July 2023

FES in Five

ESO

Foreword

Two years ago, the Government announced its intention for the electricity system to be fully decarbonised by 2035. This ambitious target reinforced Great Britain's existing global leadership in enabling low carbon electricity generation. The 2035 target gives us just over a decade to deliver a world-first, but it requires a major transition across industry, regulation and government policy – a challenge that we need to meet head on.

Great Britain also continues to take strides towards the 2050 net zero target. Businesses of the net zero economy are driving productivity, contributing over £70bn to Great Britain every year. Regions and local authorities are seeing evidence of the growth opportunity that decarbonisation presents. Maintaining this growth relies on clean energy being available – energy is part of almost every product or service that the British economy relies on. As the Electricity System Operator (ESO), we are driving the changes needed to achieve the 2035 and 2050 targets and now operate one of the fastest decarbonising electricity systems in the world.

But the decarbonisation of the energy system is only one of the challenges that we face. The devastation caused by the illegal Russian invasion of Ukraine has created global uncertainty in energy markets. It has depleted supply chains, restricted access to fossil fuels and exacerbated a cost-of-living crisis which continues to impact everyone across Great Britain.

The scale and significance of these parallel challenges highlights the ongoing challenge of balancing the opportunities of decarbonisation with the requirement for energy security and access to affordable power for consumers and businesses. What is clear is that Great Britain cannot address this trilemma without sustained, collaborative action.

Last winter, working with the Government, Ofgem and industry, we led the development of a world first Demand Flexibility Service. Over a million households were signed up to the scheme through their electricity supplier, with eligible consumers receiving payments to reduce electricity consumption during tighter periods on the electricity system – demonstrating the impact that innovation can have as we decarbonise.

This year's Future Energy Scenarios continue to set out credible ways that the UK can achieve net zero by 2050, as well as the UK Government's commitment to a decarbonised electricity system by 2035. Based on extensive stakeholder engagement, research and modelling, each scenario considers how much energy we might need, where it could come from and how we continue to maintain outstanding levels of system reliability.

Our 2023 Future Energy Scenarios highlight one key overall theme – we must act now to achieve a clean, secure and fair energy system for all. If we don't, a once in a lifetime opportunity will pass us by.

Over the coming 12-18 months the ESO will transition into the Future System Operator – taking a broader, whole system view on how Great Britain can deliver on its net zero ambitions while maintaining a reliable and affordable energy supply. We look forward to working with the Government, Ofgem and industry during this period to ensure the Future System Operator is set up for success and the effective delivery of this critical role for society and the economy.

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Introduction

Our Future Energy Scenarios (FES) outline four different pathways for the future of the whole energy system out to 2050. Each one considers how much energy we might need and where it could come from, to build a picture of the ways in which Great Britain could reach net zero.

FES is widely used by the ESO and our stakeholders across the energy industry to:

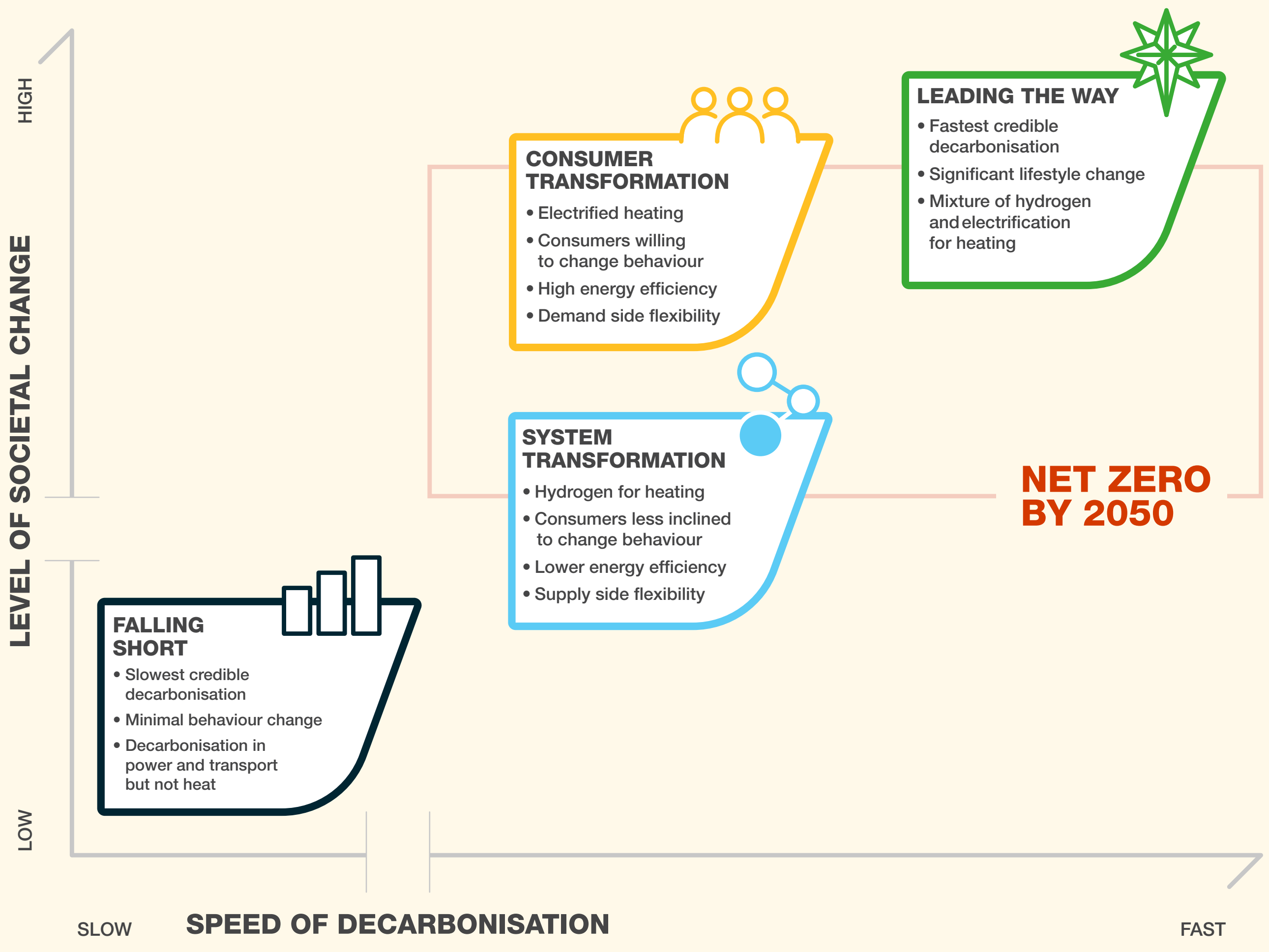
- Underpin energy network investment
- Support financial investment decisions for net zero technologies
- Inform national and regional policy
- Carry out academic research and innovation

Stakeholder feedback is collected as part of our comprehensive engagement work and incorporated alongside our own analysis and research to ensure that our data and insights remain robust and up to date. We also endeavour to make our data publicly available.

FES in Five provides you with the Key Messages and statistics from the full FES report, which can be found here.

Recent events have sparked recognition of the importance of a faster transition to net zero, to support energy security and reduce exposure to volatile international fossil fuel prices, by harnessing abundant renewable and low carbon resources.

The Scenario Framework



In line with stakeholder feedback, the scenario framework remains the same as in FES 2022. All scenarios meet the relevant security of supply standards across the different fuels in every year.

More on the Future Energy Scenarios

Consumer Transformation

The net zero target is met in 2050 with measures that have a greater impact on consumers and is driven by higher levels of consumer engagement. They will have made extensive changes to improve their home's energy efficiency and most of their electricity demand will be smartly controlled to provide flexibility to the system. A typical homeowner will use an electric heat pump with a low temperature heating system and an Electric Vehicle (EV). The system will have higher peak electricity demands managed with flexible technologies including energy storage, Demand Side Response (DSR) and smart energy management.

System Transformation

The net zero target is met in 2050. The typical domestic consumer will experience less change than in Consumer Transformation as more of the significant changes in the energy system happen on the supply side. A typical consumer will use a hydrogen boiler with a mostly unchanged heating system and an Electric Vehicle or a fuel cell vehicle. They will have had fewer energy efficiency improvements to their home and will be less likely to provide flexibility to the system. Total hydrogen demand is high, mostly produced from natural gas with Carbon Capture, Usage and Storage (CCUS).

Leading the Way

The net zero target is met by 2046. We assume that GB decarbonises rapidly with high levels of investment in world-leading decarbonisation technologies. Our assumptions in different areas of decarbonisation are pushed to the earliest credible dates. Consumers are highly engaged in reducing and managing their own energy consumption. This scenario includes more energy efficiency improvements to drive down energy demand, with homes retrofitted with measures such as triple glazing and external wall insulation, and a steep increase in smart energy services. Hydrogen is used to decarbonise some of the most challenging areas such as some industrial processes, produced mostly from electrolysis powered by renewable electricity.

Falling Short

This scenario does not meet the net zero by 2050 target. There is still progress on decarbonisation compared to today, however it is slower than in the other scenarios. While home insulation improves, there is still heavy reliance on natural gas, particularly for domestic heating. Electric Vehicle take-up grows more slowly, displacing petrol and diesel vehicles for domestic use. Decarbonisation of other vehicles is slower still with continued reliance on diesel for Heavy Goods Vehicles (HGVs). In 2050 this scenario still has significant annual carbon emissions, short of the 2050 net zero target.

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Key Message

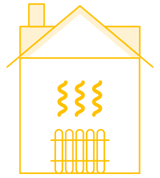
Policy and delivery

Key recommendations

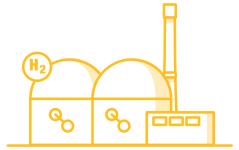
Measures to reduce uncertainty are needed to ensure the UK delivers a net zero energy system that is affordable and secure.

Recent global events have led to high energy prices and concerns over security of supply. Global economic pressure is increasing the need to reduce uncertainty for investors and consumers, and avoid delays in delivery and installation of net zero technologies.

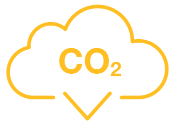
Hydrogen and gas CCUS power generation capacity reaches 12.3 GW by 2035 in System Transformation



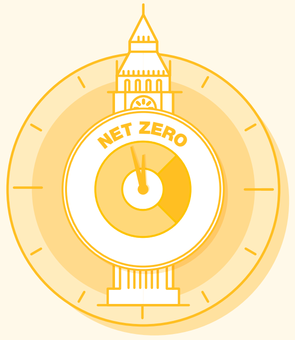
Residential heat pump installations range from 0.3 million to 1.5 million per year across all scenarios in 2030



12-56 TWh of inter-seasonal storage is required across our net zero scenarios in 2050



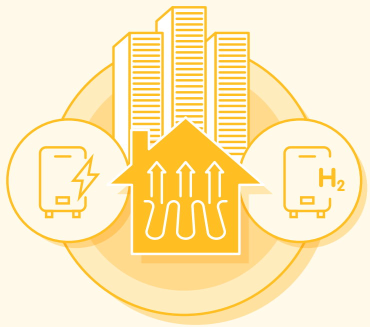
Removal of BECCS and DACCS from our net zero scenarios leaves residual emissions of 18-49 $MtCO_2e$ annually in 2050



Net zero policy

The Government must continue to reduce investment uncertainty around the business case for net zero-critical technologies such as Long Duration Energy Storage (LDES), transport and storage of hydrogen and CO_2, low carbon dispatchable power and negative emissions technologies.

A clear plan is needed for the funding and development of hydrogen and Carbon Capture Use and Storage (CCUS) projects beyond delivery of the first industrial clusters.



Focus on heat

There is a need to accelerate both the uptake of heat pumps and the decision on whether hydrogen will be used for large scale heating.

Further policy support and incentives are needed to increase uptake rates of heat pumps.

A clear decision on hydrogen for heating should be accelerated and heat pump targets and incentives reviewed accordingly.

Negative emissions

Negative emissions technology is required to enable a net zero energy system.

Robust emissions accounting standards are needed to ensure both investor and public confidence in a negative emissions market.

Further demonstration of innovative emissions reduction technologies is required to reduce uncertainties over technology and commercial readiness.

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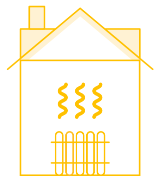
Key Message

2 Consumer and digitalisation

Consumer behaviour and digitalisation are pivotal to achieving net zero but easy access to information and the right incentives are critical.

Consumer engagement plays a crucial role in the transition towards a sustainable and secure energy system, while reducing energy costs. Removal of barriers to participation enables consumers to become an active partner in the delivery of net zero.

A 9.5 TWh drop in electricity demand was seen between 2021 and 2022 in response to the cost of living crisis



Heat demand reduction of 127 TWh is achieved in Leading the Way in 2050 through higher building standards and behavioural change

The Demand Flexibility Service event on 23rd January 2023 delivered a 324 MW reduction in demand over a half hour period

Residential demand for lighting and appliances reduces to 47 TWh in Leading the Way in 2050

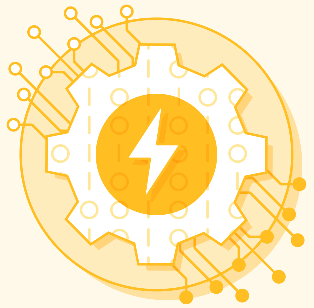
Key recommendations

Empowering change

There is a need to instil trust for consumers in energy markets and emerging technologies and services. Consumers must be guided on how they can best engage in the energy transition. This could be delivered through an information campaign, supported by a national advice service.

Ensuring transparent, comparable and simple information about products and services would enable consumers to benefit from cost savings and maximise the system benefits.

Consumers will be further incentivised to greater levels of demand reduction through market changes that simplify the consumer journey and reward flexible energy use.



Digitalisation and innovation

Innovation and smart digital solutions are required to enable consumers to further benefit from energy savings at times when they are not able to manually adjust their demand. Key to this will be developing consumer trust in data privacy.

Smart digital solutions will enable effortless consumer participation in the delivery of a net zero whole energy system. Mandating technology manufacturers to include smart capability in their products is key to the delivery of smart homes.

Successful delivery of Market-wide Half Hourly Settlement will enable consumers to participate more readily in demand flexibility.

Energy efficiency

Further emphasis is needed to harness the potential of efficiency improvements in reducing energy demand. Energy efficiency improvements to the construction and technology within our homes must be accelerated.

Radical overhaul is required to achieve this both in new build and existing housing stock. Targets for minimum energy efficiency standards should extend beyond the private rented sector.

Additional incentives and grants must be considered to ensure energy efficiency improvements are available for more consumers.

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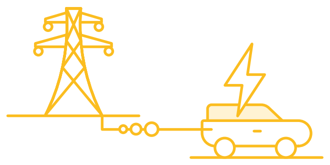
3 Key Message

Markets and flexibility

Improved market signals and new distributed flexibility solutions are key to managing a secure, net zero energy system at lowest cost to the consumer.

Delivery of the required growth in flexibility will depend on key enablers such as market reform, digitalisation and innovation.

47 GW of electricity storage is operating by 2050 in Consumer Transformation, with 18 GW connected at distribution level

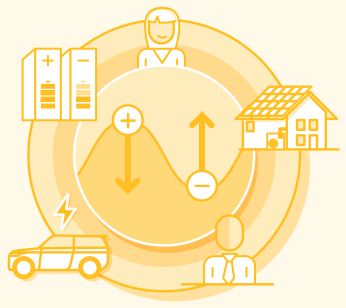


After the 2030s, V2G could contribute 20 GW of Demand Side Response in Leading the Way

Demand Side Response from residential, industrial and commercial consumers reaches over 13 GW in Consumer Transformation in 2050

Smart charging of EVs contributes a 60% reduction in peak demand in Leading the Way in 2050

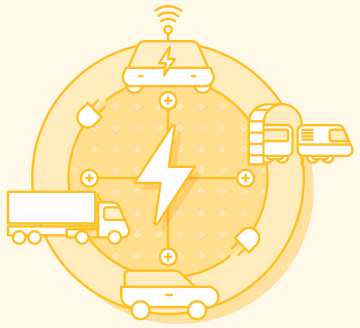
Key recommendations



Distributed flexibility

The growth of distributed flexibility (flexible energy demand resources, such as storage, EVs, heat pumps and thermal storage, connected at distribution level) is a key enabler of net zero.

A market-wide strategy, including government targets, policy support and market reform is required to facilitate the significant growth in distributed flexibility. This can also provide incentives for consumers to provide Demand Side Response, such as smart charging of EVs.



Transport flexibility

Across all future scenarios, cars are primarily electrified, increasing electricity demand and requiring strategies to manage how they are charged and how system costs are recovered.

Increasing implementation of smart EV charging is a low-regret action to help reduce the impact on peak demand and reduce curtailment of renewables.

Commercial trials of Vehicle-to-Grid (V2G) business models are required to explore their viability and contribution to system services. It also requires current challenges to be addressed, such as the slow rollout of charging infrastructure.

Locational signals

Market reform is needed to provide the real-time locational signals required to optimise decisions on when and where flexible energy sources are used.

Improving locational signals has the potential to deliver significant cost savings to consumers and support the delivery of decarbonisation targets.

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Key Message

4 Infrastructure and whole energy system

Key recommendations

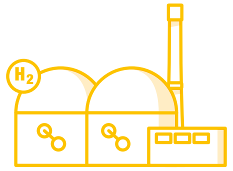
Benefits to the whole energy system must be considered to optimise the cost of delivering net zero technology and infrastructure.

Strategic coordination and whole system thinking across all sectors is required to achieve decarbonisation targets and avoid unmanageable network constraints and potential curtailment.

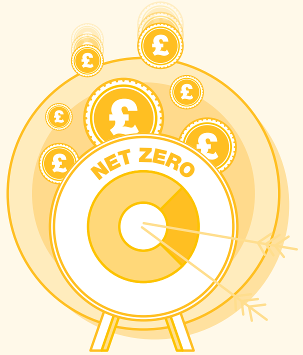
Across the net zero scenarios, at least 89 GW of wind and solar is connected in 2030, with 119 GW in Leading the Way

Between 7.6 and 21.3 TWh of electricity is curtailed in the net zero scenarios in 2030

There are over 38 GW of network-connected electrolysers in 2050 in Leading the Way



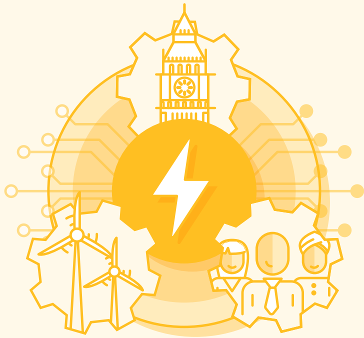
56 TWh of hydrogen storage is required in System Transformation by 2050



Strategic network investment

Strategic and timely investment across the whole energy system is critical to achieving decarbonisation targets and minimising network constraints.

Accelerated coordinated planning and delivery of strategic, whole system investment through Centralised Strategic Network Planning (CSNP) will require continued collaboration and engagement with the Government, Ofgem, local communities, industry and the supply chain. Strategic network investment should be enabled through reforms to the planning system, while also balancing social and environmental impacts.



Connections reform

Connections reform is required to facilitate quicker, more coordinated and efficient connection to the GB electricity system to deliver net zero.

Continued collaboration between Government, Ofgem and industry is critical.

The process must be future-proofed to facilitate potential prioritisation of connections for delivery of whole system benefits and net zero in line with strategic network planning.

Location of large electricity demands

New large electricity demands, including electrolysers to convert electricity to hydrogen, will be required for net zero. This demand has significant potential to deliver whole system flexibility and reduced network constraints alongside decarbonisation.

A coherent strategy is required to ensure large electricity demands are located where they provide the biggest benefit to consumers and the whole energy system.

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The routes to net zero

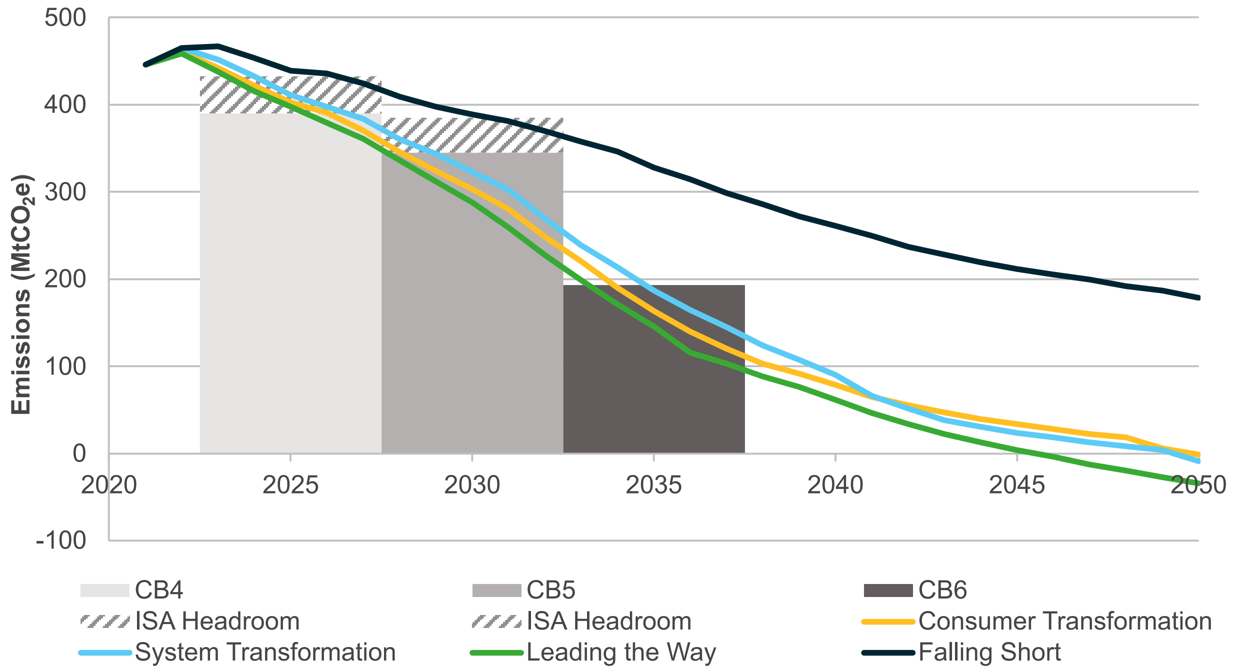
Our net zero scenarios show that it is possible to reach net zero before 2050. However, significant uncertainty remains in the delivery of key net zero technologies out to 2050, so it is critical to address these in the short-term. Bringing forward the decarbonisation of key levers to the transition, like the decarbonisation of heat, and acting now on no regret options, such as V2G, will reduce the risk of falling short.

Leading the Way reaches net zero by 2046 and achieves annual net emissions of -34 $MtCO_2e$ by 2050, which equates to removal of Greenhouse Gas (GHG) emissions from the atmosphere. Consumer Transformation and System Transformation reach net zero by 2050. Falling Short does not get to net zero by 2050, resulting in 179 Mt of residual emissions.

Net zero power sector emissions are reached in 2034 for Leading the Way and Consumer Transformation: one year earlier than the 2035 target. System Transformation reaches net zero power sector emissions by 2035 and Falling Short in 2046.

It is also important to look at short-term decisions and policy implementation, alongside longer-term potential, in order to get a view of current progress towards any one of our net zero scenarios. This varies across sectors and fuels but allows for additional insight into what is needed to achieve net zero. This informed the recommendations we set out in our Key Messages.

Figure 1. Net greenhouse gas emissions and carbon budgets



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FES key comparison chart 1

This chart contains a selection of recent policy targets and ambitions in relation to net zero and energy security and highlights how they compare to the different scenarios. Analysis for FES 2023 commenced before the publication of several key policy documents and does not signify that any individual targets cannot be met across the range of scenarios.

CT Consumer Transformation | LW Leading the Way | ST System Transformation | FS Falling Short | Policy (shaded cells)

		2022	By 2025	By 2030	By 2035	By 2040	By 2045	By 2050	Maximum potential by 2050
Emissions	Meets 2050 Net Zero target	446 $MtCO_2e$ emissions[1]						Policy: CT LW ST	Net zero by 2046 LW
	Meets 5th carbon budget			Policy: CT LW ST	FS				
	Meets 6th carbon budget				Policy: CT LW ST			FS	-34 $MtCO_2$ in 2050 LW
Electricity supply	50 GW of offshore wind	13 GW		Policy: LW	CT ST	FS			115 GW CT
	Up to 5 GW floating offshore wind	0 GW			Policy: CT LW ST	FS			20 GW CT
	Up to 70 GW of solar	14 GW			Policy	LW		CT	91 GW LW
	No unabated natural gas-fired generation capacity (subject to security of supply)	36 GW			Policy	LW	ST	CT	LW reaches this target in 2036 LW
	Up to 24 GW nuclear generation capacity	6.1 GW						Policy	16 GW CT
Energy storage	100 GWh of non-battery electrical storage	2.5 GW / 26 GWh			LW		CT		134 GWh LW
	30 GWh of battery electrical storage	2.7 GW / 3.1 GWh		LW		CT		ST	63 GWh LW
Interconnectors	18 GW capacity	7.4 GW		Policy	CT LW				26.8 GW (LW reaches 17.5 GW in 2030) LW
Hydrogen	10 GW low carbon hydrogen production capacity in operation or construction	<1 GW		Policy: LW	ST		CT		83 GW ST
	5 GW hydrogen production from electrolysis	<1 GW		Policy: LW	ST	CT			55 GW LW
	Up to 2 GW of low carbon hydrogen production capacity in operation or construction[2]	<1 GW	Policy	ST LW	CT				83 GW ST
Natural Gas	40% reduction in gas consumption			Policy: LW	CT	ST			97% reduction CT
Bioenergy	*Strategy expected this year – bioresource supply consistent with CCC Carbon Budget 6*								

1 2021 emissions, latest data available
2 FES scenarios on this chart represent operation rather than construction as well as a mix of CCS enabled and electrolytic hydrogen

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FES key comparison chart 2

This chart contains a selection of recent policy ambitions in relation to net zero and energy security and highlights how they compare to the different scenarios. Analysis for FES 2023 commenced before the publication of several key policy documents and does not signify that any individual targets cannot be met across the range of scenarios.

CT Consumer Transformation
LW Leading the Way
ST System Transformation
FS Falling Short
Policy

		2022	By 2025	By 2030	By 2035	By 2040	By 2045	By 2050	Maximum potential by 2050
Transport	Sales of petrol and diesel cars and vans banned	1.6m petrol and diesel cars and vans sold		CT LW	ST	FS			37m battery electric cars and vans FS
	Zero tailpipe emissions for all new cars	7% of cars sold			CT LW ST	FS			Zero ICE cars still on the road CT ST LW
	Zero tailpipe emissions for all new HGVs	<1% of HGVs sold				CT LW ST	FS		Zero ICE HGVs still on the road CT ST LW
Heating	600,000 heat pumps installed per year	Approximately 60,000		CT LW	ST	FS			1.6m per year CT
	4 in 5 homes not using natural gas boiler as primary heat source	1 in 5				LW	CT ST		100% CT ST LW
Natural Gas	Gas grid connection for new homes ends	>60%	CT LW		ST				0% LW
Industry	Annual industrial hydrogen demand over 10 TWh	<0.5 TWh		ST	LW		CT		88 TWh ST

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Key statistics

	2022	2030				2035				2050				
Emissions		CT	ST	LW	FS	CT	ST	LW	FS	CT	ST	LW	FS	**Emissions**
Annual average carbon intensity of electricity (g CO_2/kWh)	183	66	68	38	104	-14	0	-7	50	-41	-40	-13	-10	Annual average carbon intensity of electricity (g CO_2/kWh)
Net annual emissions ($MtCO_2e$)	463	303	323	288	389	164	187	145	328	-1	-9	-34	178	Net annual emissions ($MtCO_2e$)
Electricity														**Electricity**
Annual demand (TWh)[1]	286	344	325	369	326	467	400	479	373	726	678	671	570	Annual demand (TWh)[1]
Electricity demand for heat (TWh)	19	27	21	28	24	43	21	45	30	80	60	65	69	Electricity demand for heat (TWh)
Peak demand (GW)[2]	58	69	63	63	67	87	73	82	78	113	101	98	114	Peak demand (GW)[2]
Total installed capacity (GW)[3]	112	187	172	207	159	266	225	287	189	386	344	387	285	Total installed capacity (GW)[3]
Wind and solar capacity (GW)	35	102	89	119	70	158	134	178	94	239	213	249	149	Wind and solar capacity (GW)
Interconnector capacity (GW)	7	12	12	17	12	19	16	24	15	21	16	27	16	Interconnector capacity (GW)
Total storage capacity (GW)[4]	3	21	17	31	13	37	20	52	15	64	41	72	26	Total storage capacity (GW)[4]
Total storage capacity (GWh)[5]	29	60	51	118	44	116	59	149	47	166	116	197	62	Total storage capacity (GWh)[5]
Total vehicle-to-grid capacity (GW)[6]	0	2	0	3	0	14	1	28	0	34	16	39	8	Total vehicle-to-grid capacity (GW)[6]
Natural Gas														**Natural Gas**
Annual demand (TWh)[7]	986	571	671	533	828	384	581	331	700	29	364	74	513	Annual demand (TWh)[7]
1-in-20 peak demand (GWh/day)	5550	3985	4823	3368	5331	2593	3858	1987	4950	282	2086	509	3962	1-in-20 peak demand (GWh/day)
Residential demand (TWh)[8]	311	240	276	227	325	151	204	117	294	0	1	0	147	Residential demand (TWh)[8]
Imports (TWh)	598	411	460	353	559	285	422	227	436	25	358	55	356	Imports (TWh)
Hydrogen														**Hydrogen**
Annual demand (TWh)	0	3	38	40	1	19	151	80	3	120	446	242	14	Annual demand (TWh)
Residential hydrogen demand for heat (TWh)	0	0	0	5	0	0	49	14	0	0	119	29	0	Residential hydrogen demand for heat (TWh)
CCS enabled hydrogen production (TWh)[9]	0	0	25	7	0	1	104	26	1	1	218	26	6	Blue hydrogen production (TWh)[9]
Electrolytic hydrogen production (TWh)[10]	0	3	11	32	1	17	26	48	2	111	175	177	8	Green hydrogen production (TWh)[10]
Bioresources														**Bioresources**
Bioresource demand (TWh)	127	103	113	147	130	169	156	139	137	219	228	160	148	Bioresource demand (TWh)

1. Customer demand plus on-grid electrolysis meeting GB hydrogen demand only, plus losses, equivalent to GBFES System Demand Total in ED1 of data workbook
2. Refer to data workbook for further information on winter average cold spell (ACS) peak demand
3. Includes all networked generation as well as total interconnector and storage capacity (including vehicle-to-grid available at winter peak)
4. Includes vehicle-to-grid capacity available at winter peak
5. Excludes vehicle-to-grid
6. Less capacity will be available during winter peak 5-6pm due to vehicle usage
7. Includes shrinkage, exports, biomethane and natural gas for methane reformation
8. Residential demand made up of biomethane and natural gas
9. Blue hydrogen is created using natural gas as an input, with CCUS
10. Green hydrogen is created via electrolysis using zero carbon electricity (this figure does not include hydrogen produced directly from nuclear or bioenergy)

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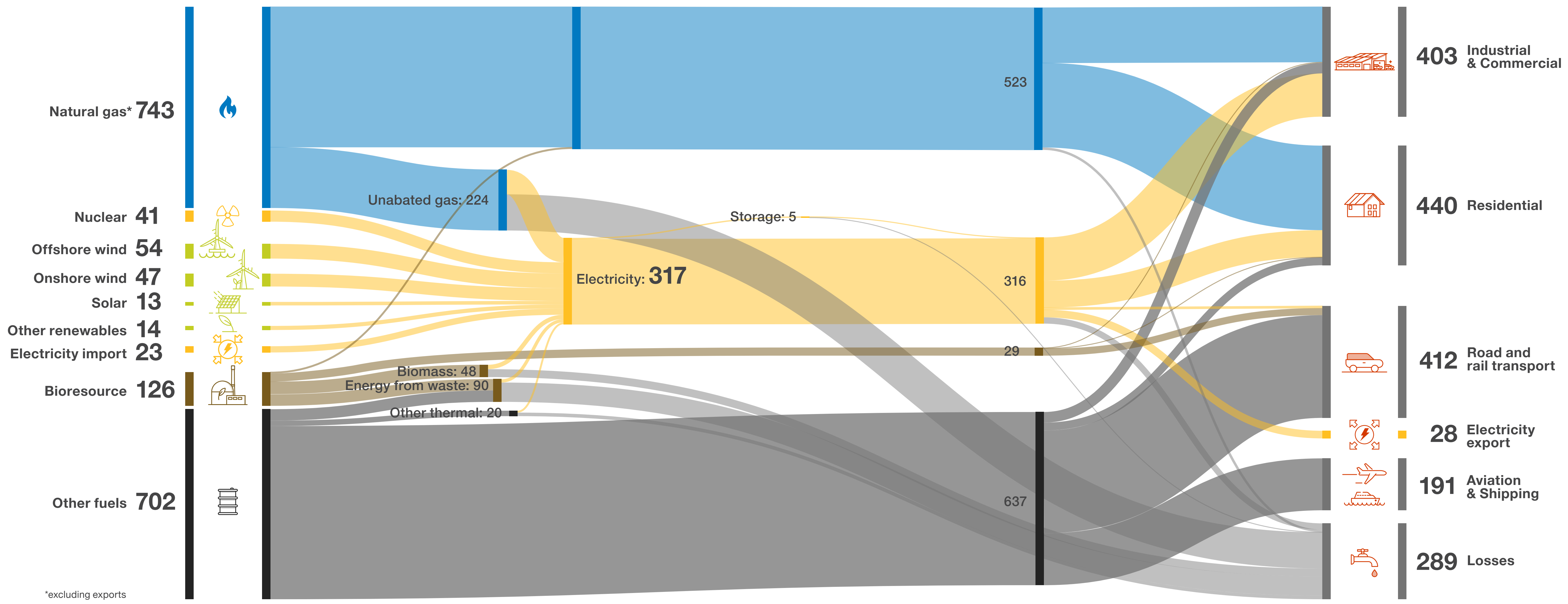
Energy supply and demand

2022 (1763 TWh)

- Fossil fuels make up 82% of total energy supply in 2022
- Petroleum supplies 93% of road transport demand and 100% of aviation and shipping demand
- Interactions between different fuels are low, demonstrating limited whole system thinking



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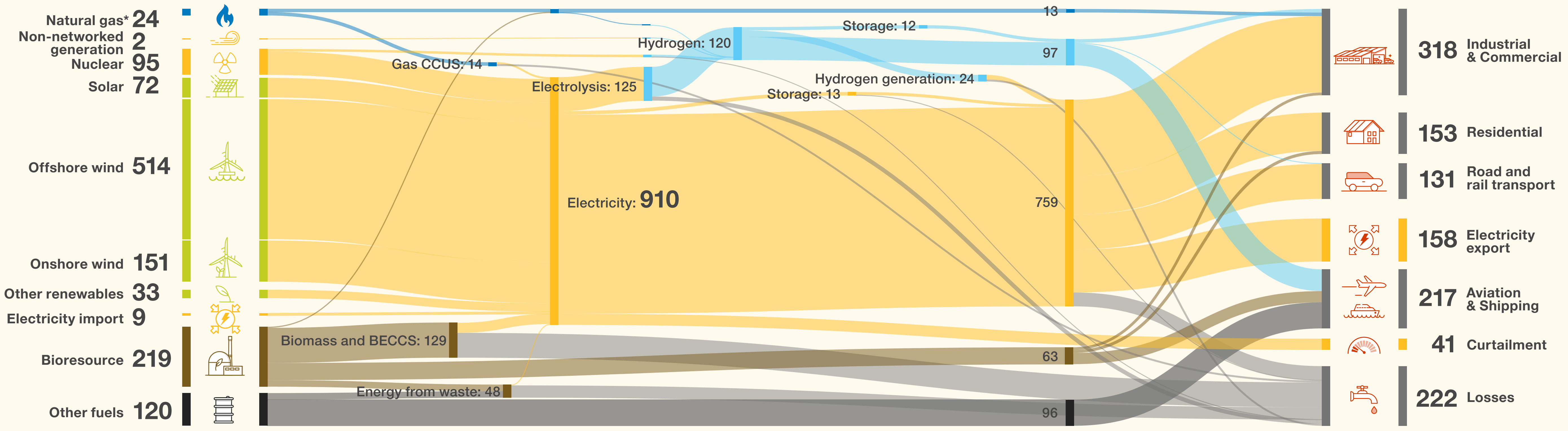
Energy supply and demand in 2050

Consumer Transformation (1239 TWh)

- Home heating, transport and industry largely electrified
- High levels of energy efficiency combined with large-scale electrification lead to lowest consumer energy demands across the scenarios excluding aviation
- High levels of renewable generation with low hydrogen production leads to the highest levels of electricity curtailment and export of any of the scenarios
- Two thirds of hydrogen produced is used in aviation, with another 20% used for electricity generation, to help meet security of supply

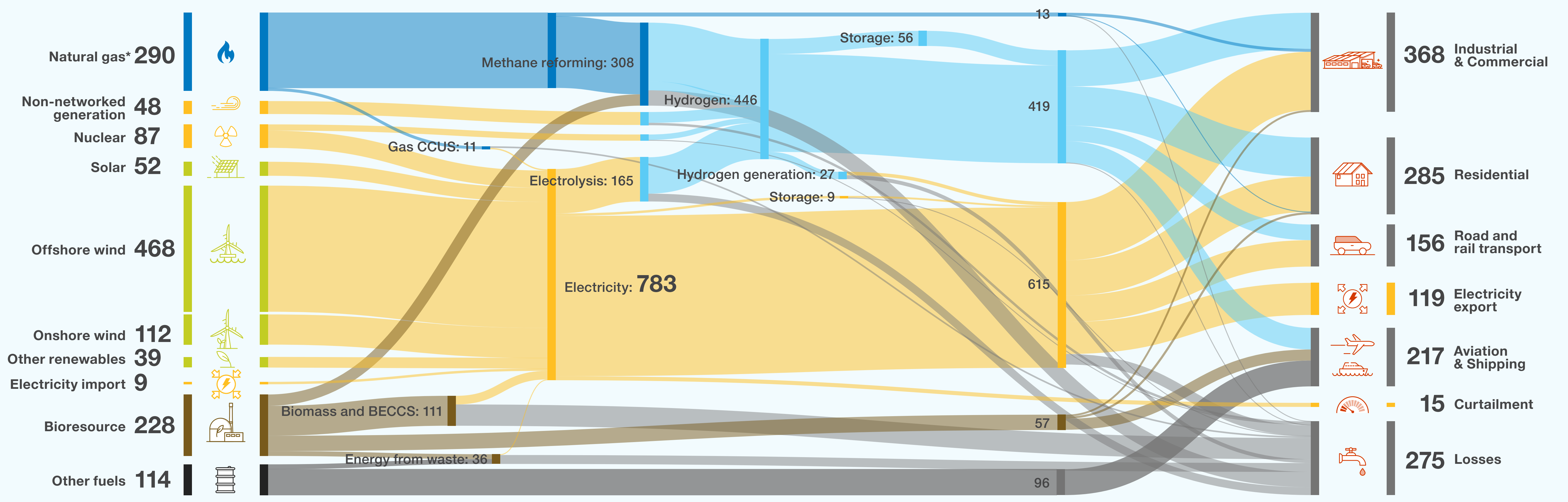


*excluding exports

Energy supply and demand in 2050

System Transformation (1447 TWh)

- Highest proportion of hydrogen across the scenarios with widespread use for home heating, industry and HGVs
- High natural gas use for hydrogen production from methane reformation
- Highest level of bioresource use - bioenergy used to produce both hydrogen and electricity, mostly alongside CCUS for negative emissions
- Electricity production more than double that of today, partly to meet highest demand for electrolysis

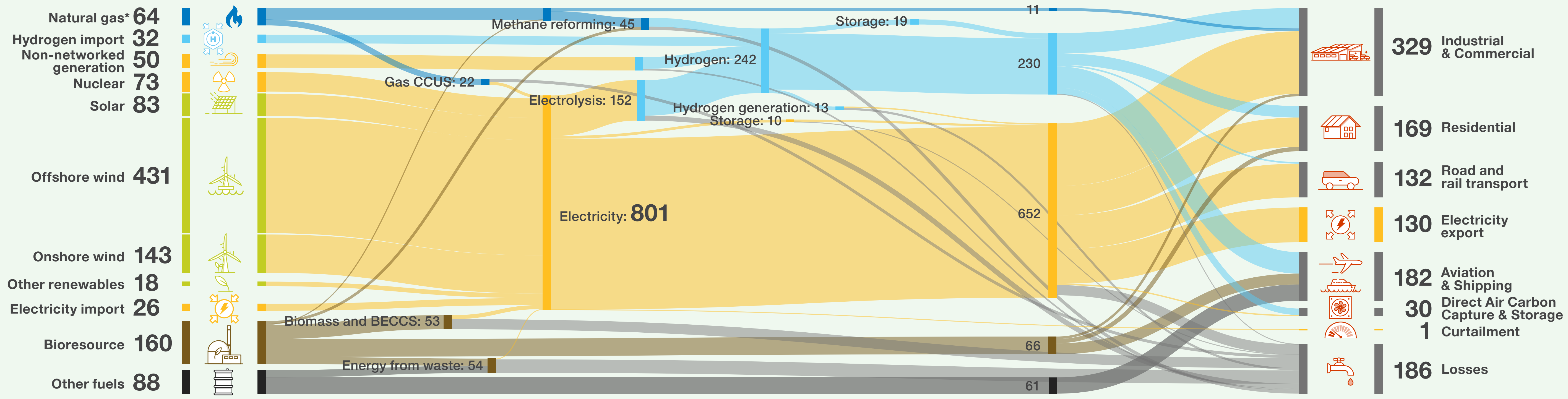


*excluding exports

Energy supply and demand in 2050

Leading the Way (1167 TWh)

- Combination of hydrogen and electricity used in industry and to heat homes
- Lowest level of electricity curtailment across the scenarios, due to the highest level of flexibility
- Lower bioresource use for negative emissions due to emissions reduction from land use change and Direct Air Carbon Capture and Storage (DACCS)
- Zero carbon fuels meet two thirds of aviation demand



*excluding exports

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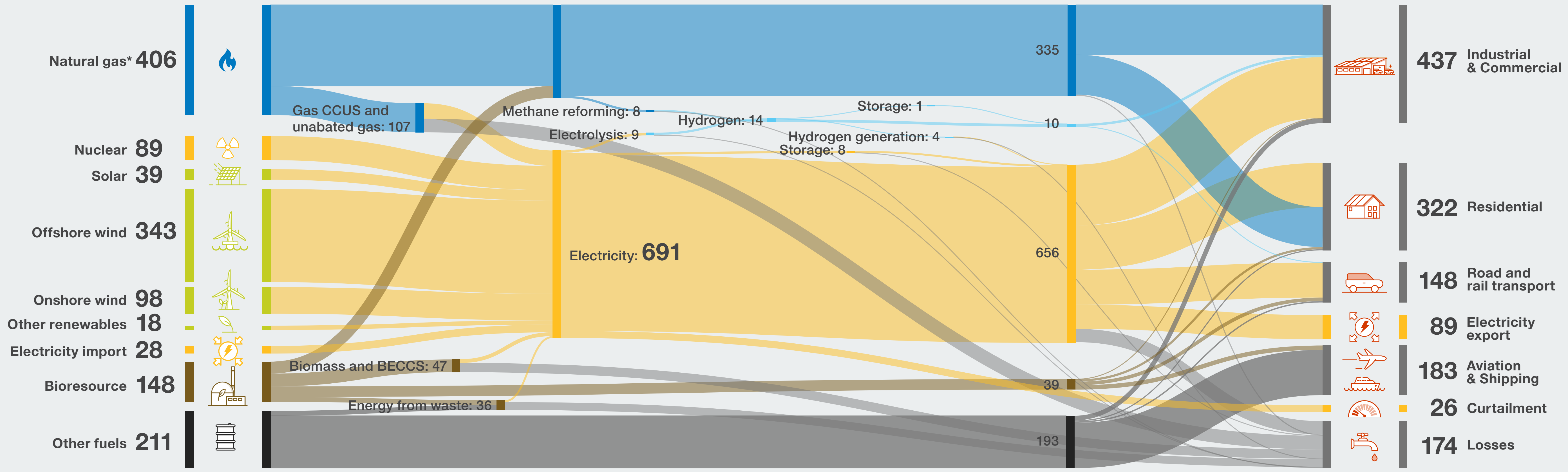
Energy supply and demand in 2050

Falling Short (1380 TWh)

- Continued high usage of natural gas, particularly for domestic heating and industry
- Small private vehicles fully electrified (including some plug-in hybrids) whilst HGVs rely on fossil fuels
- Low use of hydrogen as production isn't decarbonised
- Highest total end-user energy demand due to minimal increase in energy efficiency measures and reliance on inefficient fossil fuels



*excluding exports

Thanks for your time, we hope you found FES 2023 interesting and useful!

Continuing the Conversation

In terms of next steps, we now move into our main stakeholder engagement stage of the FES cycle, using your comments and questions about FES 2023 to inform our future analysis and insights. We're also increasing the regional focus of our work, and would especially welcome your local insights.

Similar to previous years, we will be using FES 2023 as a basis for the next iteration of 'FES - Bridging the Gap to Net Zero'. If you'd like to know more, please click here.

Ways to connect and stay in touch

Keep an eye out for any surveys, energy articles and engagement opportunities via our FES newsletter. If you are not already subscribed, you can do so via subscribers.nationalgrid.co.uk, the ESO website nationalgrideso.com or use the FES email address opposite.

Email us with your views on FES or any of our future of energy documents at: fes@nationalgrideso.com and one of our team members will be in touch.

Access our current and past FES documents, data and multimedia at: nationalgrideso.com/future-energy/future-energy-scenarios.

Get involved in the debate on the future of energy and join our LinkedIn group Future of Energy by National Grid ESO.

For further information on ESO publications please visit: nationalgrideso.com.

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