncertainty in this area. This includes little-to-significant projections for hydrogen electrolysis, hydrogen-fuelled electricity generation, hydrogen-fuelled vehicles and hydrogen for heating.
Stakeholders felt that the DFES process does not account for grid constraints.	In the near term, grid constraints are directly reflected through the modelling of the pipeline of accepted connections to project the deployment of generation, storage and demand. Beyond the current pipeline, the DFES intentionally does not account for transmission network constraints, as one key purpose is to understand the network planning and reinforcements that may be needed in the future to mitigate constraints and unlock future network capacity to enable deployment.
Stakeholders commented that net zero targets are unrealistic due to societal and economic factors.	The scenario framework includes a scenario that does not achieve net zero by 2050, representing much slower progress towards decarbonisation targets and associated transitions to other technologies in homes and businesses.
Stakeholders asked whether devolved government targets are reflected in the DFES process.	Devolved government targets and policies are directly reflected in the DFES, yes. This specifically impacts the projections for renewable generation, bioenergy, waste incineration, heat and transport in the South Wales licence area analysis.
Stakeholders asked whether decarbonisation of heat would require a major expansion of generating capacity, such as more nuclear power.	The overarching scenario framework reflects the additional electricity demand resulting from the electrification of heat and transport through increasing capacity of low carbon generation at both distribution and transmission level. Nuclear power capacity (including small modular reactor projects) is considered to connect at the transmission network level and thus is not specifically modelled in the DFES.

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