

Introduction to net-zero

Dr Jeff Hardy, Senior Research Fellow Grantham Institute, Imperial College London

y @jjeh102

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We understand and can attribute global warming to human activities

Energy from the sun





Greenhouse gases: Carbon dioxide, methane, nitrous oxide, ...

Adding greenhouse gases traps more energy and heats the planet

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Source: https://showyourstripes.info/

Rapid global decarbonisation required

Billion tonnes of CO₂/yr

Climate change is seen as a major threat

major threat						
% who say is a major threat to their country						
	More common response					
	Global climate change	The spread of infectious diseases				
Spain	83%	78%				
France	83	74				
Italy	83	69				
South Korea	81	89				
Japan	80	88				
UK	71	74				
Belgium	70	69				
Netherlands	70	62				
Germany	69	55				
Canada	67	67				
Sweden	63	56				
U.S.	62	78				
Denmark	60	59				
Australia	59	68				
14-COUNTRY MEDIAN	70	69				
Source: Summer 2020 Global Attitudes Survey. Q13a, d.						

Nearly equal shares view climate

change and the spread of disease as a

Views of climate change as a major threat have increased in many countries

% who say global climate change is a major threat to their country

Note: Countries shown experienced a 10 percentage point change or greater over this time period. In Italy, 2020 survey was conducted by telephone; surveys were conducted face-to-face 2013-2018. All differences shown are 2013-2020, except for the Netherlands (2016-2020) and the U.S. (2012-2020).

Source: Summer 2020 Global Attitudes Survey. Q13a.

PEW RESEARCH CENTER

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climate-change-as-about-the-spread-of-infectious-diseases/

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Source – Pew Research Centre:

UK Climate Change Act

"It is the duty of the Secretary of State to ensure that the **net** UK carbon account for the year 2050 is **at least 100% lower** than the 1990 baseline."

Climate Change Act 2008

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Net-zero means THIS and THIS...

	2020s	2030s	2040s
Electricity	Largely decarbonise electricity: renewables, flexibility, coal phase-out	Expand electricity system, de generation (e.g. using hydroger	ecarbonise mid-merit/peak n), deploy bioenergy with CCS
Hydrogen	Start large-scale hydrogen production with CCS	Widespread deployment in industry, un heavier vehicles (e.g. HGVs, trains) and p	use in back-up electricity generation, potentially heating on the coldest days
Buildings	Efficiency, heat networks, heat pumps (new-build, off-gas, hybrids)	Widespread electrification gas grids potentially	, expand heat networks, switch to hydrogen
Road Transport	Ramp up EV market, decisions on HGVs	Turn over fleets to zero-emission v	ehicles, cars & vans before HGVs
Industry	Initial CCS clusters, energy & resource efficiency	Further CCS, wid hydrogen, some	espread use of electrification
Land Use	Afforestation, peatland restoration		
Agriculture	Healthier diets, reduced food waste, tree growing and efficiency on farms		
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Net-zero means THIS and THIS...

Aviation Operational measures, new plane efficiency, constrained demand growth, limited sustainable biofuels Shipping Operational measures, new ship fuel efficiency, use of ammonia Waste Reduce waste, landfill ban for biodegradable waste Limit emissions from combustion of non-bio wastes (e.g. some use of CCS) F-Gases Move almost completely away from F-gases Removals Develop options & policy framework Deployment of BECCS in various forms, demonstrate direct air capture of CO ₂ , other removals depending on progress Infra- structure Industrial CCS clusters, decisions on gas grid & HGV infrastructure, expand vehicle charging & electricity grids Hydrogen supply for industry & potentially buildings, roll-out of infrastructure, hydrogen/electric HGVs, more CCS infrastructure, electricity network expansion		2020s	2030s	2040s
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Infra- structure Industrial CCS clusters, decisions on gas grid & HGV infrastructure, expand vehicle charging & electricity grids Hydrogen supply for industry & potentially buildings, roll-out of infrastructure hydrogen/electric HGVs, more CCS infrastructure, electricity network expansion Health benefits due to improved air quality, healthier diets and more walking & cycling	Removals	Develop options & policy framework	Deployment of BECCS in vario air capture of CO ₂ , other remo	us forms, demonstrate direct ovals depending on progress
Health benefits due to improved air quality, healthier diets and more walking & cycling	Infra- structure	Industrial CCS clusters, decisions on gas grid & HGV infrastructure, expand vehicle charging & electricity grids	Hydrogen supply for industry & potential hydrogen/electric HGVs, more CCS infra	ly buildings, roll-out of infrastructure for structure, electricity network expansion
Co-benefits Clean growth and industrial opportunities	Co-benefits	Health benefits due	to improved air quality, healthier diets and more w Clean growth and industrial opportunities	alking & cycling

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Energy and global greenhouse gas emissions

Global greenhouse gas emissions by sector Our World in Data This is shown for the year 2016 – global greenhouse gas emissions were 49.4 billion tonnes CO_2eq . Iron and steel (7

Source - Our World in data: https://ourworldindata.org/emissions-by-sector

OurWorldinData.org - Research and data to make progress against the world's largest problems. Source: Climate Watch, the World Resources Institute (2020).

Energy in the rich list

50 Largest Corporations by Revenue, 2016 (in Billions)

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The energy bit is relatively straightforward... 11

Energy = around 67% of current home greenhouse gas emissions

~3.6 (6.1*) GW/year (300 x 12MW turbines/year) (current 4GW/year) ~1.2 million BEVs/year (136 per hour) (current 331 vehicles/hour) ~600k installations/year (68 per hour) (current 182 boilers/hour)

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Technology alone doesn't achieve carbon targets

Role of societal and behavioural changes

Low-carbon technologies or fuels not societal / behavioural changes

Measures with a combination of lowcarbon technologies and societal / behavioural changes

Largely societal or behavioural changes

Source: CCC analysis

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And folks might need some help...

15th February 2020	16th February 2020
Period	Price (inc. VAT)
00:00 - 00:30	1.58 p/kWh
00:30 - 01:00	1.58 p/kWh
01:00 - 01:30	1.97 p/kWh
01:30 - 02:00	0.63 p/kWh
02:00 - 02:30	-1.68 p/kWh
02:30 - 03:00	-2.10 p/kWh
03:00 - 03:30	-2.10 p/kWh
03:30 - 04:00	-3.19 p/kWh
04:00 - 04:30	-2.94 p/kWh
04:30 - 05:00	-2.94 p/kWh
05:00 - 05:30	-2.31 p/kWh
05:30 - 06:00	-2.10 p/kWh
4-	

Complicated time of use pricing

Different kit

Upfront costs

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