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Document 3

13 November 2017

3rd Round Table for Studying Energy Situations: A UK perspective

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What the UK Climate Change Act requires

- **Section 1**

  It is the duty of the Secretary of State to ensure that the net UK carbon account for the year 2050 is at least 80% lower than the 1990 baseline.

- **Section 4**

  1) It is the duty of the Secretary of State—

     (a) to set for each succeeding period of five years beginning with the period 2008-2012 ("budgetary periods") an amount for the net UK carbon account (the "carbon budget"), and

     (b) to ensure that the net UK carbon account for a budgetary period does not exceed the carbon budget.

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The Climate Change Act sets a framework to drive change

The Climate Change Act

1	**A goal**	**2050 Emissions Target**
2	**A pathway**	**Carbon budgets**
3	**A toolkit**	Requirement that Government brings forward **policies**
4	**A monitoring framework**	**Committee on Climate Change** to monitor progress and suggest changes

Source: Committee on Climate Change

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The UK 2050 target: required global emission reduction

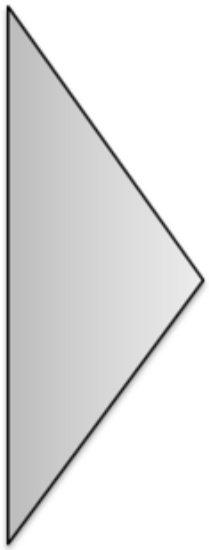
Assessment of damage

Decision rule

- keep temperature change close to 2°C
- and probability of 4°C increase at very low level (less than 1%)

Global trajectories considered

- Early or later peak (2015 vs. 2030)
- 3%/4% annual emissions reduction



Required global emissions reduction of 50%

- 20-24 $GtCO_2e$ emissions in 2050
- 8-10 $GtCO_2e$ in 2100

Source: Committee on Climate Change

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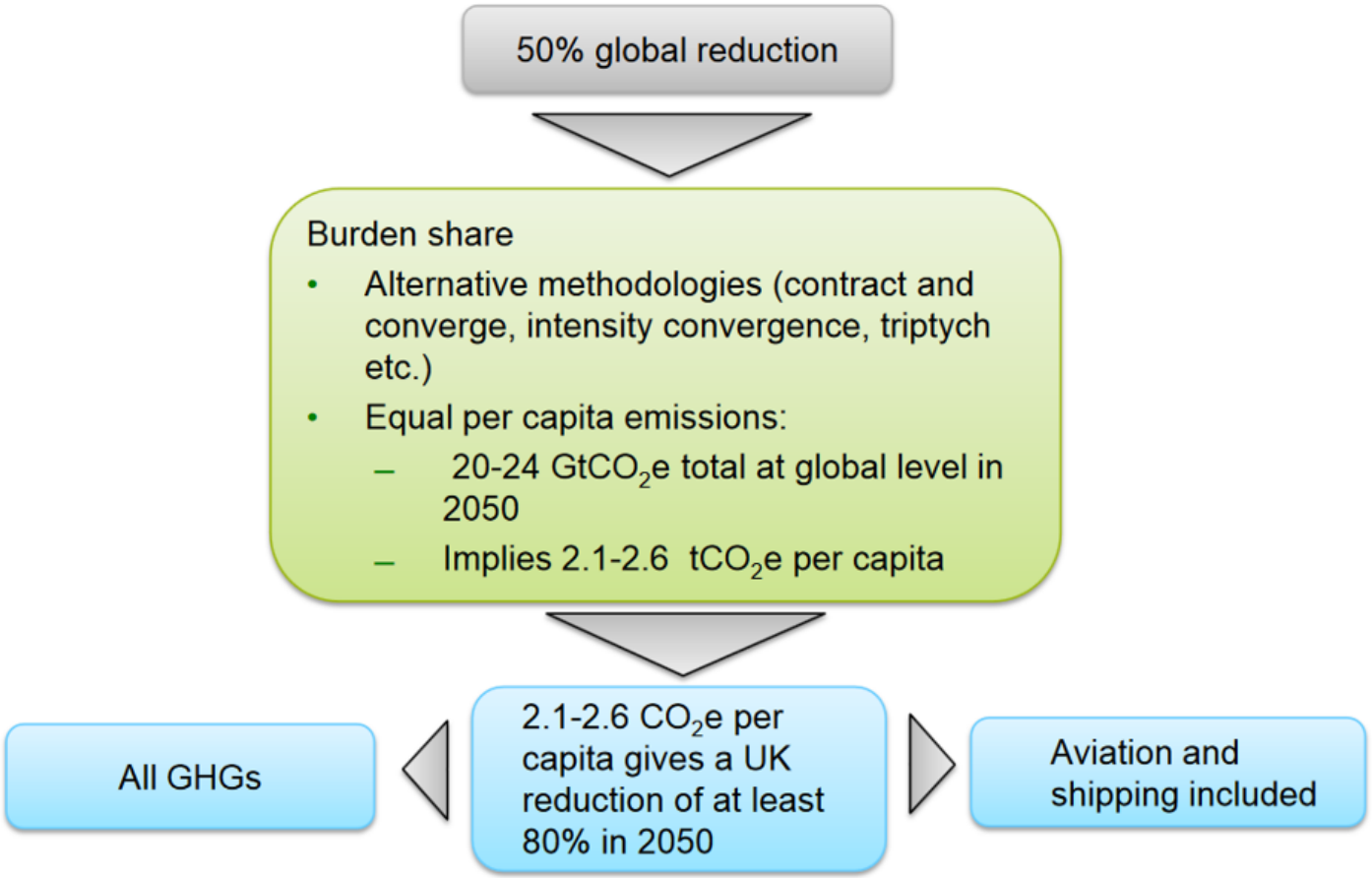
The UK 2050 target: appropriate UK contribution



Source: Committee on Climate Change

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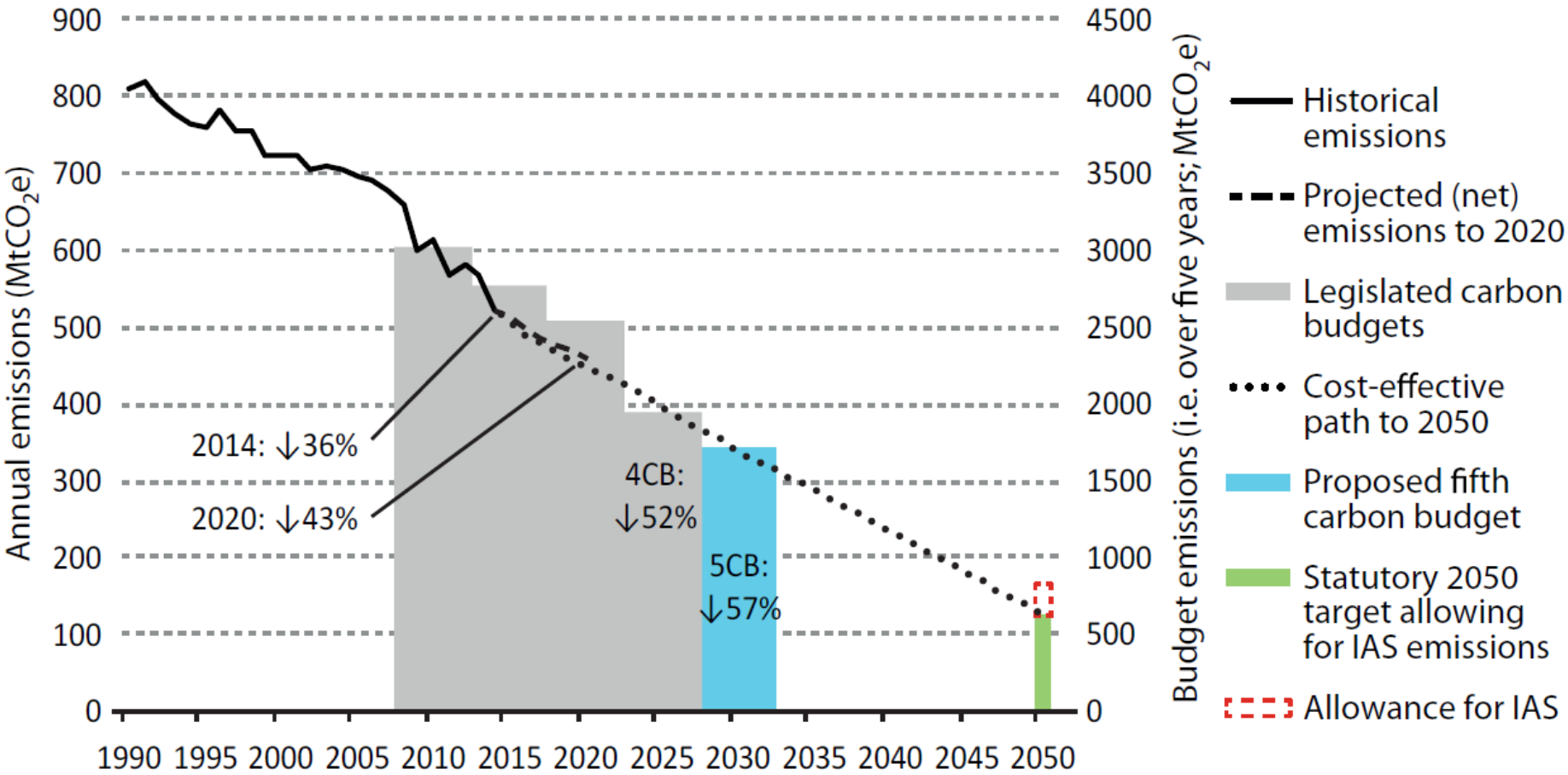
UK carbon budgets and the path to 2050



Source: Committee on Climate Change

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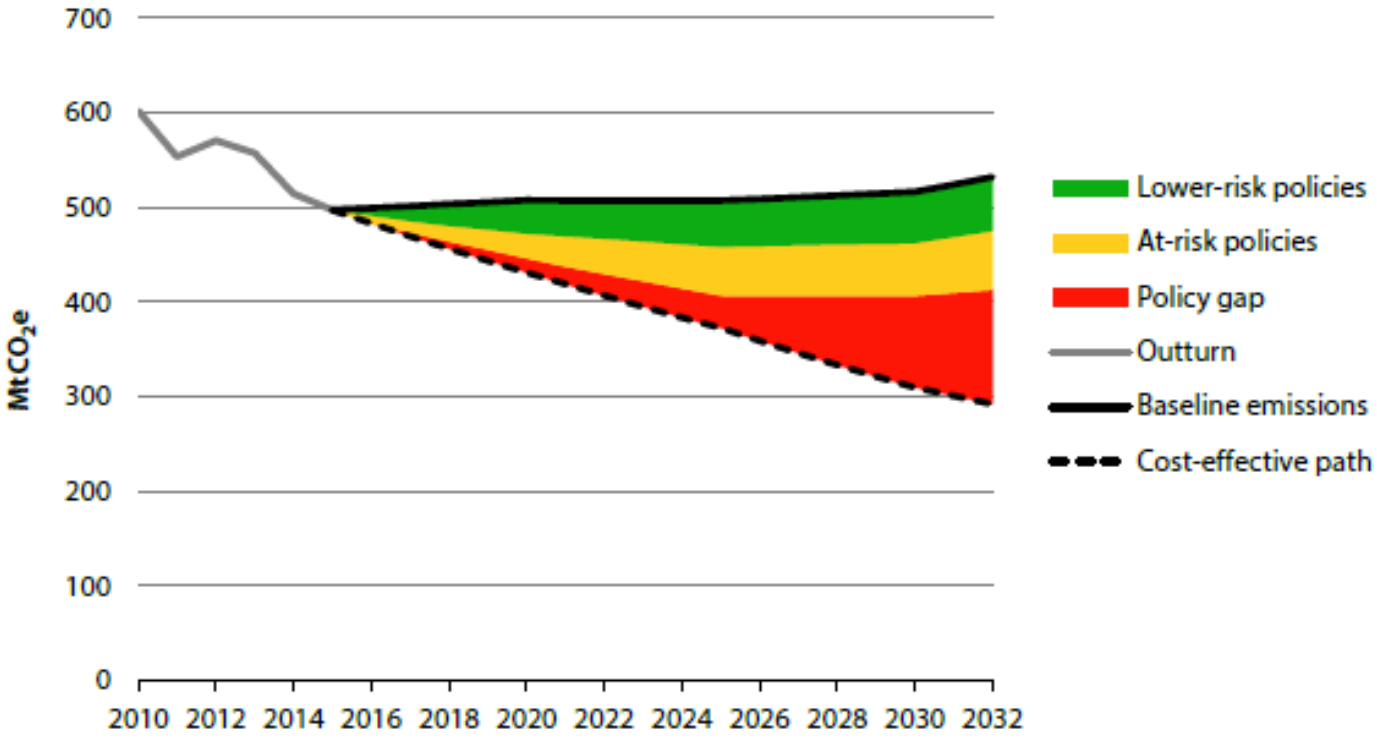
Assessment of current policies against the cost-effective path to meet carbon budgets and the 2050 target



The Government recognises there is a gap and is committed to producing an emissions reduction plan, which will set out how it will meet its carbon targets.

Source: Committee on Climate Change

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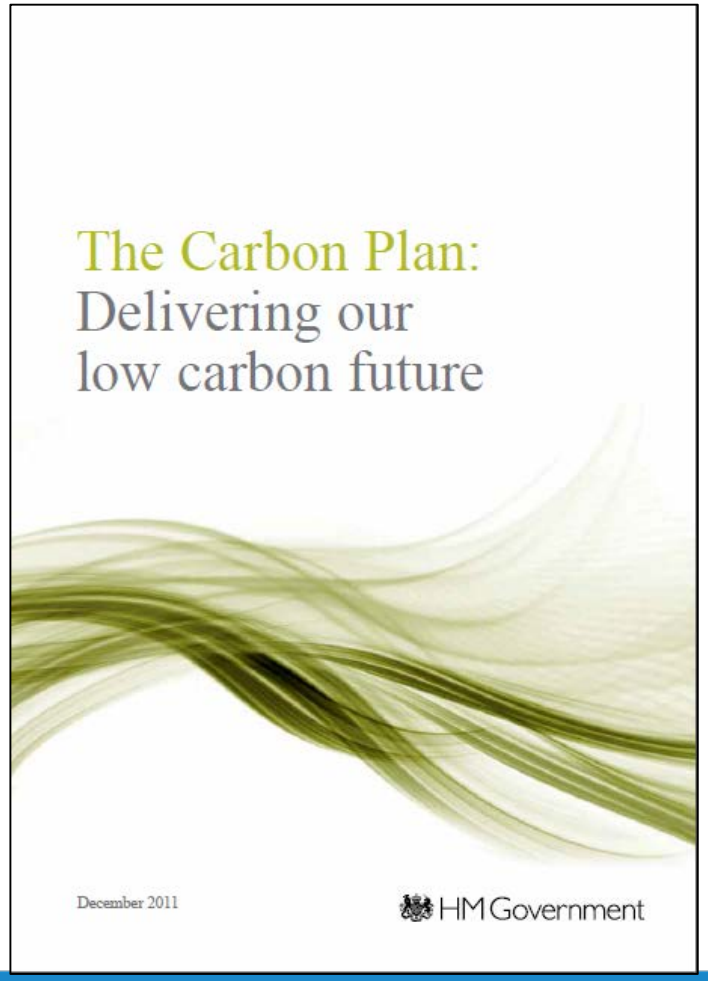
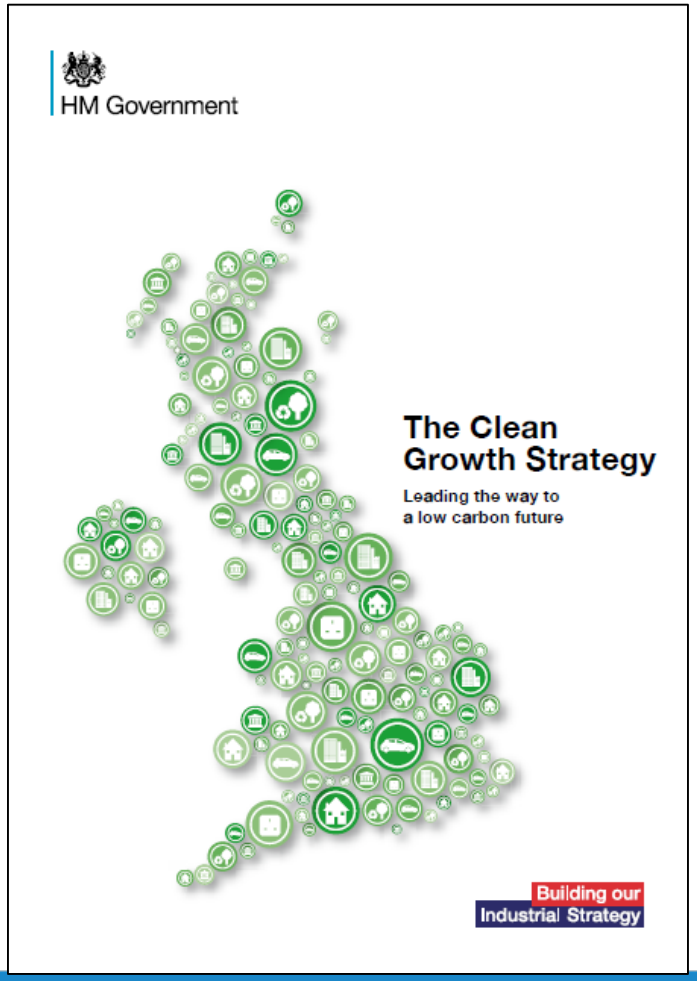
In October 2017, the Clean Growth Strategy (CB5) replaced the 2011 Carbon Plan (CB4)





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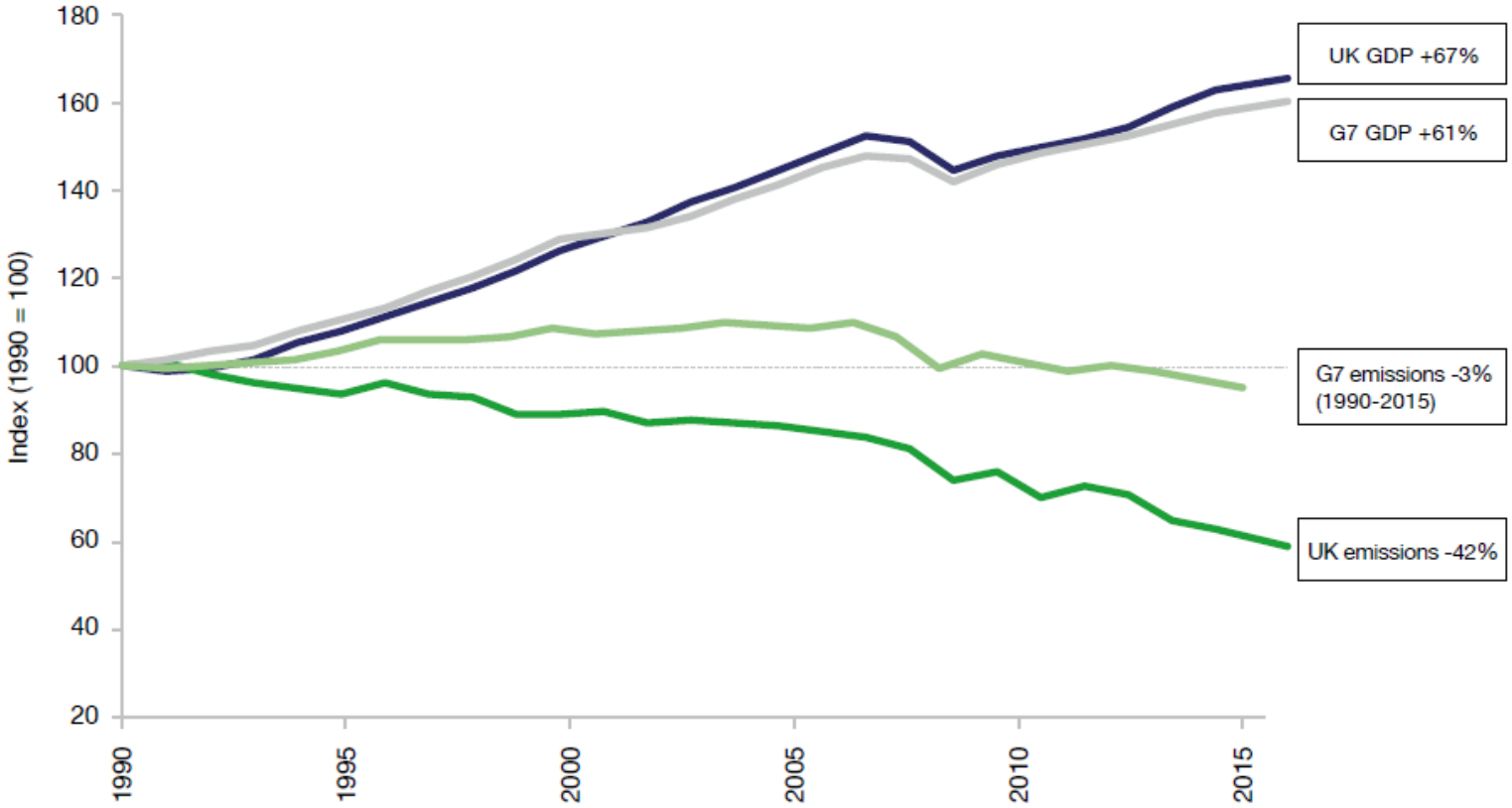
UK has grown the economy and cut emissions faster than the G7



Source: Clean Growth Strategy

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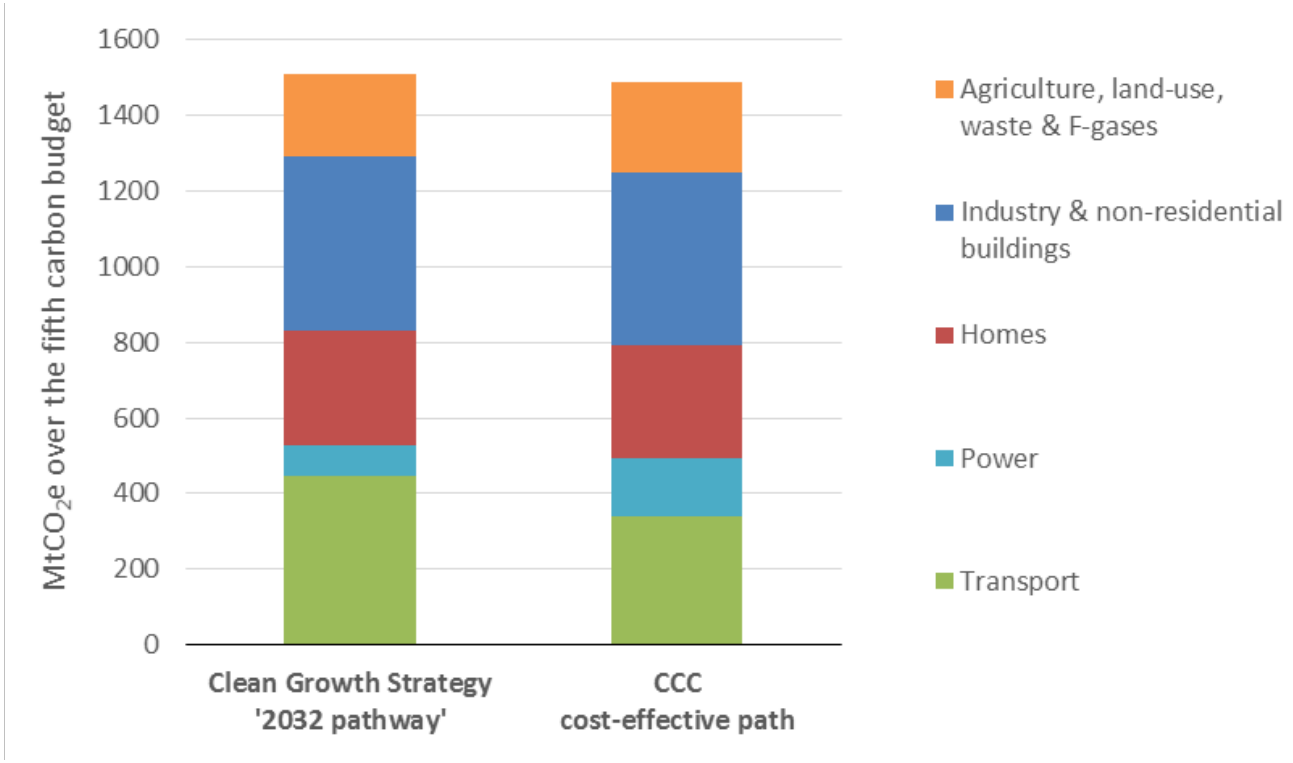
The Government's focus is on achieving CB5 through domestic action in the UK



Source: Committee on Climate Change

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But quantified policies not enough to meet 4th or 5th budgets…

		Carbon Budget				
		1 2008-12	2 2013-17	3 2018-22	4 2023-27	5 2028-32
Budget, cumulative emissions, Mt		3,018	2,782	2,544	1,950	1,725
Average reduction vs 1990 emissions, %		-25%	-31%	-37%	-51%	-57%
Existing policies	Projected emissions, cumulative emissions, Mt	2,982 actual	2,650 E	2,453 E	2,096 E	1,972 E
	Result vs. Budget,%	-1.2%	-4.7%	-3.6%	+7.5%	+14.3%
Existing and new policies and proposals[131]	Projected emissions, cumulative emissions, Mt	2,982 actual	2,650 E	2,453 E	2,066 E	1,892 E
	Result vs. Budget, cumulative emissions, Mt	-36	-132	-91	+116	+167
	Result vs. Budget,%	-1.2%	-4.7%	-3.6%	+6.0%	+9.7%
	Cumulative surplus (+) or deficit (-), Mt		+132	+223	+107	-60

"We are prepared to use the flexibilities available to us to met carbon budgets…if this presents better value for UK taxpayers, businesses and consumers" – i.e. banking over-performance from one carbon budget to the next

Source: Clean Growth Strategy

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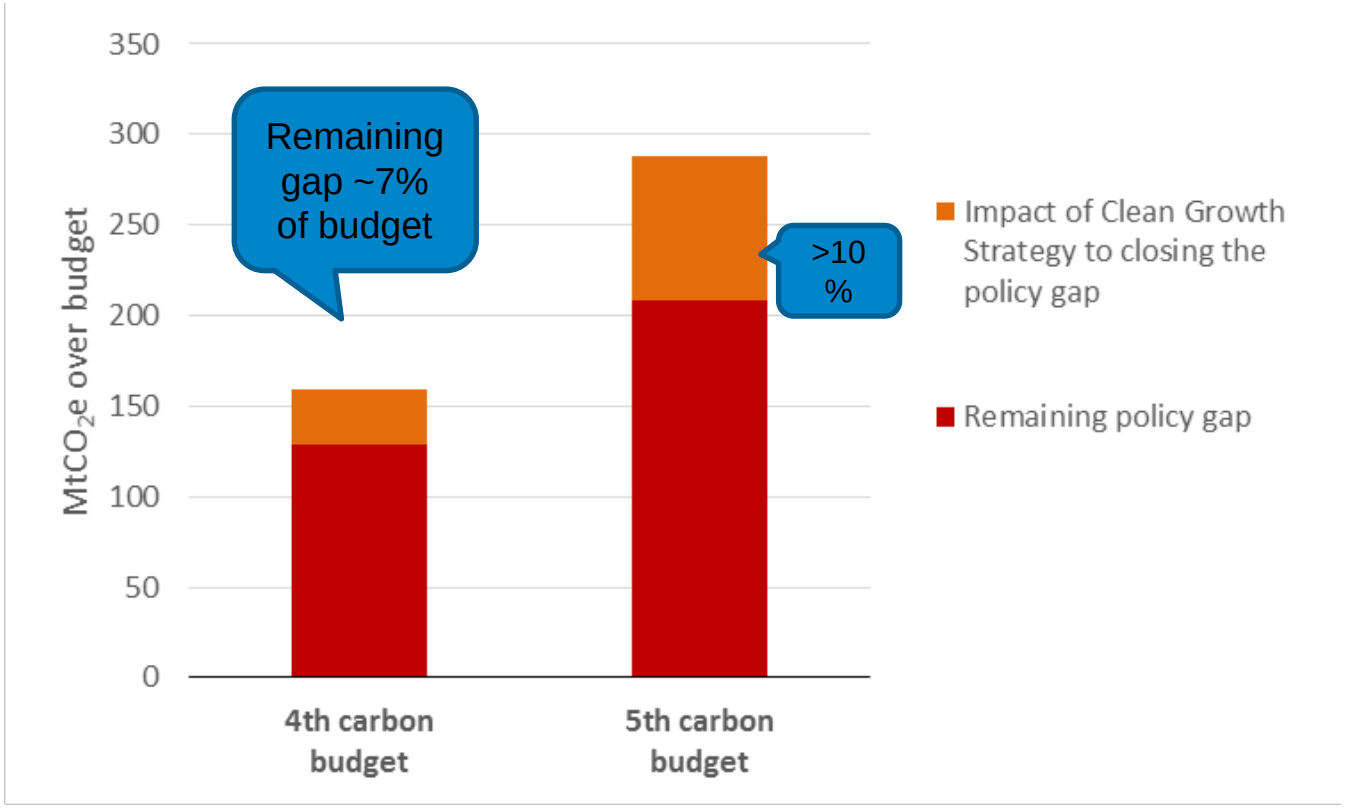
Policies & proposals in the Clean Growth Strategy still leave a large policy gap



Source: Committee on Climate Change

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The Strategy emphasises the role of innovation in closing the policy gap…

- "While we have the option to use flexibilities to fully meet our carbon budgets, the ambitious policies and proposals set out in this Strategy, and the rapid progress and accelerating pace of changes in low carbon technologies so far, suggest we may not need to use this option."
- "It is only through innovation that we will see the cost of clean technologies come down"
- But passive approach? Hydrogen "needs to work as well and as cheaply as current technologies"; "we need to find alternatives to industrial fuels without increasing cost"

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Recovering ground on carbon capture, (use) and storage

- Demonstrate international leadership in carbon capture usage and storage (CCUS), by collaborating with our global partners and investing up to £100 million in leading edge CCUS and industrial innovation to drive down costs

- Work in partnership with industry, through a new CCUS Council, to put us on a path to meet our ambition of having the option of deploying CCUS at scale in the UK, and to maximise its industrial opportunity

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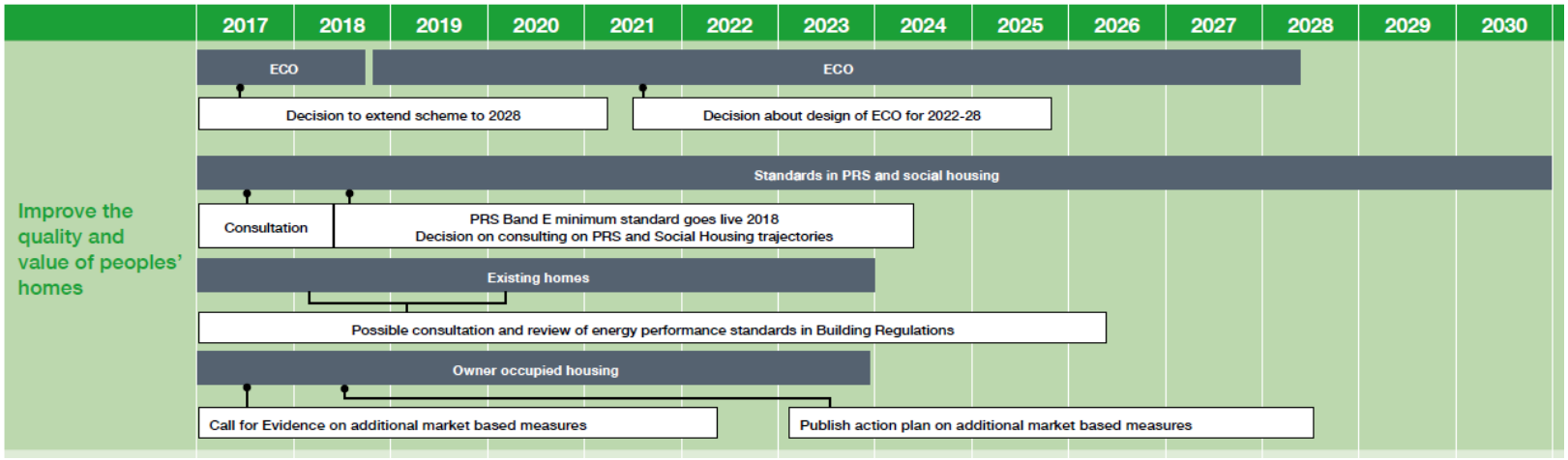
A timetable for policy development

Homes



Improving our Homes		
BEIS	Publish a call for evidence on additional measures to encourage energy performance, particularly amongst owner occupiers.	Published alongside this Strategy
BEIS	Publish a call for evidence on how to reform and streamline the Green Deal framework to make the "Pay as You Save" system more accessible to businesses, while ensuring adequate protection for consumers.	Published alongside this Strategy
BEIS	Work with industry to implement the independent industry led *Each Home Counts review* to improve quality and standards for all retrofit energy efficiency and renewable energy installations.	2017

- **Reinstates a regular Clean Growth Inter-ministerial Group**
- **Commits to an annual updating cycle**

Source: Clean Growth Strategy

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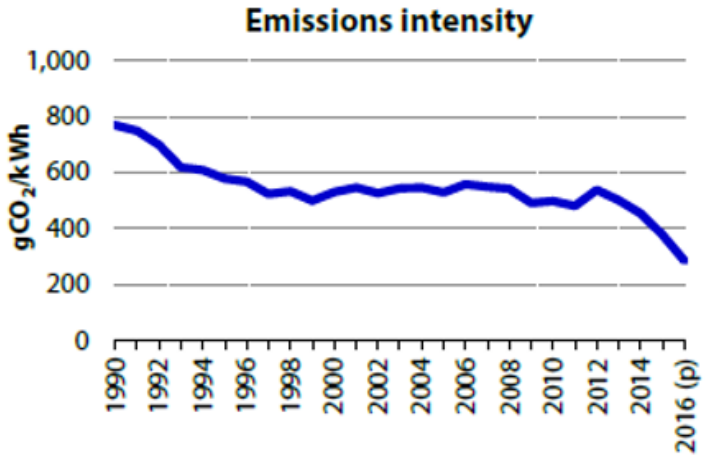
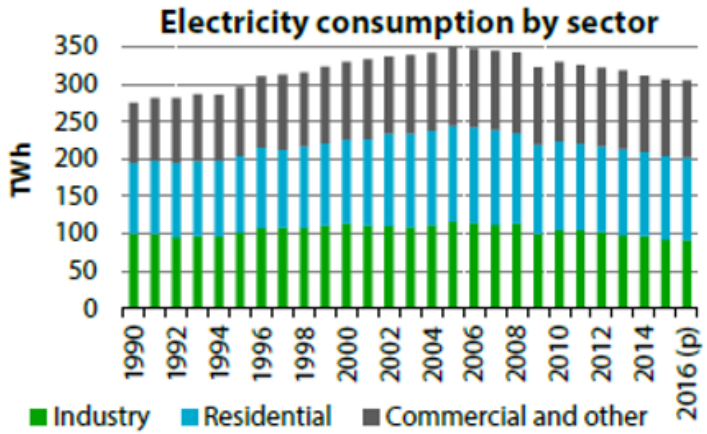
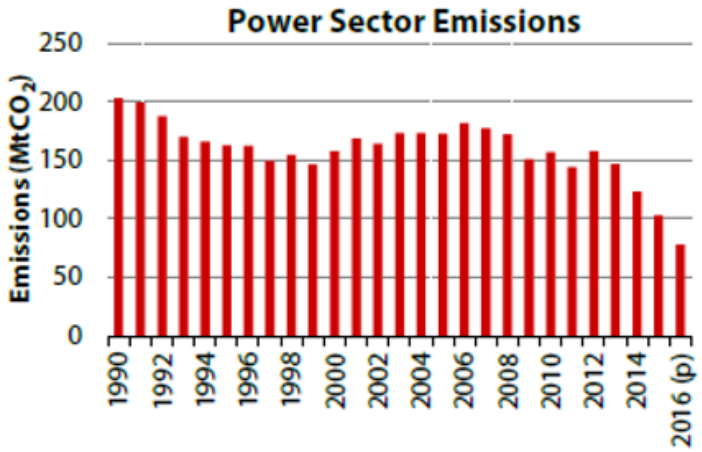
The UK power sector is decarbonising







Source: Committee on Climate Change

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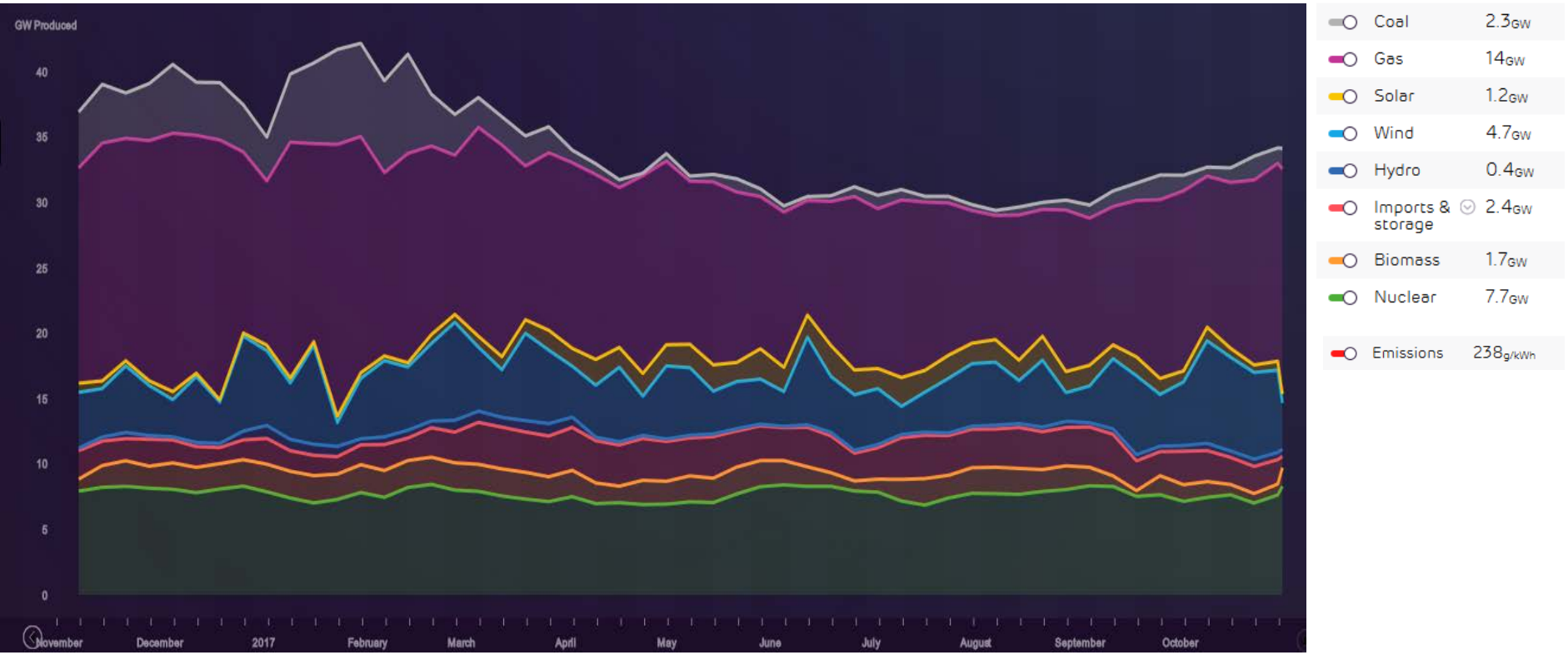
The UK power sector is decarbonising: ~50% zero carbon



Source: electricityinsights.co.uk

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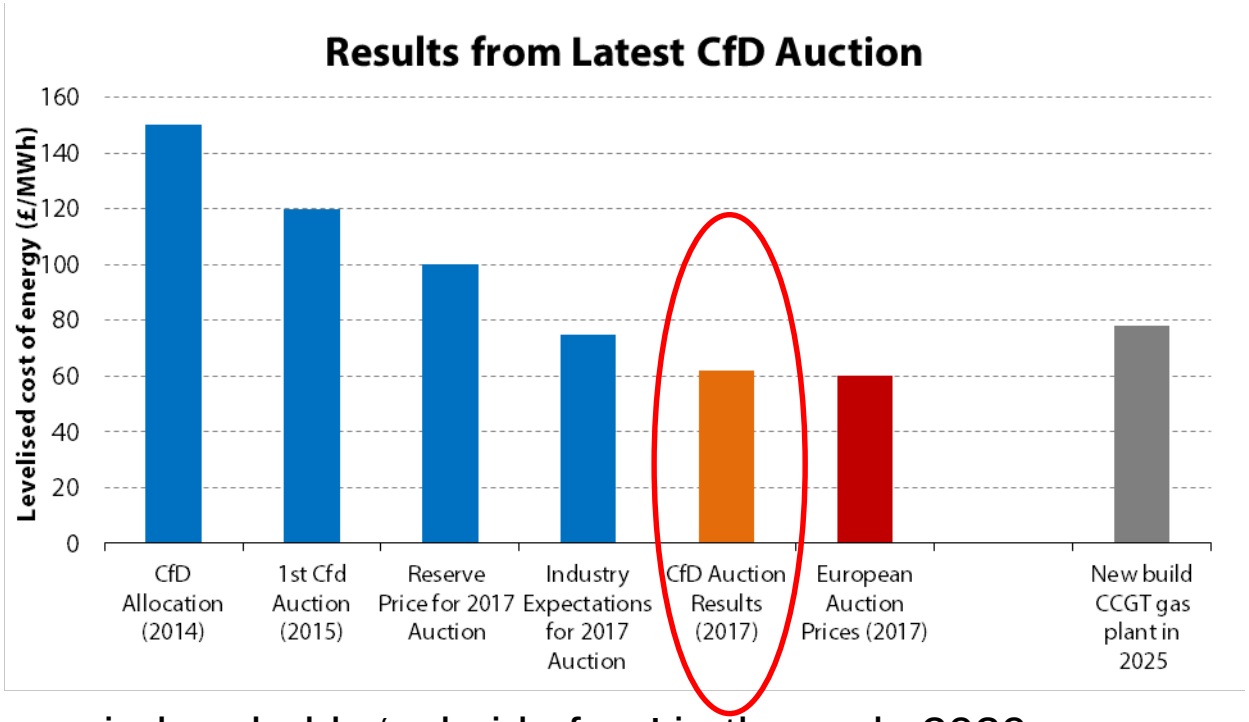
Offshore wind auction results (Sept 2017)

- Auction cleared at record low prices for the UK: £74.50 and £57.50/MWh



- Offshore wind probably 'subsidy-free' in the early 2020s
- Significantly cheaper than nuclear power (£92.50/MWh in 2013) and projected CCS

Source: Committee on Climate Change

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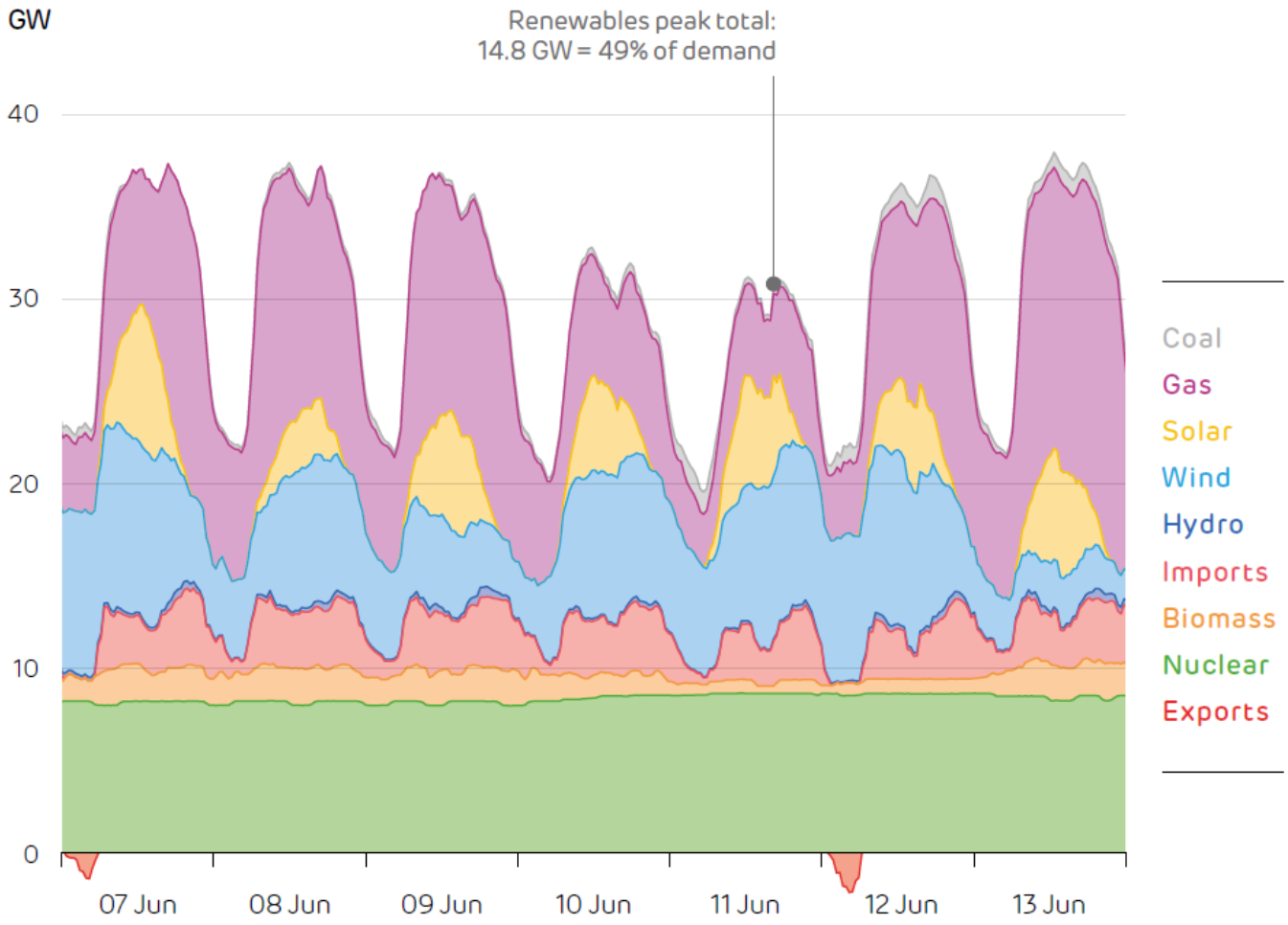
The system is taking the strain – June 2017



Source: Imperial College London

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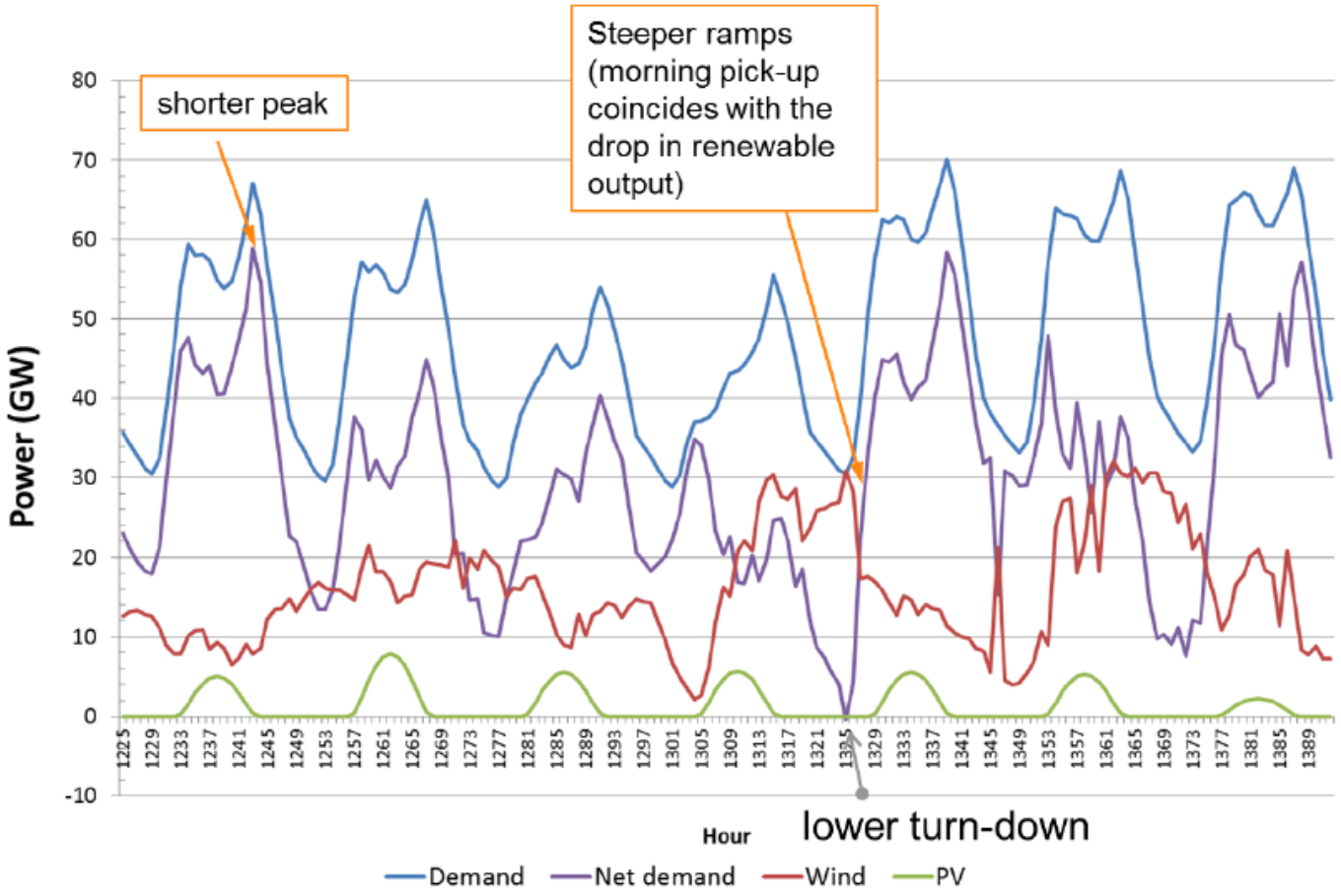
But new challenges mid-century



Source: Imperial College London

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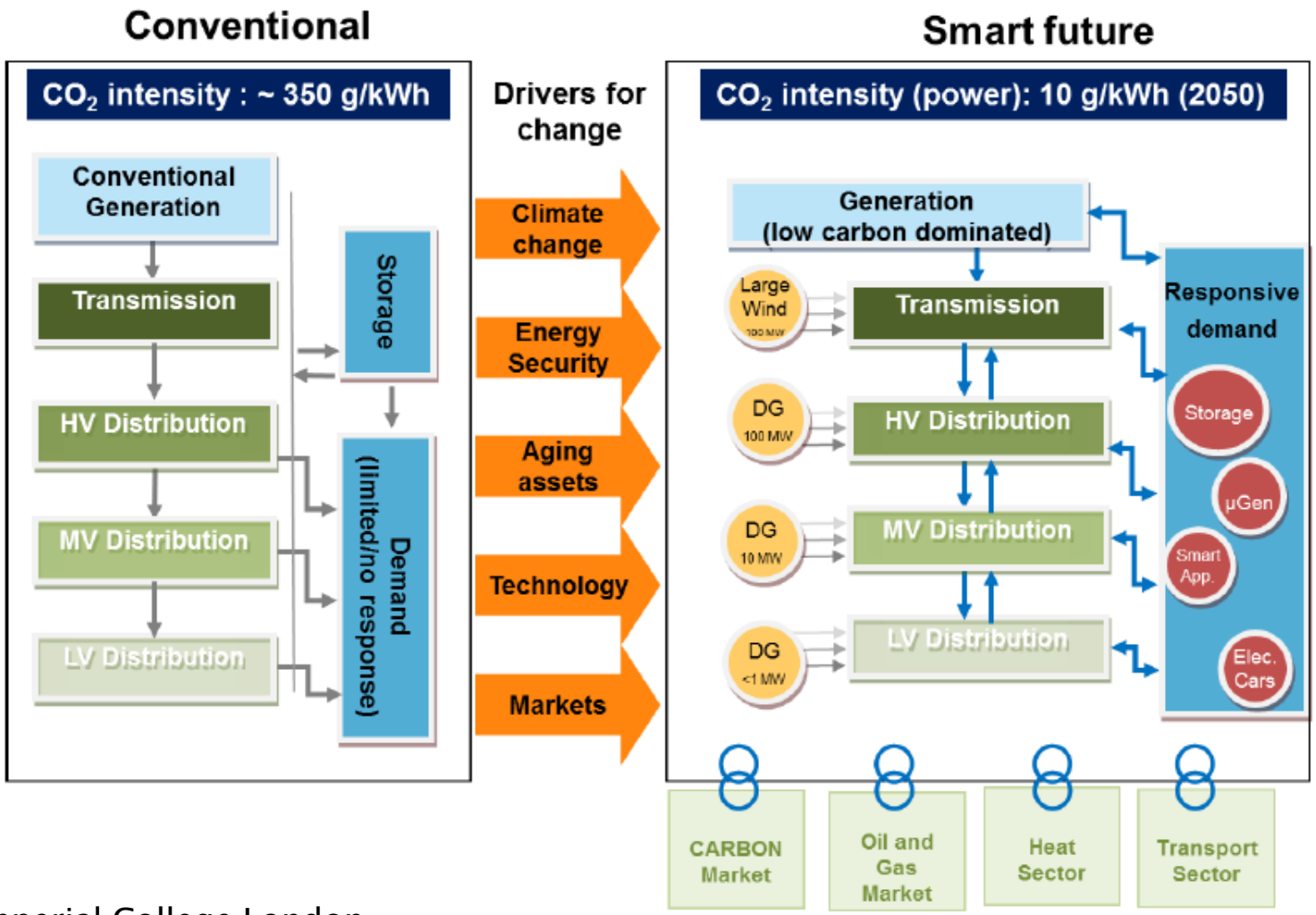
Evolving towards a smart system



Source: Imperial College London

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Where the benefits are to be found

	Scheme	Minimum size*	Notice period	Duration	Regularity**	Value***	Contract
FREQUENCY RESPONSE SERVICES	**Static Firm Frequency Response (FFR)**	10 MW	30 sec	Max 30 min Typically 5 min	10-30	££	Monthly electronic tender
	Dynamic FFR	10 MW	2 sec	Max 30 min Typically 3-4 min	Daily	£££	Monthly electronic tender
	FFR Bridging	< 10 MW	30 sec	30 min	10-30	££	Bilateral contract of 12-24 months to transition in to the FFR market (either Static or Dynamic).
	Frequency Control by Demand Management (FCDM)	3 MW	2 sec	30 min	~10	££	Bilateral contracts for 1-2 yrs. Week ahead notification of daily load able to shed
	Enhanced Frequency Response (EFR)	1 - 50 MW	1 sec Dynamic	Max 15 min Typically 3-4 min		£££	New product – trial tender
RESERVE SERVICES	**Short Term Operating Reserve (STOR)**	3 MW	20 min	2-4 hrs Typically <20 min	Able to deliver 3x per week	£	3 tenders p.a. 'Committed' or 'Flexible' service
	STOR Runway	< 3 MW	20 min	2-4 hrs Typically <20 min	Able to deliver 3x per week	£	Bilateral contract
	Fast Reserve	50 MW	2 min, reaching 50MW in 4 min	15 min		£	Monthly tender
	Demand Turn Up	1 MW	10 min, sometimes requested day-ahead	Min 30 min		£	New product – trial tender

Source: National Grid

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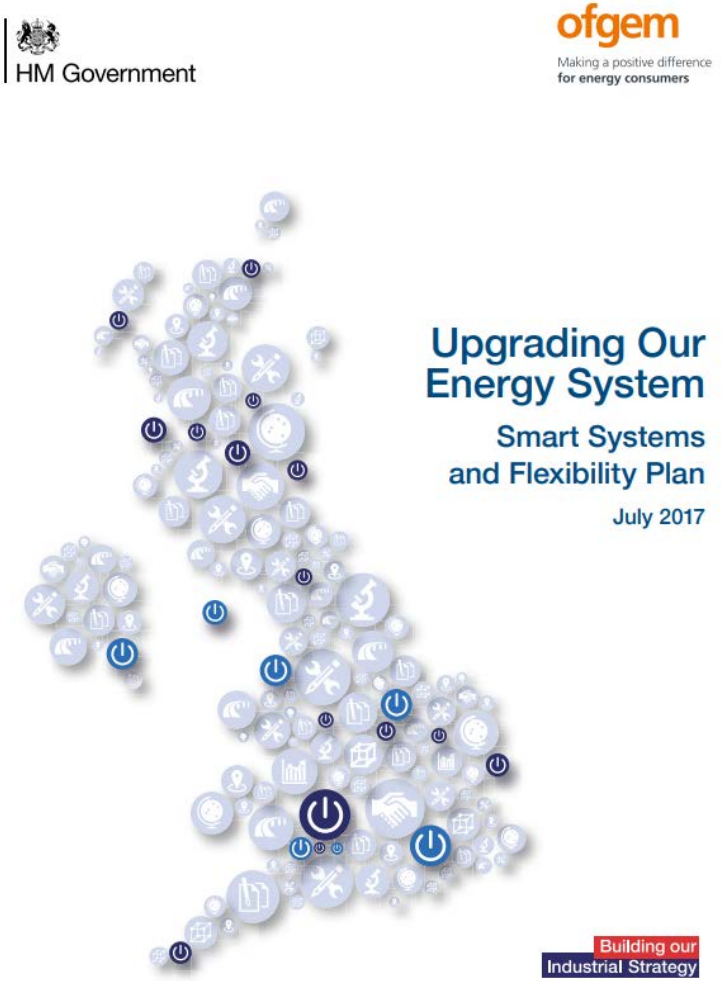
BEIS Smart Energy Plan (July 2017): networks and storage

- The Government will …. amend…. relevant legislation to explicitly define electricity storage as a distinct subset of generation.
- Network operators and industry to continue to improve network connections for storage – in particular, acting now to clarify the connection, increasing transparency about where to connect
- Up to £70m available for innovation in smart energy technologies including storage up to 2021. The Government has announced an investment of £246m for the Faraday Challenge, which is focusing on the design and manufacture of better batteries for electric vehicles.



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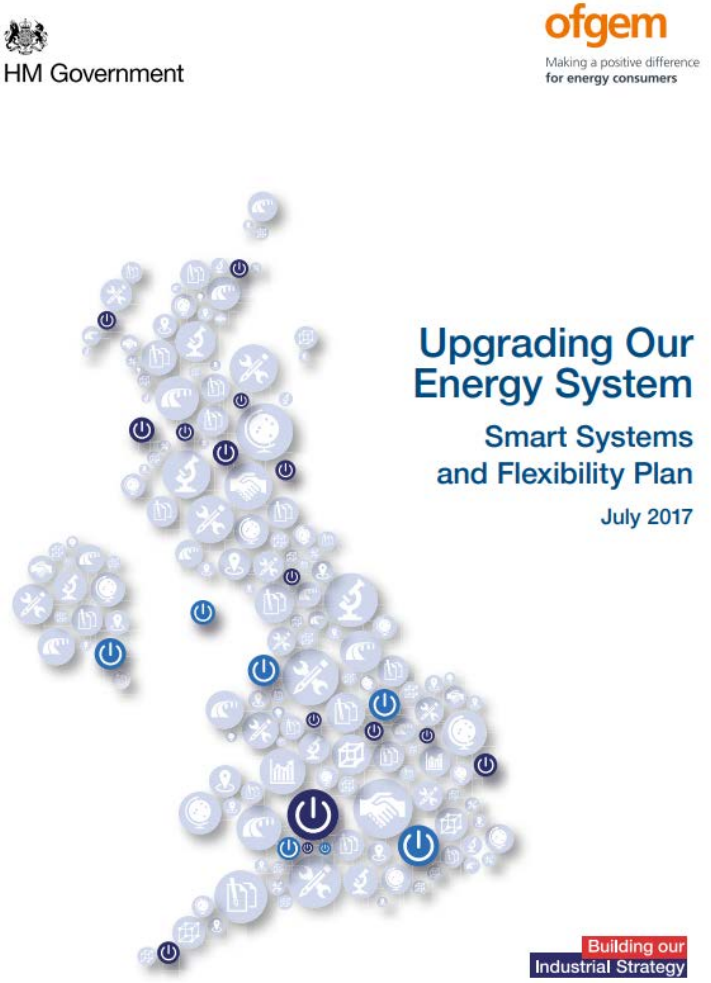
BEIS Smart Energy Plan (July 2017): consumers

- Roll-out of smart meters, removal of the four-tariff cap and delivery of cost-effective elective half-hourly settlement.
- Seeking powers to set standards for smart appliances. ….ensure interoperability of appliances, maintain data privacy and provide cyber security.
- The Automated and Electric Vehicles Bill will include provisions to make regulations for smart electric vehicle charging infrastructure.



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Nuclear in the UK: Conventional and Small Modular Reactors

Conventional reactors

- £92.50/MWh strike price for Hinkley Point C 1500 MW European PWR in 2013. Start date 2025-27.
- Generic Design Assessment complete for Westinghouse AP1000; under way for Hitachi-GE ABWR (due Dec 2017)
- No new nuclear in Scotland

SMRs

- November 2015 Spending Review: £250m nuclear R&D programme including competition to identify the best value SMR design for the UK
- March 2016: competition to gauge market interest among technology developers, utilities, potential investors and funders
- BEIS intends (August 2016) to develop an SMR roadmap, which will summarise the evidence so far, set out the policy framework and assess the potential, for one or more possible pathways for SMRs
- No mention in the *Clean Growth Strategy* (October 2017) or the *Building our Industrial Strategy* Green Paper (January 2017)

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Thank you for your attention!

More:

- www.theccc.org.uk
- www.gov.uk/government/publications/clean-growth-strategy
- www.electricinsights.co.uk
- www.gov.uk/government/publications/upgrading-our-energy-system-smart-systems-and-flexibility-plan