



March 2022

Future Energy Scenarios

# Bridging the Gap to Net Zero

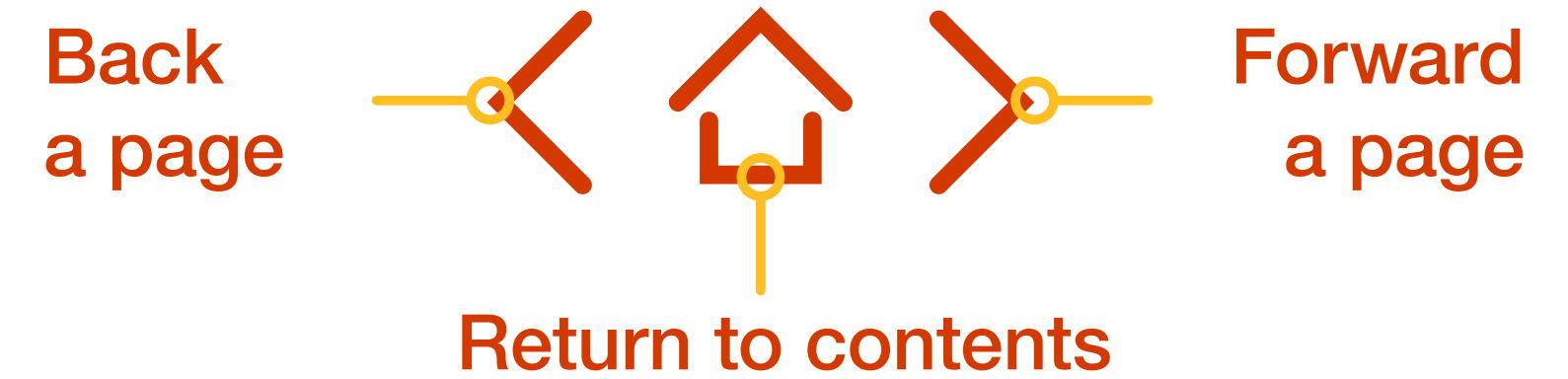
A closer look at peaks and troughs: The key milestones and actions to enable a flexible whole energy system in 2035.

# Navigation



This version of Bridging the Gap to Net Zero has been optimised for printing out or viewing on a tablet.

## Page navigation explained



From here you can navigate to any part of the publication.

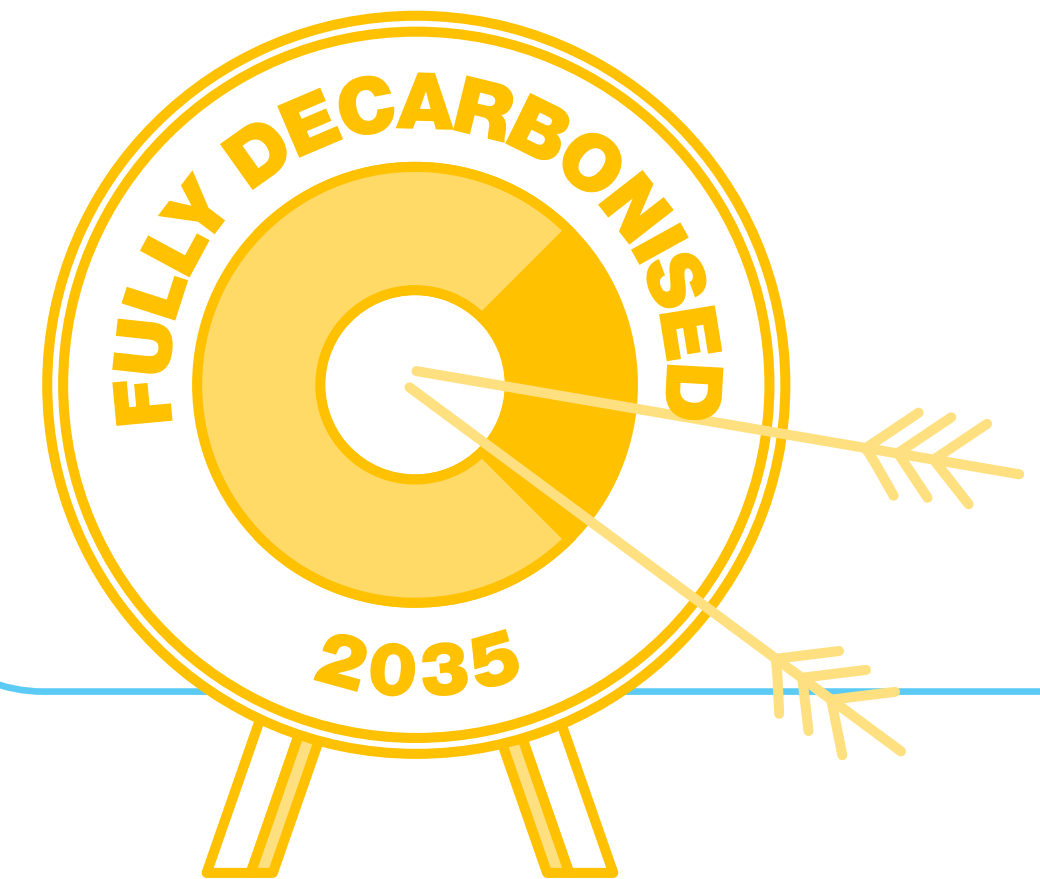
## Text Links

Click highlighted grey text to navigate to an external link. Or to jump to another section of the document.



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# Welcome

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The challenge of Net Zero has not gone away since our last report. In fact, the recent government target to achieve a fully decarbonised electricity system by 2035 has only brought the challenge into even sharper focus.

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**Fintan Slye**

Executive Director,  
Electricity System Operator (ESO)



**Laura Sandys**

Independent Chair of  
Bridging the Gap 2022

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The 2035 target has determined exactly what we need to do, so this year's Bridging the Gap to Net Zero project focuses on how and when.

While today balancing our system is primarily an electricity system problem, in the near future it can only be solved by a whole energy system approach, where the system is balanced as much by managing demand as it is by using energy storage, hydrogen and electric vehicles. We need to change our behaviour and our energy system to get there.

There are many important policies and initiatives that are being developed and our work aims to join the dots between these plans to provide a coherent overview. In doing so it's also become clear that there are some gaps, which we've also highlighted.

Central to this project is addressing the sequencing of what needs to be done and with input from key stakeholders and experts, we've devised a timeline of action. The agreed milestones are linked to the actions from existing plans and strategies, which are needed to enable us to achieve the 2035 target.



# Welcome

A key message arising from this work is the need for much greater clarity of roles and responsibilities to address some overlap and some gaps currently in the system. At the heart of this transformation there needs to be an overarching role – prioritising, driving action and delivery and monitoring progress.

There is no time to waste. Transforming a whole system takes time and we have to ensure that the change is sequenced appropriately. However, this is not just an energy systems challenge. Our changes impact and involve consumers in a manner that the sector has not experienced before. This transition must be fair, never losing sight of its responsibilities to society, the economy and consumers.

If we want to be able to have a system that is not only fully decarbonised but also reliable and has been delivered in a fair and equitable way, we need to start taking some bold decisions this year. Our stakeholders agreed. The journey to Net Zero will not be smooth, straightforward or without mistakes. However, it is a journey that we at the ESO are fully committed to and which we believe cannot be put off any longer. Working together, we can achieve Net Zero but the decade of delivery has already begun.

Thanks to Laura Sandys CBE, who has joined us for a third year of the project as independent co-chair and advisor to the project. Laura has offered invaluable insight and a fresh perspective to the work.

**Thanks also to all our stakeholders,  
who have taken part in the project.**



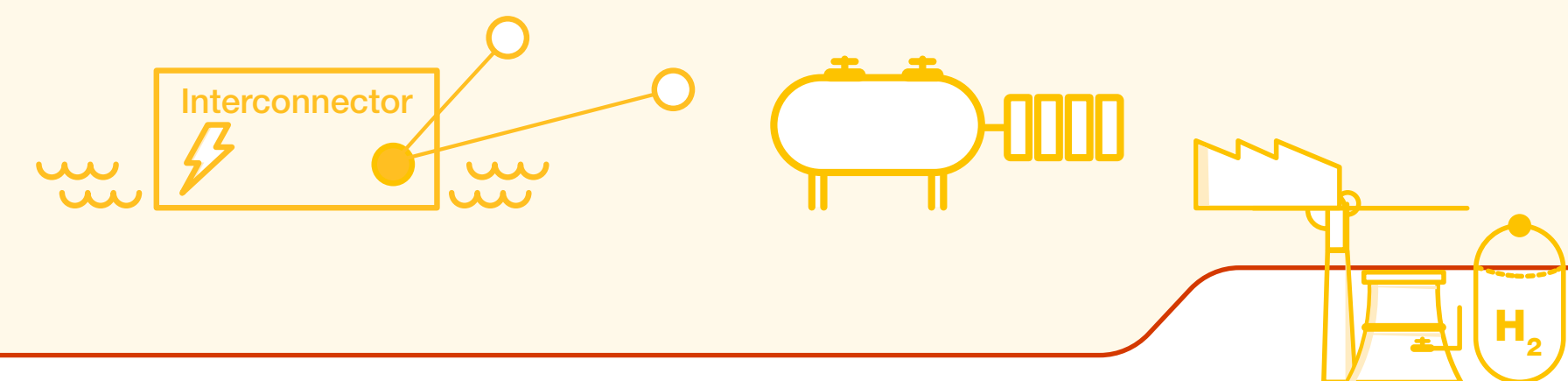
# Executive summary

Through detailed discussions with our stakeholders over the past six months, we've heard some points made again and again. So whilst we've structured the report around five different themes, these points form the basis for the **three key messages**, which span across the themes. They are the most urgent areas needing to be addressed now, to ensure that we have the flexibility we need for a fully decarbonised power system in 2035.

## 1 Flexibility needs broad and large-scale investment to start now

Strategic investment is needed in flexibility related assets, which are digitalised and interoperable. This is alongside the need for urgent market reform and investment in all networks.

- Our milestones for investment show that we need to start building the necessary infrastructure for 2035 in the next few years.
- For flexibility specifically, infrastructure encompasses everything from large assets such as hydrogen electrolyzers to domestic level technology and networks.
- Without the actions relating to market reform and comparable investment in digitalisation across the sector, we won't be able to access the flexibility we need.
- Builds on FES21 key message 4 Infrastructure and whole energy system.

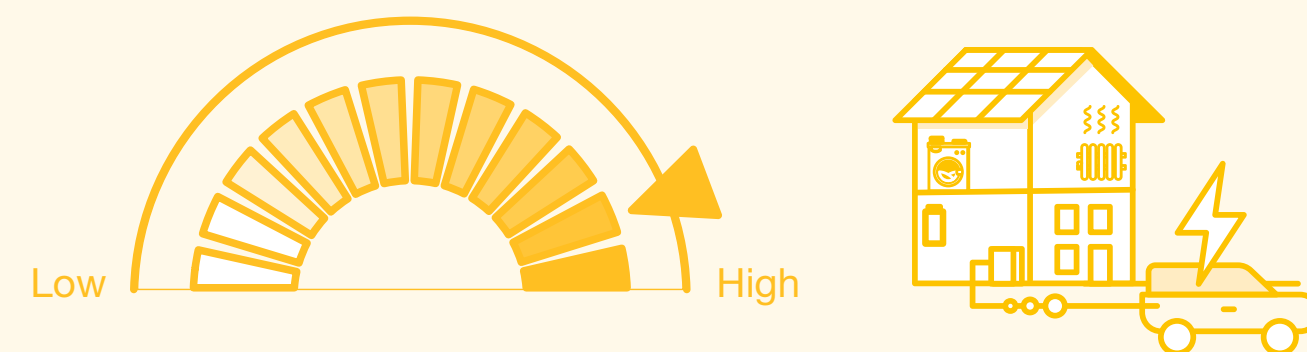


# Executive summary

## 2 Consumers are part of the solution

Unlocking end-consumer flexibility is fundamental to effectively managing a fully decarbonised energy system. Facilitating access to this flexibility is complex and needs to start now.

- In FES 21, consumers are assumed to move up to 18% of peak demand away to times of lower demand.
- Our actions address how to make this possible through changes to markets and homes.
- Recent consumer research informed our work, which highlighted some of the barriers to consumer engagement such as understanding and cost.
- Builds on FES21 key message 2 Consumer and digitalisation.



## 3 Net Zero needs cross-sector coordination

A whole system approach to coordinating the delivery of Net Zero across the country is required to prioritise and drive action.

- Our work has shown how many different plans and strategies already exist but are not always coordinated.
- Stakeholders agreed that Net Zero requires a whole system approach and clarity on related roles and responsibilities.
- The flexibility timeline brings together what needs to be done, by when and by whom.
- Builds on FES21 key message 1 Policy and delivery.



# Executive summary

The target of a fully decarbonised power system by 2035 is ambitious and one the ESO fully embraces. We know that we will need a wide range of **flexibility** assets and tools by 2035 to maintain the system's operability and that we will dispatch demand as often as supply in future.

By 2035, this challenge will not just be an electricity system challenge, it will be a whole energy system challenge met with **whole system** solutions. To break down this challenge of operating a flexible energy system, we worked with external stakeholders to develop a set of key milestones related to flexibility, which need to be met in order for the 2035 vision to become a reality.

In a separate but complementary report, we have followed a **Day in the Life** of a 2035 flexible energy system. This provides an illustration of how a decarbonised energy system looks and how it functions on a cold, still winter's day.

**Flexibility** is the ability to adjust energy supply and demand to keep them balanced.

**Whole system** refers to all the interdependent systems across the wider economy associated with provision of energy including systems such as transport, water, waste, hydrogen as well as electricity and gas.

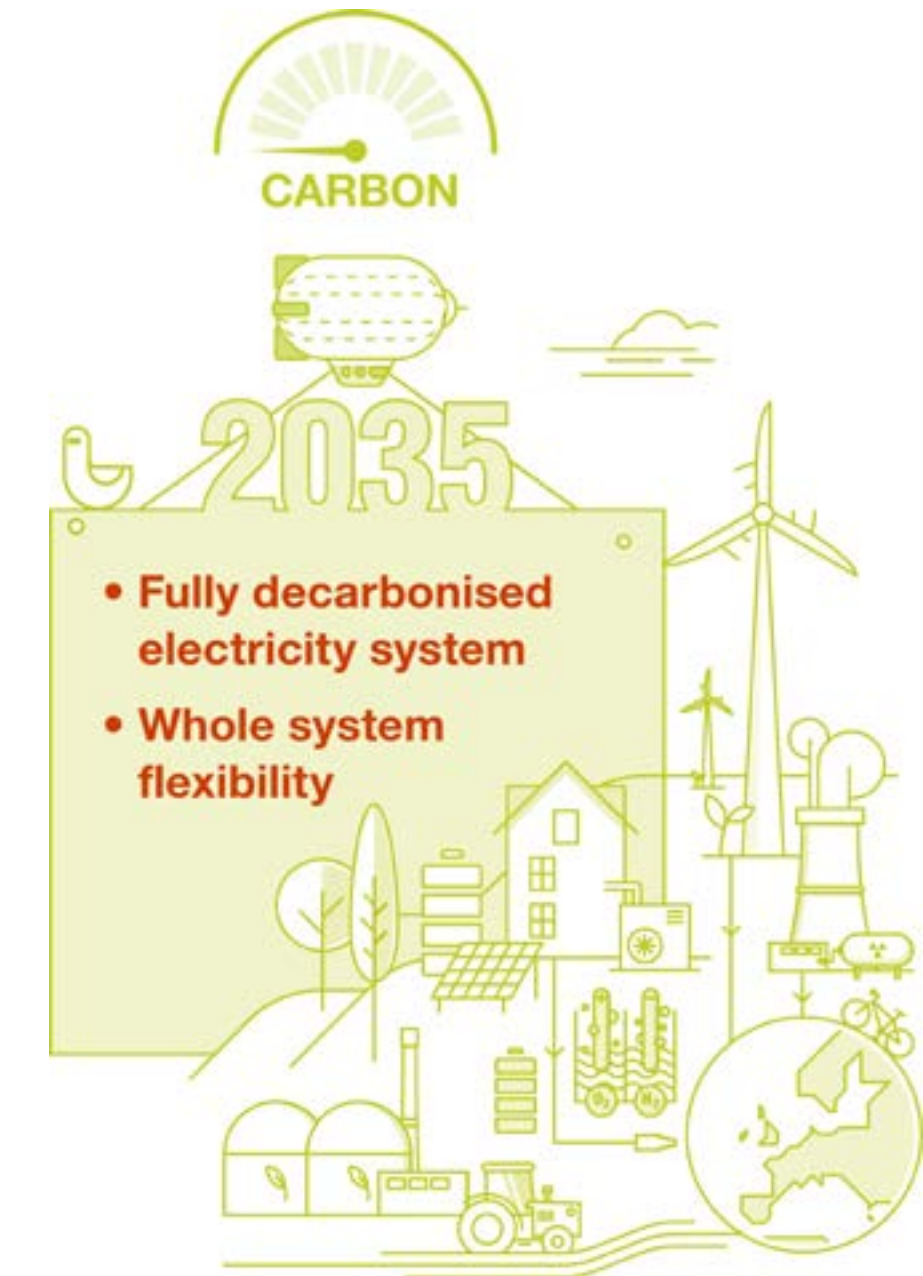




# Executive summary

We started by agreeing with stakeholders what the vision of what a 2035 flexible, whole energy system looks like, split across 5 interlinked themes, all underpinning safe and reliable **system operation**. From this vision we worked backwards and developed the milestones we need to hit by 2025 and 2030 to ensure we are on the right pathway to 2035.

The important part is how we are going to meet these milestones, what needs to be done by whom and by when. To answer this, we mapped existing industry actions to a timeline, joining the dots between commitments and targets. This showed that there is a lot of good work underway already but that there are also some gaps to be addressed.



## What a 2035 whole energy system looks like:



### Investment

Whole system flexibility infrastructure is in place to enable decarbonised system operation.



### Markets

Markets enable flexibility of all durations through the right long-term investment and short-term dispatch signals.



### Consumers

The majority of consumers are able to deliver the flexibility needed seamlessly via automated products and services.



### Digitalisation

Digitalisation is a fundamental part of the whole energy system as it enables greater market facilitation of flexibility actions.



### Roles and responsibilities

A coordinated approach to whole energy system operation is achieved through clarity of roles and responsibilities for Net Zero.

### System operation

Our number one priority is keeping the lights on, and this won't change as we accelerate the decarbonisation of the power system. Our **Operability Strategy** articulates how we will meet this challenge, by starting first with fulfilling our target to operate the system at zero carbon by 2025 and then continuing to make this possible all year long. Bridging the Gap complements the Operability Strategy by looking in more detail at the challenges associated with the need for and provision of more flexibility.





# Bridging the Gap in brief



# What is Bridging the Gap?

As the Electricity System Operator (ESO), we produce annually a set of credible Future Energy Scenarios (FES), which map what could happen between now and 2050. Our most recent FES publication features three scenarios that meet the 2050 Net Zero emissions target. These show the level and scale of change that we could see as the energy system continues to decarbonise.

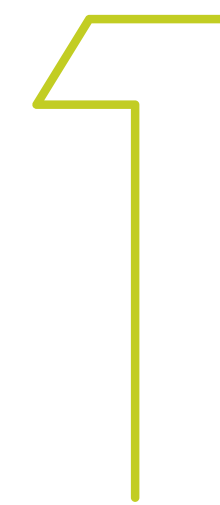
The Bridging the Gap to Net Zero project aims to explore some of the FES key messages with stakeholders, looking at areas of greatest uncertainty and ambiguity. The final output is a consensus view on the key actions - for the ESO and wider industry - on the immediate next steps that should happen to progress the UK towards its Net Zero target.

By 2035, the ESO is likely to have evolved into a Future System Operator of some sort, however as this is still to be determined, we will be talking about the ESO's role as it stands today until 2025, thereafter we refer to an FSO where appropriate.




This year, the Bridging the Gap to Net Zero project is taking a closer look at peaks and troughs in the electricity system in 2035, made especially relevant with the new target for a fully decarbonised power system by 2035. Last year we published some high-level policy recommendations relating to data and digitalisation, technology and markets and how they could help deal with peaks and troughs on the system.

## Bridging the Gap this year is split into two parts:



A Day in the Life of 2035 – how a flexible, whole energy system operates and is resilient with a high level of renewable generation.

See separate [A Day in the Life of 2035 report](#)



What needs to be done and when to deliver the flexibility needed to support a fully decarbonised energy system in 2035.

See this report and [infographic](#)

# A Day in the Life of 2035

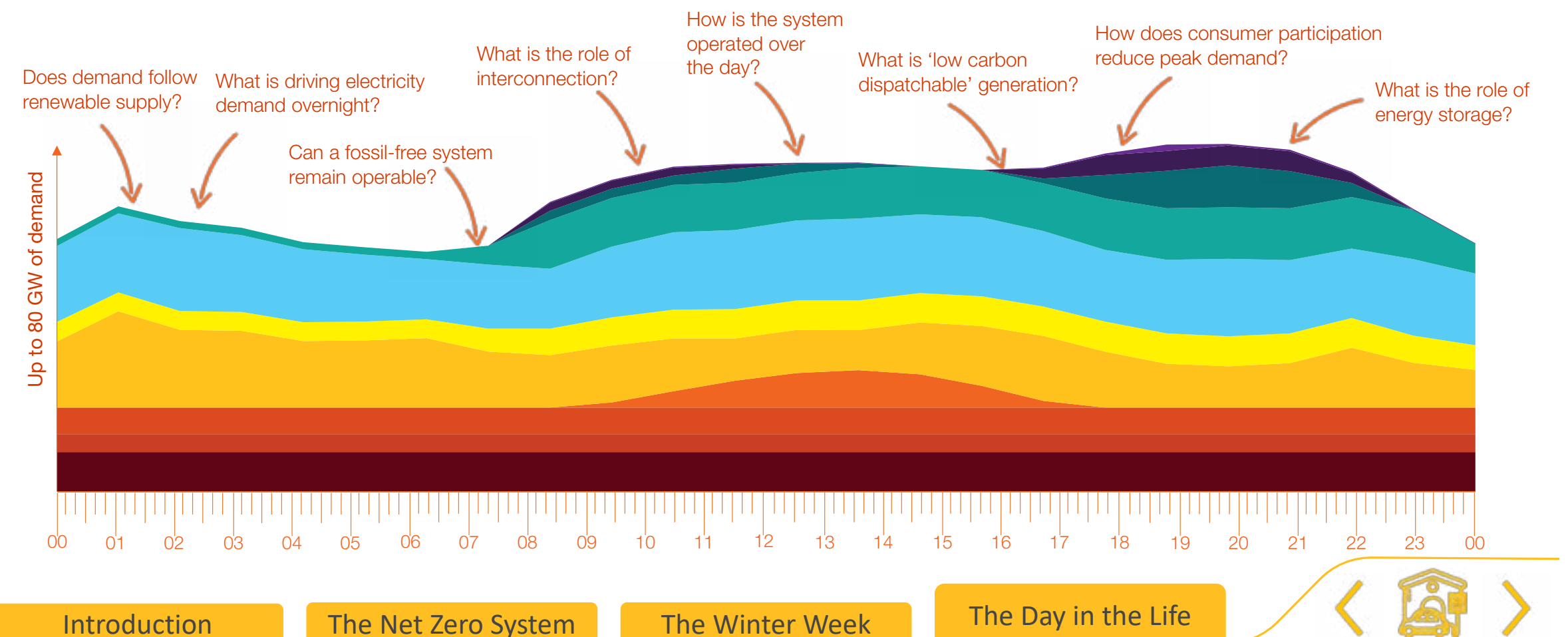
This separate but complementary project gives us a story of how the system is operated over the course of a cold, dark, still day in January 2035. It shows the variety of tools and assets required to manage weather-related generation over 24 hours and the complexity in comparison to today. To read the full report, [click here](#).

The basis for this project is a winter week when there is high demand, due to electric heating, lights and vehicles and low renewable electricity supplies. The narrative explains how the energy system can still function on a challenging day such as this and achieve the UK government's ambition of no fossil fuel electricity generation by 2035.

Key messages from this project:

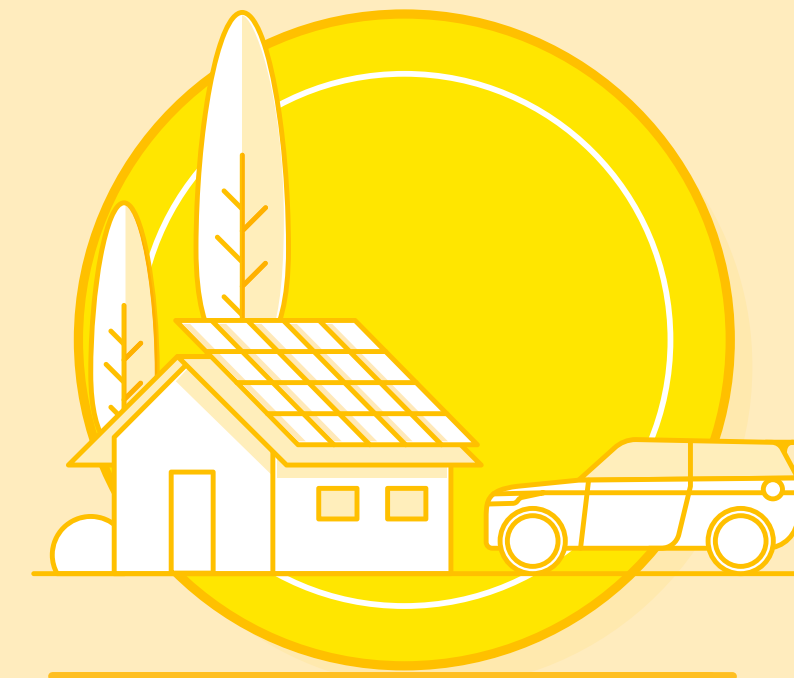
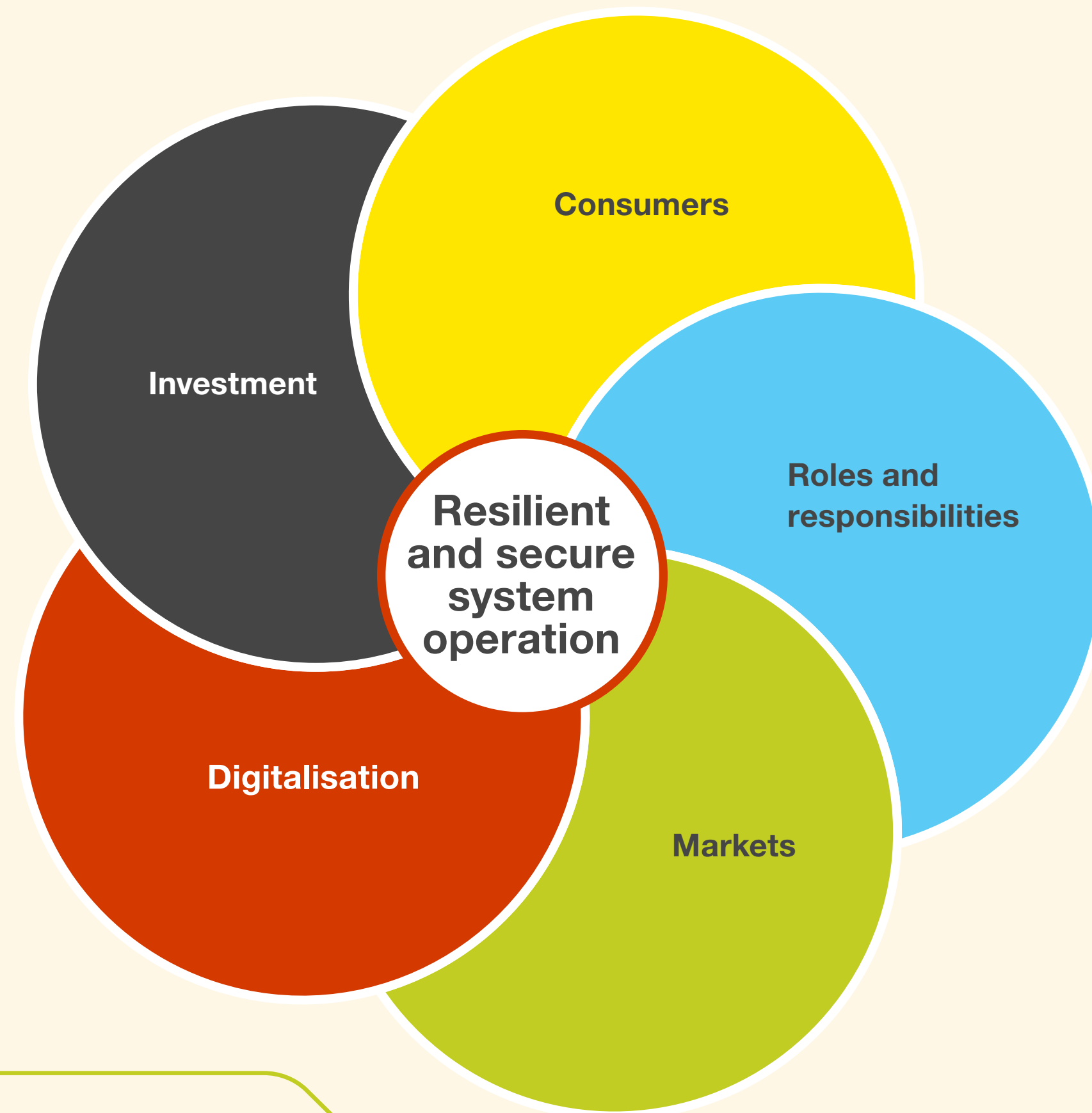
- Consumer engagement is the cornerstone of an efficient renewables-based electricity system as it can help to tailor demand to supply by providing demand-side flexibility.
- 2035 will be highly decentralised, avoiding fossil-fuelled generation by drawing on value and flexibility from across the energy system. This has been facilitated by new roles, such as aggregators, distribution system operators (DSOs), and new energy supply tariffs.
- A Net Zero electricity system by 2035 is clearly achievable, even when a particularly challenging gloomy, still winter day is investigated in hour-by-hour detail.

## The Day in the Life of 2035



# Timeline structure

In stakeholder discussions about what needs to happen between now and 2035 to enable the flexibility required for decarbonising the power system, there were five themes which became apparent. They are all linked and all vital to ensuring resilient and secure system operation. We have used them to structure our approach and the resultant flexibility timeline.



## Consumers

End-consumers are vital in providing flexibility. Without them meeting the 2035 target will be challenging. This means accessing flexibility from millions of homes and businesses by engaging and enabling consumers.

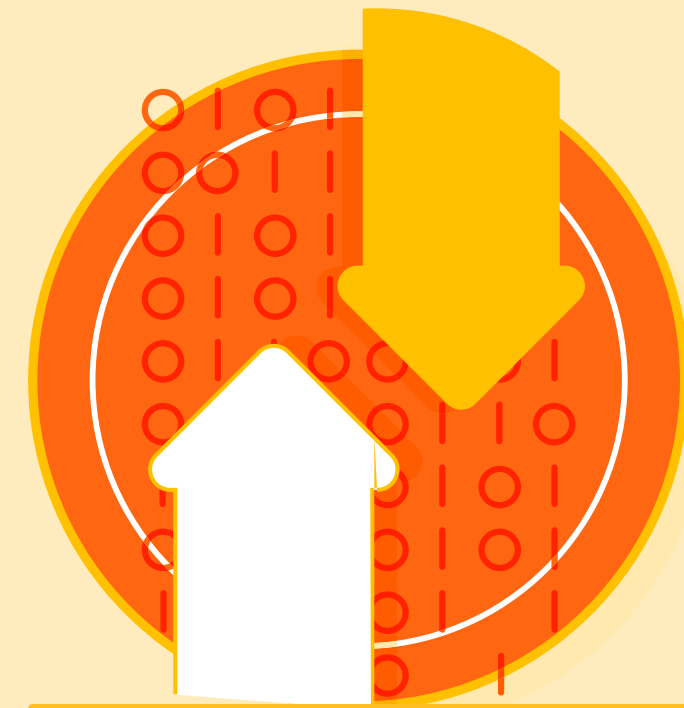


# Timeline structure



## Roles and responsibilities

Roles and responsibilities need to be re-defined for a Net Zero system as soon as possible and the rules need to be changed to support this.



## Digitalisation

Increased levels of digitalisation, and the associated infrastructure, are required across the whole energy system to increase interoperability and to manage complexity.



## Investment

Flexibility in 2035 means investment in many areas is needed, for example energy storage, EV charging infrastructure, electrolysis. This is in addition to the offshore wind, networks, and digitalisation infrastructure required.



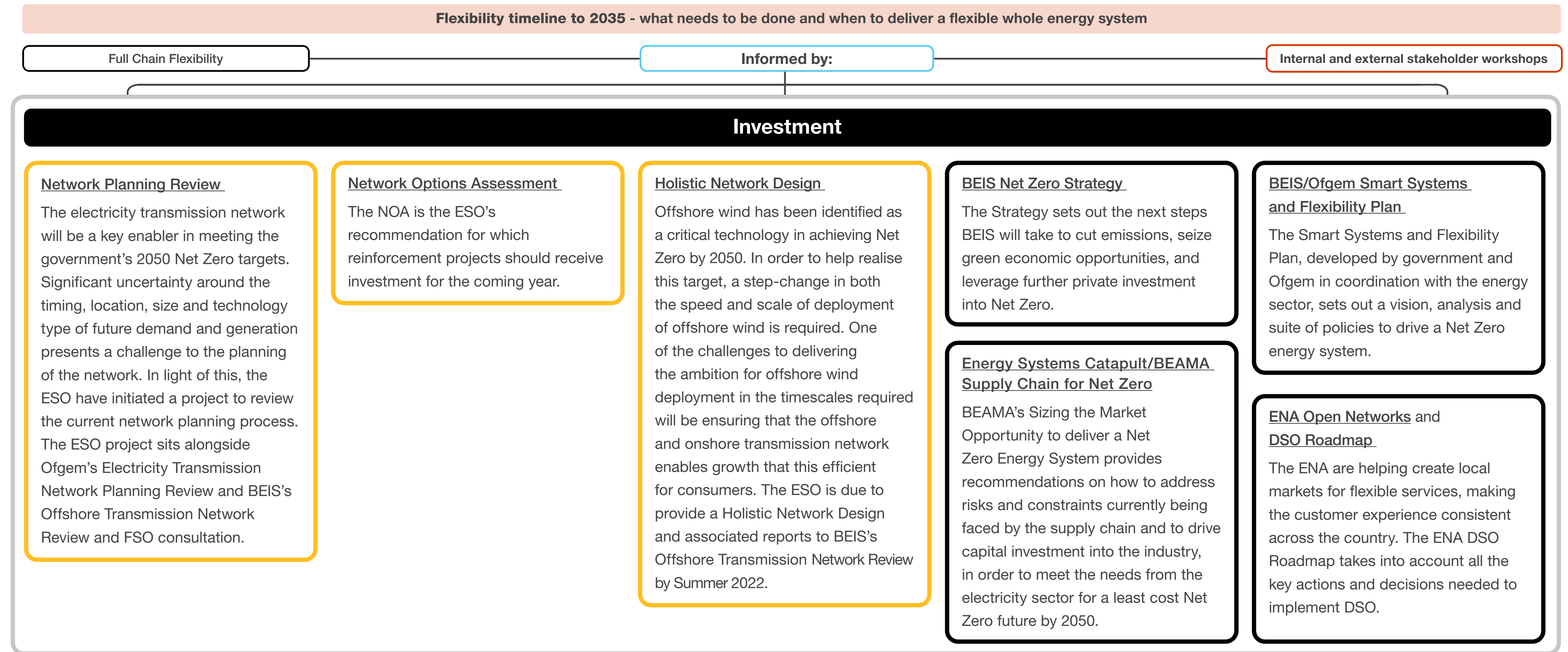
## Markets

Energy market reforms are necessary to create the right environment for investments in flexibility and the development of new consumer facing business models.



# Joining the dots

One of our main aims this year was to join the dots between existing ESO activities, key industry plans and strategies to build up the timeline of activities and the most important milestones. The policy context and FES scenario ranges for the period out to 2035 can be found in [Appendix 1](#).



**Key:** Orange border: ESO activity Black border: External activity/strategy



# Joining the dots

## Flexibility timeline to 2035 - what needs to be done and when to deliver a flexible whole energy system

Full Chain Flexibility

Informed by:

Internal and external stakeholder workshops

Full Chain Flexibility is a key strategic priority for Ofgem. They want to be able to take advantage of a fully flexible system to bring more renewable generation online whilst simultaneously keeping costs down for all consumers.

### Consumers

#### Consumer Research

We commissioned consumer research completed for us by Public First to identify the key areas that need to be addressed to achieve the desired levels of flexibility from end-consumers. The research was in the form of consumer focus groups and polling and was a build on our [Empowering Climate Change Action research](#).

#### Consumer Strategy

The ESO is in the process of shaping its Consumer Strategy ahead of Business Plan 2 publication in the Spring. The strategy will identify what steps the ESO can take in the short, medium and longer term to drive a better consumer experience in today's ecosystem.

#### BEIS Heat & Buildings Strategy

The Strategy brings together the government's work on energy efficiency and clean heat. It will ensure that there is a consistent and coherent approach across different markets, buildings and occupancy types, and that there are robust plans which offer a credible pathway to achieving carbon budgets and lay the foundations for Net Zero buildings in the UK by 2050.

#### BEIS/Ofgem Smart Systems and Flexibility Plan

The Smart Systems and Flexibility Plan, developed by government and Ofgem in coordination with the energy sector, sets out a vision, analysis and suite of policies to drive a Net Zero energy system.

#### BEIS Net Zero Strategy

The Strategy sets out the next steps BEIS will take to cut emissions, seize green economic opportunities, and leverage further private investment into Net Zero.

Key: Orange border: ESO activity Black border: External activity/strategy





# Joining the dots

Flexibility timeline to 2035 - what needs to be done and when to deliver a flexible whole energy system

Full Chain Flexibility

Informed by:

Internal and external stakeholder workshops

## Roles & Responsibilities

### FSO consultation

BEIS and Ofgem are jointly consulting on the proposals for an expert, impartial FSO with responsibilities across both the electricity and gas systems, to drive progress towards Net Zero whilst maintaining energy security and minimising costs for consumers.

### Codes Roadmap & ESO insight into Energy Code Reform

The energy codes are the rulebook for industry and will be an essential facilitator for Net Zero. But they are complex and slow to adapt. Working with industry stakeholders, the ESO are looking at adopting more Strategic Code Reform alongside BEIS/Ofgem's Energy Code Reform work.

### BEIS/Ofgem Smart Systems and Flexibility Plan

The Smart Systems and Flexibility Plan, developed by government and Ofgem in coordination with the energy sector, sets out a vision, analysis and suite of policies to drive a Net Zero energy system.

Key: Orange border: ESO activity Black border: External activity/strategy



# Joining the dots

## Flexibility timeline to 2035 - what needs to be done and when to deliver a flexible whole energy system

Full Chain Flexibility

Informed by:

Internal and external stakeholder workshops

### Markets

#### Markets Roadmap 2022

The Markets Roadmap sets out the ESO's ambitions, principles, and processes to transform markets beyond 2025. It details our vision for response, reserve, thermal, reactive, stability, restoration, and the Balancing Mechanism.

#### Net Zero Markets Reform

ESO's Net Zero Market Reform project was established in early 2021 to examine holistically the changes to current GB electricity market design that will be required to achieve Net Zero. By April 2022 the project is expected to deliver recommendations for a preferred high-level package of reforms.

#### Operability Strategy Report

The Operability Strategy Report (OSR) explains the challenges we face in operating a rapidly changing electricity system. It sets out our operational requirements and the future system needs to meet these requirements. The Markets Roadmap complements the OSR and describes how our markets are evolving to meet these future needs in the most efficient way.

#### BEIS/Ofgem Smart Systems and Flexibility Plan

The Smart Systems and Flexibility Plan, developed by government and Ofgem in coordination with the energy sector, sets out a vision, analysis and suite of policies to drive a Net Zero energy system.

#### ENA Open Networks and DSO Roadmap

The ENA are helping create local markets for flexible services, making the customer experience consistent across the country. The ENA DSO Roadmap takes into account all the key actions and decisions needed to implement DSO.

#### BEIS Net Zero Strategy

The Strategy sets out the next steps BEIS will take to cut emissions, seize green economic opportunities, and leverage further private investment into Net Zero.

Key: Orange border: ESO activity Black border: External activity/strategy



# Joining the dots

Flexibility timeline to 2035 - what needs to be done and when to deliver a flexible whole energy system

Full Chain Flexibility

Informed by:

Internal and external stakeholder workshops

## Digitalisation

### Digitalisation Strategy and Action Plan

The ESO's Digitalisation Strategy and Action Plan sets out our approach to digitalisation to deliver benefits for our stakeholders. It shares our understanding of stakeholder needs, the customer experience journey they have with us, and the products and services we need to provide to meet those needs.

### Virtual Energy System

This world first, real-time replica of our entire energy landscape will work in parallel to our physical system, affording a virtual environment through which we can share data and model and test scenarios to make our decision-making more robust.

### BEIS/Ofgem Smart Systems & Flexibility Plan

The Smart Systems and Flexibility Plan, developed by government and Ofgem in coordination with the energy sector, sets out a vision, analysis and suite of policies to drive a Net Zero energy system.

### BEIS Digitalisation Strategy

The Digitalisation Strategy, developed by the government, Ofgem and Innovate UK in coordination with the energy sector, sets out a vision and suite of policies to digitalise the energy system.

### Energy Digitalisation Taskforce

The Energy Digitalisation Taskforce is focused on modernising the energy system to unlock flexibility and drive clean growth towards Net Zero carbon emissions by 2050. Their [report](#), published in January 2022, recommends greater control for consumers over their data to build trust, plug and play options for innovators to enable interoperability with the energy system, and mandated carbon monitoring as key drivers to accelerate Net Zero.






Key: Orange border: ESO activity Black border: External activity/strategy



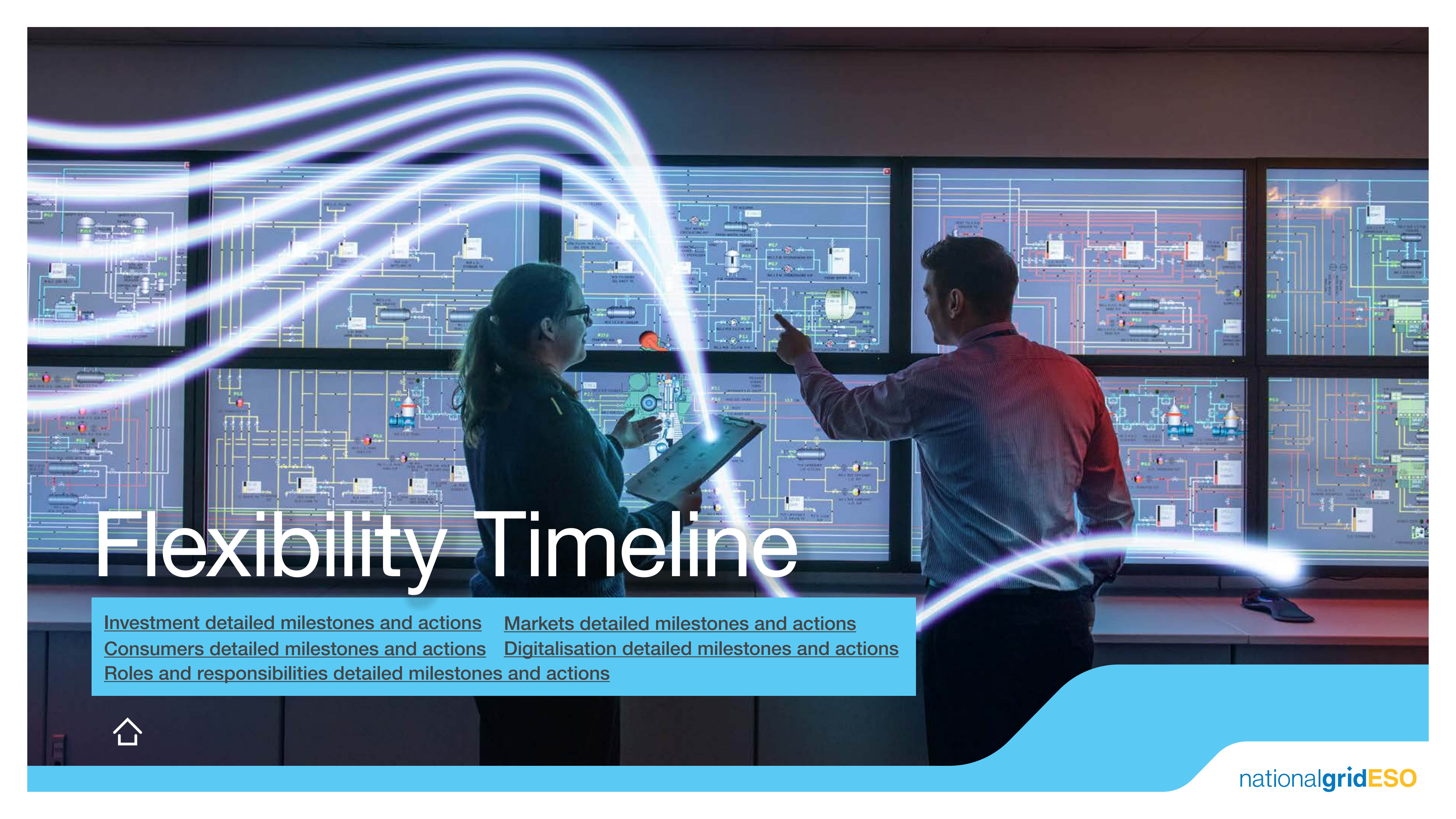
# Key milestones



The milestones you see here are the priority ones we need to hit to reach 2035. More detailed milestones and associated actions can be found in the full flexibility timeline.

	 <b>Investment</b>	 <b>Consumers</b>	 <b>Roles and responsibilities</b>	 <b>Markets</b>	 <b>Digitalisation</b>
<b>2025</b> priority milestones	Strategic flexibility infrastructure projects are underway, e.g. long duration storage, electrolysis.	More flexibility enabling, end-consumer products and tariffs are on offer.	Clarity on who is doing what in the future, flexible energy system.	Revenue streams will be more certain for investment in flexible assets.	Interoperability and resilience across the energy system is possible through greater digitalisation.
<b>2030</b> priority milestones	Whole energy system approach is used to make strategic decisions about infrastructure.	Consumer facing businesses enable consumers to provide flexibility.	Codes and standards in place to support different Net Zero roles and responsibilities.	Reformed markets create incentives for flexibility.	System balancing and stability actions are automatically deployed.
<b>2035</b> target met	Whole system flexibility infrastructure is in place to enable decarbonised system operation.	The majority of consumers are able to deliver the flexibility needed seamlessly via automated products and services.	A coordinated approach to whole energy system operation is achieved through clarity of roles and responsibilities for Net Zero.	Markets enable flexibility of all durations through the right long-term investment and short-term dispatch signals.	Digitalisation is a fundamental part of the whole energy system as it enables greater market facilitation of flexibility actions.





# Flexibility Timeline

[Investment detailed milestones and actions](#)

[Markets detailed milestones and actions](#)

[Consumers detailed milestones and actions](#)

[Digitalisation detailed milestones and actions](#)

[Roles and responsibilities detailed milestones and actions](#)



# How to read the flexibility timeline

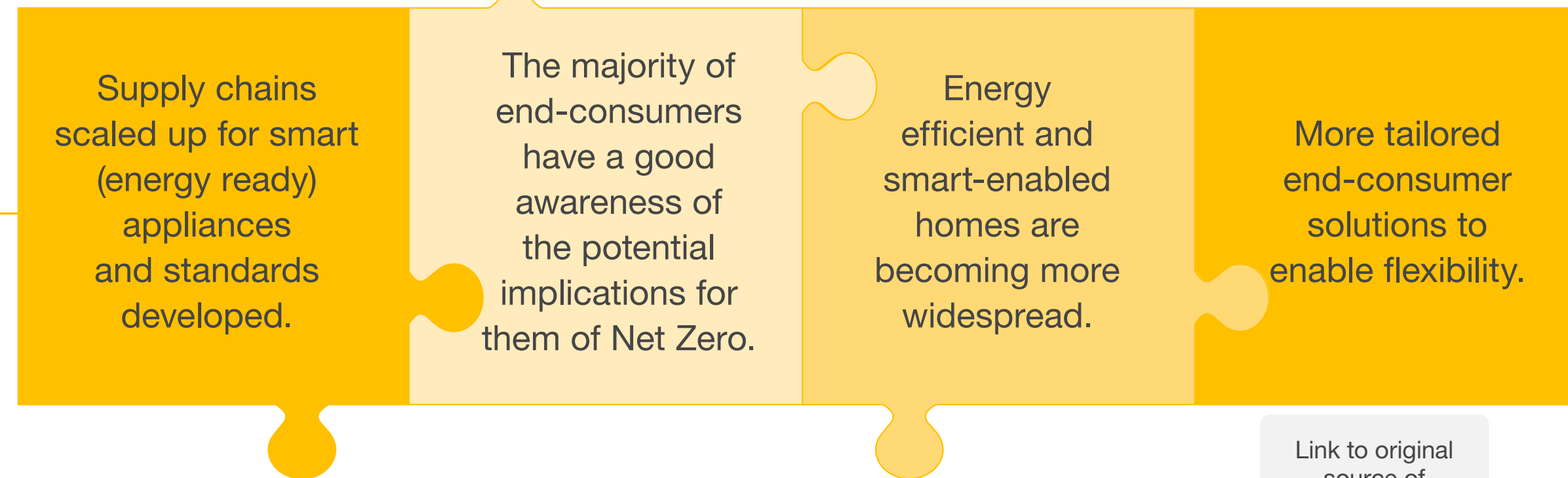
We present the milestones and associated actions identified from existing ESO and wider industry work by theme to help manage the range and complexity. There are however many links and interactions between all actions across the themes and we have highlighted this where relevant.

The milestones and actions are sectioned into blocks, starting with 2025 milestones and the key actions needed to meet these milestones. We then introduce the 2030 milestones and the associated actions. Actions from 2030 – 2035 are few as they are yet to be fully defined across industry but have been included where applicable.



**2025 milestones**

Click to read actions



Milestones that need to be hit by 2025, 2030 or 2035.

Link to original source of the action (where relevant).

Reference number of any linked actions.

All actions have been allocated a number for reference (e.g. CON means Consumer).

Key actions identified from existing ESO and other publications; colour coded by owners. Owners in bold. Any gaps we have identified are clearly marked with suggested owners.

**Action colour coding**

ESO	Energy Suppliers	Various
BEIS	Gap	UK ETS
		Ofgem

Priority action = ★ Operability related = ●

CON5	<p><b>Key actions for now to 2025</b> ● ★</p> <p>Drive increase in domestic flexibility provision through delivery of funding for home upgrades for all existing homes and improve future homes standards for new homes, so homes are energy efficient and smart <b>(BEIS)</b>.</p>	<p><b>For more detail</b></p> <p>BEIS Net Zero Strategy BEIS Heat and Buildings Strategy <u>Department for Levelling Up, Housing, Communities</u> ESO Consumer attitudes work</p>	<p><b>Linked timeline actions</b></p>
CON6	<p><b>Key actions for now to 2025</b></p> <p>Set up an agency to provide trusted guidance and advice to households in England and Wales about Net Zero (<b>Gap: suggested owner: BEIS</b>).</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p>
CON7	<p><b>Key actions for now to 2025</b> ★</p> <p>Increase skills and training for installation of low-carbon home heating systems <b>(BEIS)</b>.</p>	<p><b>For more detail</b></p> <p>BEIS Heating and Buildings Strategy</p>	<p><b>Linked timeline actions</b></p>



# Investment detailed milestones and actions



One of the most urgent requirements for flexibility is an acceleration in the levels of investment. **The Carbon Trust** says that investing in flexibility as a “no-regrets decision” has the potential to deliver material net savings of up to £16.7bn per annum.

**From now to 2025:** Investment in flexibility has the ability to potentially reduce overall costs by reducing the need for network reinforcements or additional generation capacity. This requires planning and scoping to be undertaken in the next four years to make sure that development starts in time for the 2035 target.

**Between 2025 and 2030:** Delivering the strategic investment plans for flexibility assets needs to be the priority during this period so that the infrastructure is in place by 2035. This investment needs to include further digitalisation to ensure we are on the pathway to automation of flexibility in 2035.



Strategic infrastructure decisions have been made and projects are underway, including First of a kind (FOAK) infrastructure for flexibility (e.g. long duration storage, electrolysis).

INV1	<b>Key actions for now to 2025</b> ★	<b>For more detail</b>	<b>Linked timeline actions</b>
	Develop strategic infrastructure plan considering aspects such as colocation ( <b>Gap: suggested owner: Ofgem</b> ).		
INV2	<b>Key actions for now to 2025</b> ★	<b>For more detail</b>	<b>Linked timeline actions</b>
	Ensure funding is available to kick off projects (such as electrolysis, hydrogen storage and long duration storage) ( <b>BEIS</b> ).	<u>BEIS Net Zero Strategy</u>	

**Action colour coding**

ESO	Energy Suppliers	Various
BEIS	Gap	UK ETS
		Ofgem

Priority action = ★ Operability related = ●



# Investment detailed milestones and actions



Strategic network investment needs are more clearly articulated by the ESO.

Investment needed in infrastructure and assets for flexibility is forthcoming and supply chains are scaled up.

INV3	<p><b>Key actions for now to 2025</b> <span style="float: right;">● ★</span></p> <p>Deliver strategic planning methodology to Ofgem <b>(ESO - early 2023)</b> and then develop a strategic network plan by 2025 <b>(Ofgem)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">ESO Network Planning Review</a>  <a href="#">Ofgem Electricity Transmission Network Planning Review</a></p>	<p><b>Linked timeline actions</b></p>
INV4	<p><b>Key actions for now to 2025</b></p> <p>Deliver Holistic Network Design recommending a coordinated onshore and offshore network for projects due to connect by 2030 <b>(ESO, June 2022)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">ESO Offshore Coordination</a>  <a href="#">BEIS Offshore Transmission Network Review</a></p>	<p><b>Linked timeline actions</b></p>
INV5	<p><b>Key actions for now to 2025</b> <span style="float: right;">●</span></p> <p>Assess longer term capacity and operational needs to ensure 2035 decarbonised energy system will be adequate and resilient <b>(ESO)</b>.</p>	<p><b>For more detail</b></p> <p>ESO via Net Zero Adequacy Study  <a href="#">ENA Networks DSO Roadmap</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">MA3</a></p>
INV6	<p><b>Key actions for now to 2025</b></p> <p>Plan to strengthen supply chains to ensure products and materials are available for investment to take place <b>BEAMA / BEIS (UK Electricity Supply Chain Council)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">Energy Systems Catapult/BEAMA Growing the Supply Chain for Net Zero</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">MA6</a>  <a href="#">CON7</a></p>





# Investment detailed milestones and actions



Whole energy system concepts, markets and approach are used to make strategic decisions about infrastructure to reduce costs.

First Carbon Capture Utilisation and Storage (CCUS), hydrogen, large scale and long duration storage projects are in place and operational.

First steps to delivery of strategic network investment has taken place, informed by local, national, onshore, offshore and whole energy system needs.

INV7	<b>Key actions for now to 2025-2030</b> ★	<b>For more detail</b>	<b>Linked timeline actions</b>
	Implement the strategic investment plan, with whole energy system basis ( <b>Gap, suggested owner: Ofgem</b> ).		<u>RR1</u>

INV8	<b>Key actions for now to 2025-2030</b>	<b>For more detail</b>	<b>Linked timeline actions</b>
	Develop and deliver FOAK projects ( <b>BEIS/energy industry</b> ).	<u>BEIS Net Zero Strategy</u>	<u>INV2</u>

INV9	<b>Key actions for now to 2025-2030</b>	<b>For more detail</b>	<b>Linked timeline actions</b>
	Implement strategic network plan and develop assets with consultation across industry, across fuels and with whole energy system approach. This action will continue out to 2035 ( <b>Transmission Owners/other investors/TBC</b> ).		



**Target met:**  
Whole system flexibility infrastructure is in place to enable decarbonised system operation.



# Consumers detailed milestones and actions



Our FES21 show that end-consumers can play a key role in providing up to an 18% reduction from peak in 2035. To fulfil this however, end consumer flexibility provision needs to be seamless and automated. Businesses will play a key role designing products and services that enable flexibility.

**From now to 2025:** Our domestic end-consumer research shows that Net Zero is not well understood and there are still significant barriers to end-consumers taking action. This has shaped some of the actions we've identified.

**Between 2025 and 2030:** After market reform and the development of supply chains and products for end-consumers, it's vital during this period that end-consumers sign up to smart tariffs and products, which allow their energy demand to be more flexible.



More flexibility enabling, end-consumer products and tariffs are on offer.

CON1	<p><b>Key actions for now to 2025</b></p> <p>Consult on appropriate technical and regulatory framework for devices and flexibility service providers, which supports interoperability, data privacy, cyber security and grid stability. Implement the desired solution (consultation will take place in 2022) <b>(BEIS)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">BEIS/Ofgem Smart Systems and Flexibility Plan</a></p>	<p><b>Linked timeline actions</b></p>
CON2	<p><b>Key actions for now to 2025</b></p> <p>Deliver a four-year smart meter policy framework with fixed minimum annual smart meter installation targets for energy suppliers (beginning 1st Jan 2022) <b>(BEIS)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">BEIS/Ofgem Smart Systems and Flexibility Plan</a></p>	<p><b>Linked timeline actions</b></p>
CON3	<p><b>Key actions for now to 2025</b> ★</p> <p>Implement market-wide half hourly settlement as a minimum (by October 2025) <b>(Ofgem)</b>.</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p>
CON4	<p><b>Key actions for now to 2025</b></p> <p>Expand the energy ombudsman role to cover consumer data protection, equity, empowerment and privacy <b>(Gap: suggested owner: Ofgem)</b>.</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p>
CON5	<p><b>Key actions for now to 2025</b></p> <p>Energy suppliers design their products to meet consumers' needs as well as to facilitate low carbon energy in response to improved market signals <b>(Energy Suppliers)</b>.</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">MA1</a></p>

**Action colour coding**

ESO	Energy Suppliers	Various
BEIS	Gap	UK ETS
		Ofgem

Priority action = ★ Operability related = ●





The majority of end-consumers have a better awareness of the potential implications for them of Net Zero.

Supply chains scaled up for smart appliances and standards developed.

Energy efficient and smart-enabled homes are becoming more widespread.

CON6	<p><b>Key actions for now to 2025</b> ★</p> <p>Devise a strategic awareness campaign for consumers about Net Zero and consumer actions for Net Zero (<b>GAP: suggested owner: BEIS with support from industry/consumer groups</b>).</p>	<p><b>For more detail</b></p> <p><a href="#">ESO Consumer Research</a></p>	<p><b>Linked timeline actions</b></p>
CON7	<p><b>Key actions for now to 2025</b> ★</p> <p>Accelerate the development of supply chains to achieve economies of scale and pass on cost reductions to consumers (including electric vehicles, heat pumps, micro generation and batteries) (<b>BEIS</b>).</p>	<p><b>For more detail</b></p> <p><a href="#">BEIS Net Zero Strategy</a> <a href="#">BEIS Heat and Buildings Strategy</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">INV6</a></p>
CON8	<p><b>Key actions for now to 2025</b></p> <p>Work with industry to support the update of specifications and standards for energy smart appliances, to mandate interoperability of DSR-capable devices and to establish a technical framework for small-scale DSR (<b>BEIS</b>).</p>	<p><b>For more detail</b></p> <p><a href="#">BEIS/Ofgem Smart Systems and Flexibility Plan</a> <a href="#">Energy Digitalisation Taskforce</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">DIG12</a></p>
CON9	<p><b>Key actions for now to 2025</b></p> <p>Regulate energy smart appliances to set requirements underpinned by the principles of interoperability, data privacy, grid stability and cyber security (<b>BEIS</b>).</p>	<p><b>For more detail</b></p> <p><a href="#">BEIS/Ofgem Smart Systems and Flexibility Plan</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">DIG5</a></p>
CON10	<p><b>Key actions for now to 2025</b></p> <p>Deliver existing funding schemes for those in need whilst continuing to upgrade existing homes. Improve standards for new builds through the Future Homes Standard (FHS) and Future Buildings Standard (FBS), both to be introduced in full in 2025 (<b>BEIS</b>).</p>	<p><b>For more detail</b></p> <p><a href="#">BEIS Net Zero Strategy</a> <a href="#">Department for Levelling Up, Housing, Communities</a> <a href="#">ESO Consumer Research</a></p>	<p><b>Linked timeline actions</b></p>
CON11	<p><b>Key actions for now to 2025</b></p> <p>Set up an agency to provide trusted guidance and advice to households in England and Wales about Net Zero (<b>Gap: suggested owner: BEIS</b>).</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p>
CON12	<p><b>Key actions for now to 2025</b> ★</p> <p>Increase skills and training for installation of low-carbon home heating systems (<b>BEIS</b>).</p>	<p><b>For more detail</b></p> <p><a href="#">BEIS Heat and Buildings Strategy</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">CON7</a> <a href="#">INV6</a></p>



# Consumers detailed milestones and actions



Consumer facing businesses enable consumers to provide flexibility when needed.

Most homes and many non-domestic buildings have been adapted to be able to support flexibility with strong government policy support.

<p><b>CON13</b></p> <p><b>Key actions 2025 – 2030</b> ★</p> <p>Ensure market reforms adequately incentivise flexibility products and alternative business models (e.g. heat pumps have blended solutions with storage) <b>(BEIS/Ofgem)</b>.</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p> <p><u>MA1</u></p>
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<p><b>CON14</b></p> <p><b>Key actions 2025 – 2030</b> ★</p> <p>Implement the necessary standards and policies (e.g. relating to funding improvements) to enable homes to deliver demand side response requirements <b>(BEIS)</b>.</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p> <p><u>CON8</u> <u>CON9</u></p>
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<p><b>CON15</b></p> <p><b>Key actions 2025 – 2030</b></p> <p>Ensure all new homes built in England from 2025 onwards will be ready for Net Zero <b>(BEIS)</b>.</p>	<p><b>For more detail</b></p> <p><u>BEIS Net Zero Strategy</u> <u>Future Homes Standard</u> <u>Future Buildings Standard/</u> <u>Building Regulations</u></p>	<p><b>Linked timeline actions</b></p> <p><u>CON10</u></p>
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<p><b>CON16</b></p> <p><b>Key actions 2025 – 2030</b></p> <p>Continue to build the market to increase the delivery of heat pump installation to meet Net Zero targets <b>(BEIS)</b>.</p>	<p><b>For more detail</b></p> <p><u>BEIS Heat and Buildings Strategy</u></p>	<p><b>Linked timeline actions</b></p> <p><u>CON6</u> <u>CON7</u> <u>INV6</u></p>
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**2035**

**Target met:**  
The majority of consumers are able to deliver the flexibility needed seamlessly via automated products and services.

**2035**



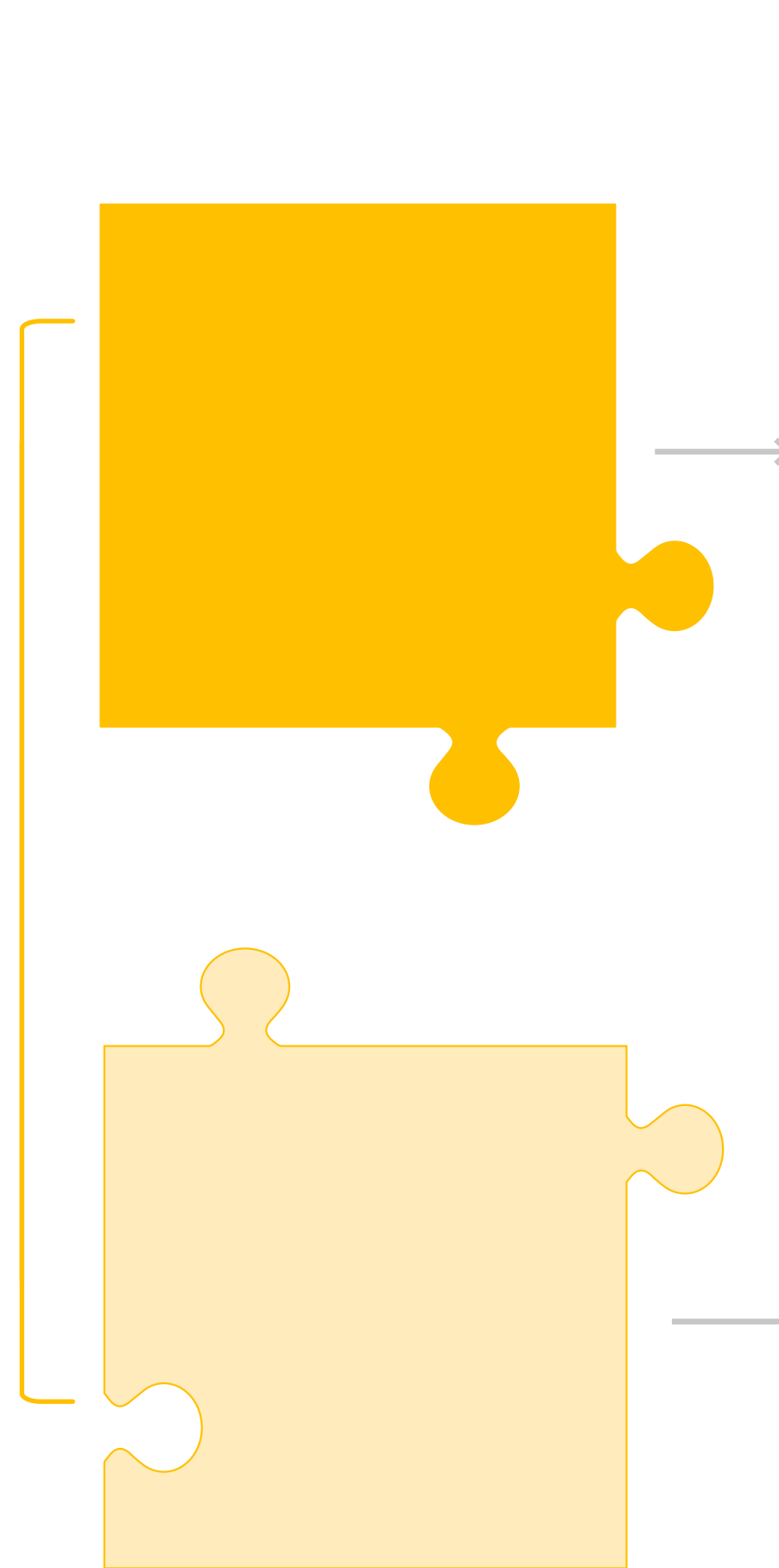
# Roles and responsibilities detailed milestones and actions



To deliver a flexible energy system, able to support Net Zero and which works for business and consumers alike, we need clear direction about who is doing what and when across the whole energy sector and beyond. This message came through clearly when we undertook our stakeholder engagement for Bridging the Gap this year.

**From now to 2025:** As soon as possible, we need clarity about the roles and responsibilities for Net Zero, as stated in our key message. This will require adequate legislative time in order to create the legal basis for Net Zero roles and responsibilities.

**Between 2025 and 2030:** After 2025 momentum needs to be maintained to ensure Net Zero activities are coordinated, complementary and result in the best outcome for end-consumers, decarbonisation and system operability.



RR1	<p><b>Key actions for now to 2025</b> ★</p> <p>Outline roles and responsibilities in a Net Zero, whole energy system for existing participants, including where responsibility for Net Zero coordination lies (Gap, suggested owners: BEIS/Ofgem).</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">INV7</a></p>
RR2	<p><b>Key actions for now to 2025</b> ★</p> <p>To avoid delaying action, ensure adequate legislative time is assigned to create the legal basis for Net Zero roles, rules and responsibilities, including whole system remit for FSO and Ofgem (Gap, suggested owner: BEIS).</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p>
RR3	<p><b>Key actions for now to 2025</b></p> <p>All reviews of codes and regulations should include a check to see that they are fully compliant with Net Zero and there is a clear timeline for new Net Zero standards/ codes (Gap, suggested owner: Ofgem).</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p>

**Action colour coding**

ESO	Energy Suppliers	Various
BEIS	Gap	UK ETS
		Ofgem

Priority action = ★ Operability related = ●



# Roles and responsibilities detailed milestones and actions



All codes, standards and methodologies are in place to support the different roles and responsibilities in a Net Zero ready, energy system.

RR4	<p><b>Key actions 2025-2030</b> ★</p> <p>Ongoing code reform to adapt to flexible energy system, including a review of the Security and Quality of Supply Standard in relation to how to define and ensure security of supply in a flexible system (Gap, suggested owner: Ofgem).</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p> <p><u>MA1</u></p>
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All whole energy system participants' roles are clear and implemented.

RR5	<p><b>Key actions 2025-2030</b></p> <p>Design roles, rules and responsibilities to be agile/flexible/adaptable and supporting an FSO (Gap, suggested owners: Ofgem/BEIS).</p>	<p><b>For more detail</b></p> <p><u>FSO consultation</u></p>	<p><b>Linked timeline actions</b></p>
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**Target met:**  
A coordinated approach to whole energy system coordination is achieved through clarity of roles and responsibilities for Net Zero.



# Markets detailed milestones and actions



Market reform will form the foundation of a flexible energy system in 2035. Its aim is to reduce barriers to entry and allow new players and technologies into the market. Real-time price signals will communicate what is required and when. Effective carbon pricing needs also to be in place to ensure that the cheapest balancing options are also the cleanest.

**From now to 2025:** The ESO will play a key role in reforming balancing services to meet its ambition for zero carbon operation in 2025.

**Between 2025 and 2030:** From 2025 onwards, it is important that wider market reform continues, including assessing the impact on the end-consumer as part of the process.



<b>MA1</b>	<p><b>Key actions for now to 2025</b> <span style="color: blue;">●</span> <span style="color: red;">★</span></p> <p>Examine holistically the changes required to current GB electricity market design to achieve Net Zero, including effective market signals for flexibility <b>(ESO)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">ESO Net Zero Market Reform</a></p> <p><a href="#">ENA Open Networks</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">INV5</a></p> <p><a href="#">CON5</a></p>
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**Action colour coding**

ESO	Energy Suppliers	Various	
BEIS	Gap	UK ETS	Ofgem

Priority action = ★    Operability related = ●



# Markets detailed milestones and actions



Zero carbon operation is possible with the new suite of balancing service.

One portal access to the ESO's services is available for all markets and propositions.

UK Emissions Trading Scheme (UK ETS) actively encourages sectors to decarbonise in line with Net Zero Strategy.

MA2	<p><b>Key actions for now to 2025</b> <span style="float: right;">● ★</span></p> <p>Investigate optimal market design for both stability and reactive power and develop enduring framework of long- and short-term markets for ancillary services <b>(ESO)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">ESO Markets Roadmap</a></p> <p><a href="#">ESO Operability Strategy Report</a></p>	<p><b>Linked timeline actions</b></p>
MA3	<p><b>Key actions for now to 2025</b> <span style="float: right;">●</span></p> <p>Assess and coordinate longer-term operability requirements (out to 2035) between NOA, ETYS and Operability Strategy Report <b>(ESO)</b>.</p>	<p><a href="#">ESO Net Zero Market Reform</a></p> <p><a href="#">ESO Pathfinders</a></p> <p><a href="#">ESO Codes Roadmap</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">INV5</a></p>
MA4	<p><b>Key actions for now to 2025</b> <span style="float: right;">●</span></p> <p>Deliver single day-ahead response and reserve markets <b>(ESO)</b>.</p>	<p><a href="#">BEIS/Ofgem Smart Systems and Flexibility Plan</a></p> <p><a href="#">ENA Open Networks</a></p>	<p><b>Linked timeline actions</b></p>
MA5	<p><b>Key actions for now to 2025</b> <span style="float: right;">●</span></p> <p>Simplify access to the Balancing Mechanism for all technology providers <b>(ESO)</b>.</p>		<p><b>Linked timeline actions</b></p>
MA6	<p><b>Key actions for now to 2025</b></p> <p>Implement Single Market Platform for all of ESO's markets <b>(ESO)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">BEIS/Ofgem Smart Systems and Flexibility Plan</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">DIG6</a></p>
MA7	<p><b>Key actions for now to 2025</b> <span style="float: right;">★</span></p> <p>Align UK ETS cap with a Net Zero consistent trajectory by January 2023, or January 2024 at the latest to ensure an effective, robust price for carbon <b>(UK ETS Authority)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">BEIS Net Zero Strategy</a></p>	<p><b>Linked timeline actions</b></p>





# Markets detailed milestones and actions



Reformed markets create incentives for flexibility.

UK ETS is pricing carbon effectively and working in tandem with wider policies to optimise the deployment of low carbon flexibility options.

MA8	<p><b>Key actions 2025 – 2030</b></p> <p>Ensure ongoing market reform includes assessing the impact on end-consumers to ensure equitable outcomes <b>(ESO)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">ESO Markets Roadmap</a></p> <p><a href="#">ESO Net Zero Market Reform</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">MA1</a></p>
MA9	<p><b>Key actions 2025 – 2030</b> ★</p> <p>ESO and DSOs work together to optimise different system needs, incentivising flexibility through removing barriers to entry and assigning value to locational flexibility <b>(ESO/DSO)</b>.</p>		<p><b>Linked timeline actions</b></p> <p><a href="#">DIG8</a></p>
MA10	<p><b>Key actions 2025 – 2030</b> ★</p> <p>Monitor and ensure that the UK ETS is operating effectively and providing a meaningful carbon price <b>(UK ETS Authority)</b>.</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p>
MA11	<p><b>Key actions 2025 – 2030</b> ★</p> <p>Take a holistic approach to ensuring the wider market framework supports the use of low carbon flexibility <b>(BEIS)</b>.</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p>



**Target met:**  
Markets enable flexibility of all durations through the right long-term investment and short-term dispatch signals.



# Digitalisation detailed milestones and actions



The energy system in 2035 will need digitalisation to be able to access all the flexibility required to operate a decarbonised system. This means interoperability at all network levels (e.g. ESO and DSO) the ability to manage large volumes of data and facilitate participation of millions of end-consumers.

**From now to 2025:** Fundamental to the delivery of a digitalised energy system is having the infrastructure in place to make it happen. For example, developing a digital spine for the energy industry, which will require sector-wide collaboration and support from the telecommunications sector.

**Between 2025 and 2030:** Focus on greater digitalisation and improved forecasting will be required to set the system up to be able to draw on demand as well as supply for balancing needs by 2035.



Interoperability and resilience across the energy system is possible through greater digitalisation and the development of key public digital assets for energy (e.g. digital spine).

DIG1	<p><b>Key actions for now to 2025</b> ★</p> <p>Develop a digital spine for energy interoperability and data sharing, working with key industry stakeholders to develop standards and tools needed (<b>BEIS/Ofgem</b>).</p>	<p><b>For more detail</b></p> <p><a href="#">BEIS Digitalisation Strategy</a>  <a href="#">BEIS/DCMS Data Strategy (upcoming)</a>  <a href="#">Energy Digitalisation Taskforce</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">CON9</a></p>
DIG2	<p><b>Key actions for now to 2025</b> ★</p> <p>Work with communications industry and Ofcom to design national digital infrastructure to support energy system (<b>Gap: suggested owners: Tech Advisory Council/ESO/DNO/Ofgem/Ofcom</b>).</p>	<p><b>For more detail</b></p>	<p><b>Linked timeline actions</b></p>
DIG3	<p><b>Key actions for now to 2025</b></p> <p>Develop and use Virtual Energy System to assess the potential impacts of actions in real-time (<b>ESO</b>).</p>	<p><b>For more detail</b></p> <p><a href="#">ESO Virtual Energy System</a></p>	<p><b>Linked timeline actions</b></p>
DIG4	<p><b>Key actions for now to 2025</b></p> <p>Implement a Data and Digitalisation Strategic Change programme that will facilitate the digital transformation of the industry and regulator (<b>Ofgem</b>).</p>	<p><b>For more detail</b></p> <p><a href="#">BEIS Digitalisation Strategy</a></p>	<p><b>Linked timeline actions</b></p>
DIG5	<p><b>Key actions for now to 2025</b></p> <p>Ensure auto-registration of energy ready/smart appliances, which is accessed via the digital spine (<b>BEIS</b>).</p>	<p><b>For more detail</b></p> <p><a href="#">BEIS Digitalisation Strategy</a>  <a href="#">Energy Digitalisation Taskforce</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">CON9</a></p>
DIG6	<p><b>Key actions for now to 2025</b></p> <p>Implement open data portal to share all relevant ESO data, improving the transparency of ESO actions (2022/23) (<b>ESO</b>).</p>	<p><b>For more detail</b></p> <p><a href="#">ESO DSAP</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">MA6</a></p>

**Action colour coding**

ESO	Energy Suppliers	Various
BEIS	Gap	UK ETS
		Ofgem

Priority action = ★ Operability related = ●



# Digitalisation detailed milestones and actions



Technology and systems have been upgraded to be able to forecast supply and demand more accurately using data-based solutions.



DIG7	<p><b>Key actions for now to 2025</b></p> <p>Develop and use detailed statistical and machine learning to improve forecasting and to understand demand profile better (2023) <b>(ESO)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">ESO DSAP</a></p>	<p><b>Linked timeline actions</b></p>
DIG8	<p><b>Key actions for now to 2025</b></p> <p>Develop the Virtual Energy System so that interconnected digital twin models across GB can be used to improve forecasts, provide more automated operation of the system and better visibility of other networks (DNO areas) and flexibility available from connected DERs <b>(ESO)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">ESO Virtual Energy System</a></p>	<p><b>Linked timeline actions</b></p> <p><a href="#">MA9</a></p>
DIG9	<p><b>Key actions for now to 2025</b></p> <p>Utilise Regional Development Programme to develop commercial capabilities for deployment of DER's <b>(ESO/DNOs)</b>.</p>	<p><b>For more detail</b></p> <p><a href="#">Regional Development Programmes</a></p>	<p><b>Linked timeline actions</b></p>



# Digitalisation detailed milestones and actions



System balancing and stability actions are automatically deployed across the ESO and DSOs, using market signals to tap into flexibility from a range of assets.



DIG10	<b>Key actions 2025 – 2030</b>	<b>For more detail</b>	<b>Linked timeline actions</b>
	Develop modelling for balancing actions to inform more automated dispatch; including capabilities to manage uncertainties, optimise across multiple scenarios and integrate disparate, real-time data feeds <b>(ESO)</b> .	<a href="#">ESO DSAP</a> <a href="#">ESO Virtual Energy System</a>	

National digital infrastructure has been developed and is integral to the whole energy system.



DIG11	<b>Key actions 2025 – 2030</b>	<b>For more detail</b>	<b>Linked timeline actions</b>
	Continue collaboration with the communications industry to ensure coordinated, cost-effective result <b>(GAP: suggested owners: BEIS/Ofgem)</b> .		
DIG12	<b>Key actions 2025 – 2030</b> ★	<b>For more detail</b>	<b>Linked timeline actions</b>
	Deliver standards (relating to technology and data) to support implementation of greater digitalisation <b>(GAP: suggested owners: BEIS/Ofgem)</b> .		<a href="#">CON8</a>

All participants have the appropriate visibility of data and volumes and are obliged to share where appropriate.



DIG13	<b>Key actions 2025 – 2030</b>	<b>For more detail</b>	<b>Linked timeline actions</b>
	Use the energy digital spine to share and view data required <b>(Energy Sector)</b> .	<a href="#">BEIS Energy Digitalisation Taskforce</a>	

**2035**

**Target met:**  
Digitalisation is a fundamental part of the whole energy system as it enables greater market facilitation of flexibility actions.

**2035**



# Appendices



# Appendix 1 - The road to 2035 – what we know already

For the period between now and 2035, there are already a number of existing policy targets in place relating to flexibility. The table below shows these targets as well as outlining when and if the different Future Energy Scenarios (from 2021) meet them. To be on a Net Zero trajectory, we need to be looking at the range made by Consumer Transformation, System Transformation and Leading the Way.

		2020	By 2025	By 2030	By 2035
<b>Transport</b>	Zero tailpipe emissions for all new cars <sup>1</sup>	7% of cars sold (COVID-19 impacted)			CT LW ST
	Exceeds 1GW of total vehicle-to-grid (V2G) capacity	N/A		CT LW	
<b>Heating</b>	600,000 heat pumps installed per year <sup>2</sup>	<30,000	LW	CT	
<b>Electricity Generation</b>	80% of GB generation output from renewables	50%	CT LW	ST SP	
	Offshore wind installation reaches 40 GW <sup>2</sup>	10.5 GW		CT LW	ST
	First Carbon Capture Usage and Storage (CCUS) power station <sup>2</sup>	0		CT LW ST	SP
<b>Hydrogen</b>	5 GW of hydrogen production capacity <sup>2</sup>	<1 GW		LW	ST
<b>Flexibility</b>	10 GW or more of electrolysis capacity	<1 GW			LW
	Exceeds 20 GW electricity storage technologies (excluding V2G)	4 GW			CT LW
	Industrial and Commercial electricity demand side response exceeds 2.5 GW	1.3 GW	CT LW	ST	

CT Consumer Transformation   
 LW Leading the Way  
ST System Transformation   
 SP Steady Progression   
 UK Government target

1. 18/11/2020 - UK Government Legal Commitment.  
 2. 14/12/2020 - Energy White Paper.



# Appendix 2 - ESO Consumer Research

We've used end-consumers research to help us to better understand consumers' knowledge, concerns and motivations. This has informed some of the key actions identified to help achieve the flexibility we need from end-consumers.

Building on the ESO's previous [Empowering Climate Change Action research](#) completed ahead of COP26, we commissioned Public First to carry out 12 focus groups and poll over 4,000 adults in the UK to understand public attitudes towards decarbonisation, Net Zero and the changes required to achieve it.

## Some of the key findings from our research with Public First:

- Despite rising levels of education about climate change, the UK's legal commitment to reaching Net Zero is not well understood; only 40% said they had definitely heard of Net Zero.
- People think they are already doing their bit, but they want to do more – 63% want to know more on what they can do to reduce climate change.
- Financial considerations are a more powerful motivator than environmental concerns – 56% would not be willing to lose more than 5% of their disposable income to help deal with climate change.
  - Only 17% of the public are likely to purchase an EV in the next 8/9 years (56% unlikely) – the biggest barriers being upfront costs and concerns of charging infrastructure.
  - 25% of people are likely to purchase a heat pump in the next five years (44% unlikely) – the biggest barrier being cost.
- Consumers primarily see Government and businesses as most responsible for tackling climate change.
- Cost remains the single most important barrier – 32% of people said they would use a government scheme to help reduce upfront costs, 39% of people would be satisfied to see a return on investment within 3 years (for their investment in home energy efficiency).

## Key areas to help consumers on the pathway to 2035:

- A national conversation about managing energy demand in the national grid.
- Lower upfront costs of home improvements.
- Government grants/payment schemes.

There is a lot of work already underway across industry to address the key areas to help consumers on the pathway to 2035. Our timeline aims to reflect this and also identify where we think there are gaps for industry to do more.



# Appendix 3 - ESO market reform projects

## Markets Roadmap

The Markets Roadmap is an annual document which is designed to set out our ambitions, principles and processes to transform our markets beyond 2025. It details our vision for response, reserve, thermal, voltage, stability, restoration, and the Balancing Mechanism.

### Key messages so far from the Roadmap relevant to Bridging the Gap:

- Zero carbon system operation is possible with the introduction of a new suite of ancillary services and implementation of a single day ahead market for response and reserve.
- Procurement models and market reforms will facilitate efficient markets that will enable flexibility to deal with significant system imbalance and deliver consumer value.
- Reformed markets and new procurement models may help to incentivise investment in all types of flexibility required.
- We will find ways to mitigate barriers to flexible technologies such as Interconnection and Distributed Energy Resources across all our balancing services.
- One portal access for all markets and propositions across ESO and DNOs will support service stacking to access markets and value.

**Next steps:** We will continue to develop our work to reform markets to achieve our ambitions. We will work closer with industry to co-create all aspects of market reforms. Our progress will be shared in the next annual Markets Roadmap publication in late March 2022.

## Net Zero Market Reform

The Net Zero Market Reform project was established in early 2021 to examine holistically the changes to current GB electricity market design that will be required to achieve Net Zero. By April 2022 the project is expected to deliver recommendations for a preferred high-level package of reforms.

This project is different to other market reform projects the ESO have previously undertaken as we will have a longer-term focus out to 2035 and 2050, and we will look at the full suite of GB electricity markets and policies, not just those run by the ESO.

### Key messages so far from phases 1 and 2 relevant to Bridging the Gap:

Following an initial scoping Phase 1 (completed March 2021), Phase 2 (completed in November 2021) looked at the case for change and set out the frameworks for assessing the different market design alternatives. Through modelling analysis and stakeholder engagement, the case for change identified three key challenges for markets to address on the road to Net Zero as follows:

- There is a need to invest at an unprecedented scale and pace.
- There is a need to manage dramatic imbalances with flexible and firm technologies across both supply and demand.
- There is a need to incentivise assets to location and dispatch where they can minimise whole system costs.

**Next steps:** Phase 3 started in December 2021 and will involve detailed assessments of the key market design options against the criteria developed in Phase 2. By April 2022 the project will deliver recommendations for a preferred high-level package of reforms.





# Get in touch

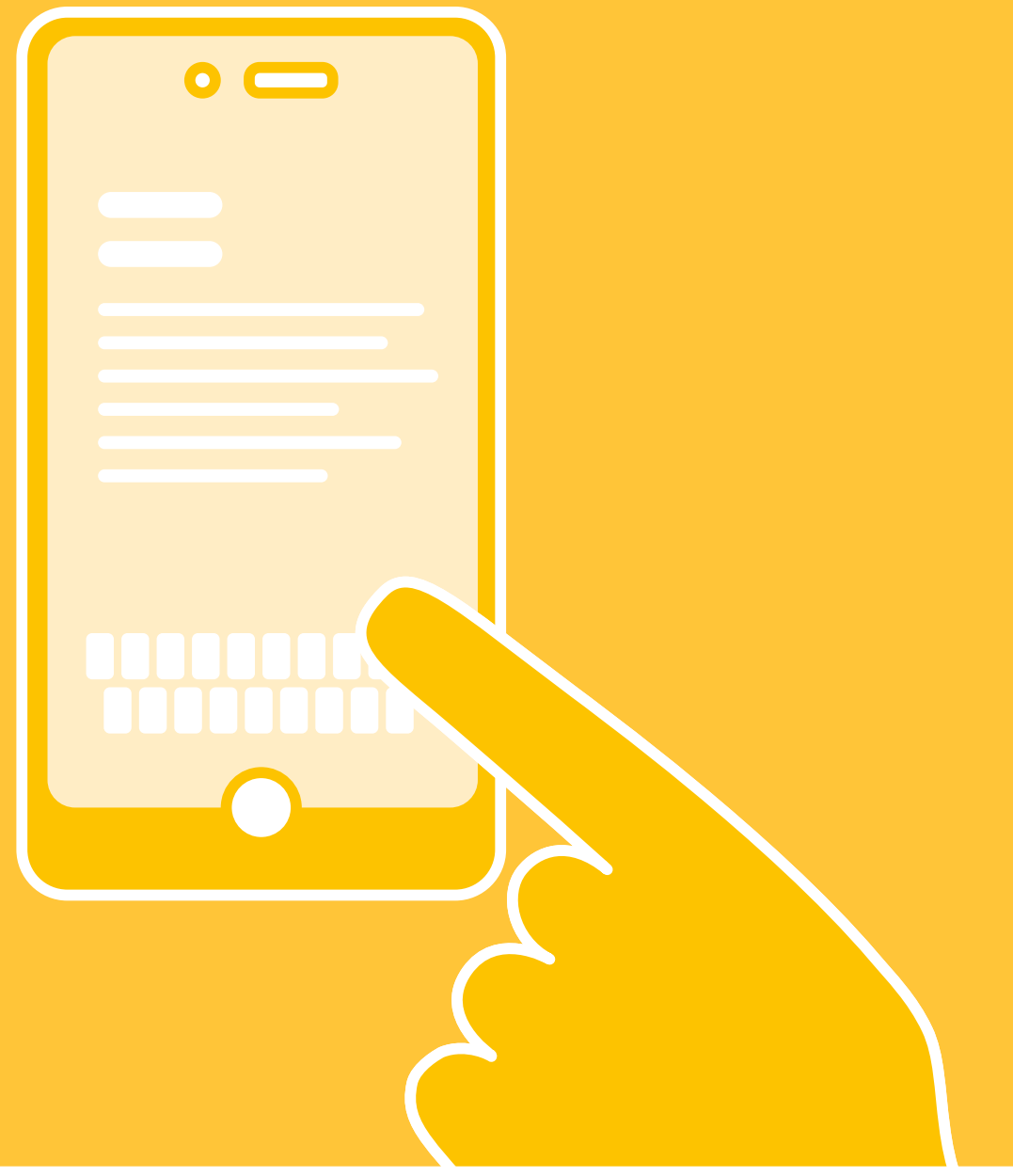
Email us with your views on FES or any of our future of energy documents at: [FES@nationalgrideso.com](mailto:FES@nationalgrideso.com) and one of our team members will get in touch.

Access our current and past Bridging the Gap documents here: [nationalgrideso.com/future-energy/future-energy-scenarios/bridging-the-gap-to-net-zero](https://nationalgrideso.com/future-energy/future-energy-scenarios/bridging-the-gap-to-net-zero)

Get involved in the debate on the future of energy and join our LinkedIn group [Future of Energy by National Grid ESO](#)

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# Thank you!

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Energy Networks Association

Association for Decentralised Energy

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BEIS

