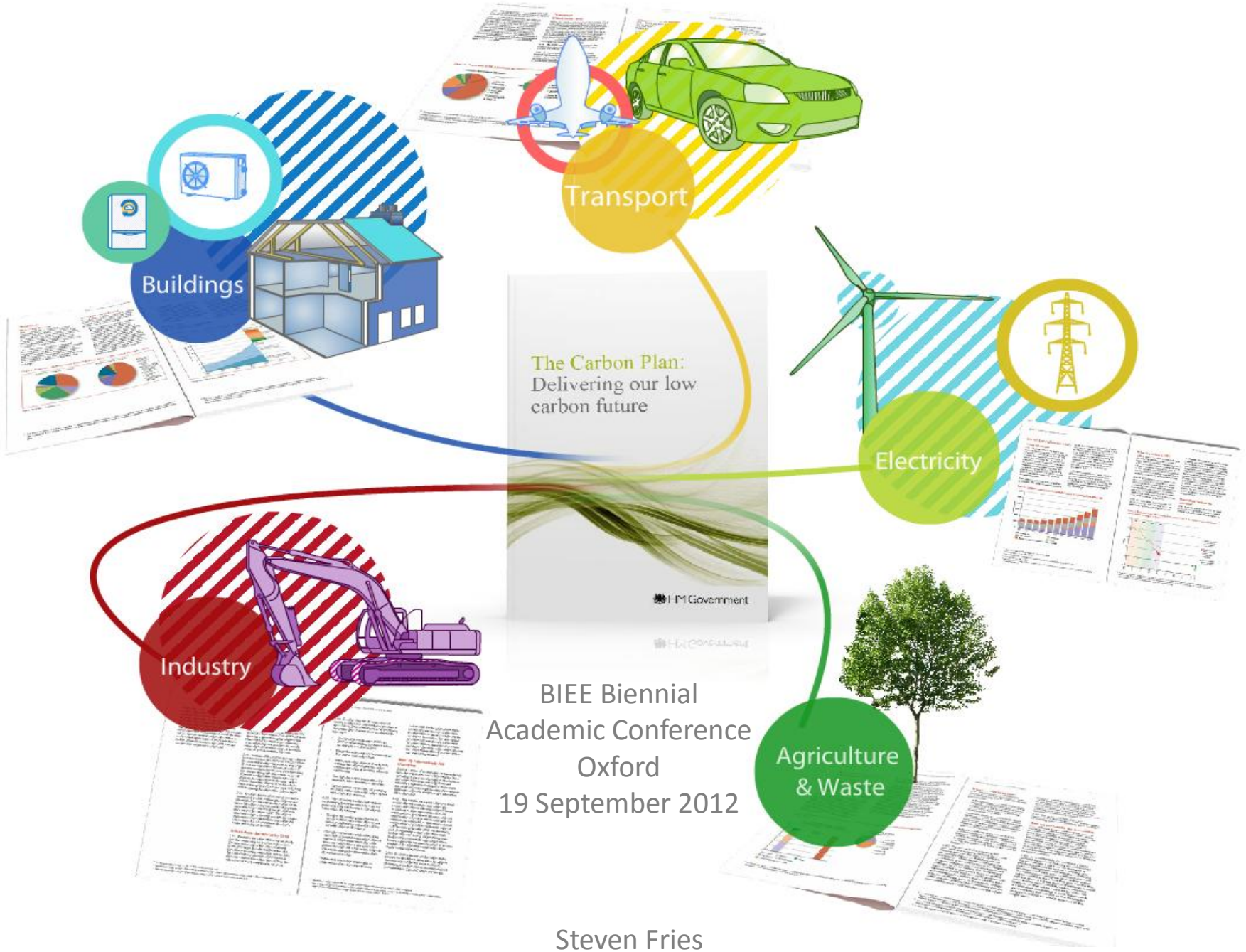


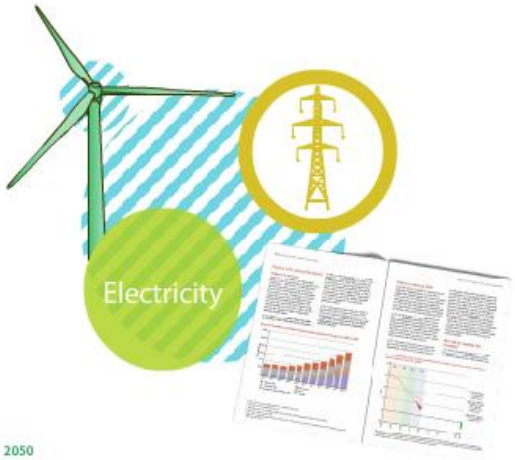
BIEE Biennial
Academic Conference
Oxford
19 September 2012

Steven Fries
DECC Chief Economist


Transport

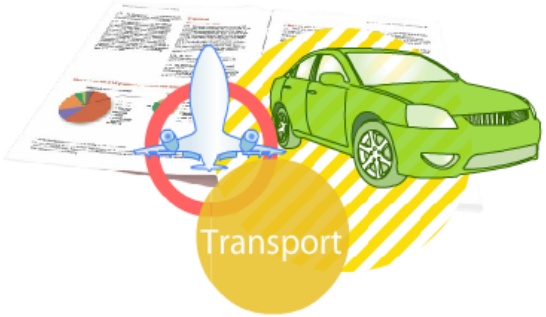

Buildings


CB1
CB2
CB3
CB4
800
700
600
500
400
300
200
100
0
1990 Baseline
2009
25%
reduction
2020
34%
reduction
CB4
50%
reduction
2050
80%
reduction
Emissions
2008
2013
2018
2023
2028
2033
2038
2043
2048
2050

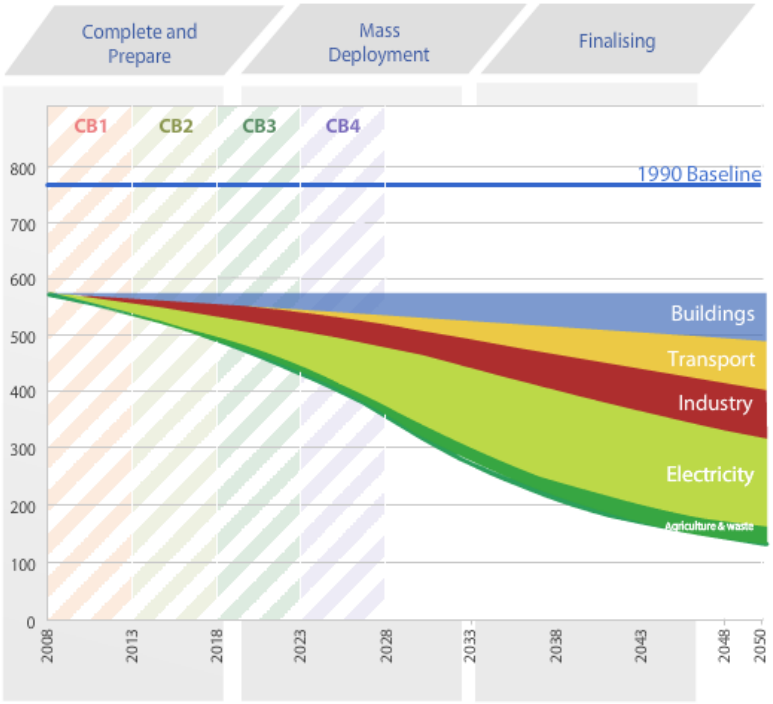

Electricity

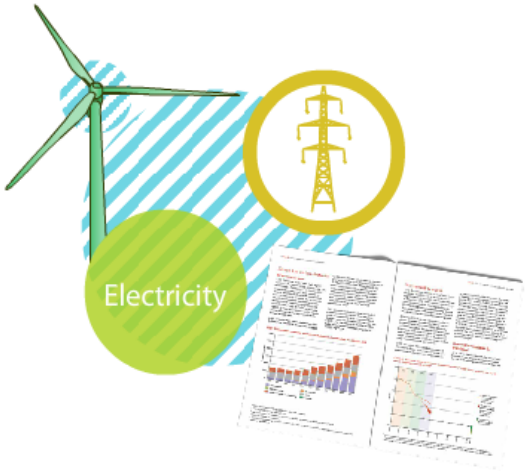

Industry

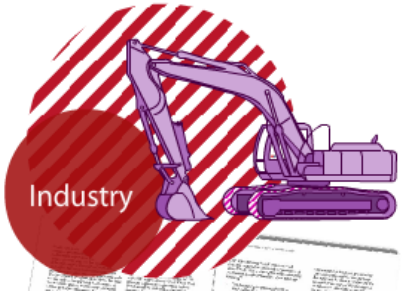

Agriculture
& Waste


Transport

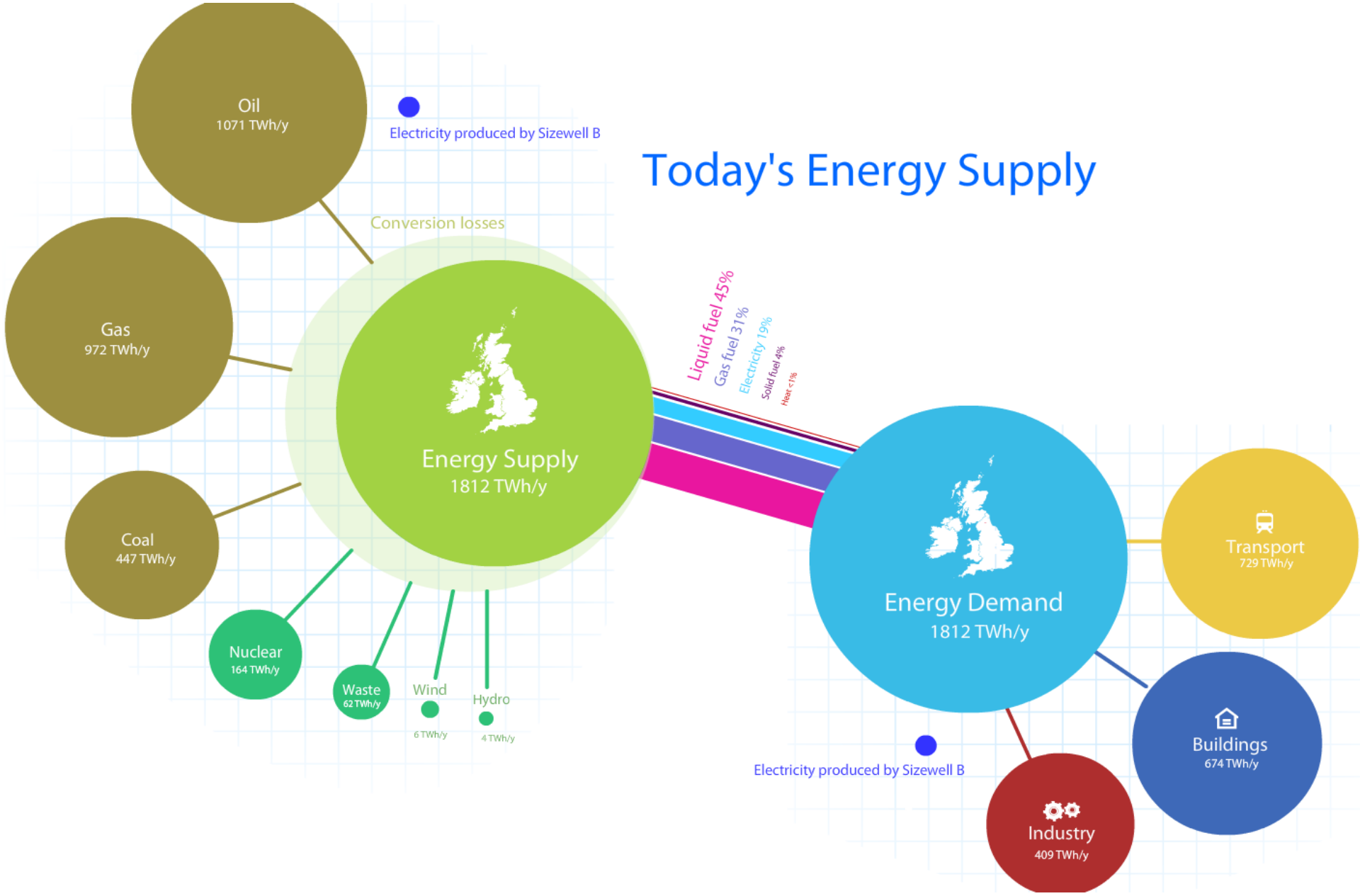

Buildings


Complete and Prepare
Mass Deployment
Finalising
CB1
CB2
CB3
CB4
1990 Baseline
Buildings
Transport
Industry
Electricity
Agriculture & waste
Emissions
800
700
600
500
400
300
200
100
0
2008
2013
2018
2023
2028
2033
2038
2043
2048
2050


Electricity


Industry


Agriculture
& Waste


Today's Energy Supply
Oil
1071 TWh/y
Electricity produced by Sizewell B
Conversion losses
Gas
972 TWh/y
Coal
447 TWh/y
Nuclear
164 TWh/y
Waste
62 TWh/y
Wind
6 TWh/y
Hydro
4 TWh/y
Energy Supply
1812 TWh/y
Liquid fuel 45%
Gas fuel 31%
Electricity 19%
Solid fuel 4%
Heat <1%
Energy Demand
1812 TWh/y
Electricity produced by Sizewell B
Transport
729 TWh/y
Buildings
674 TWh/y
Industry
409 TWh/y

Power Stations
151 $MTCO_2e$

Transport
122 $MTCO_2e$

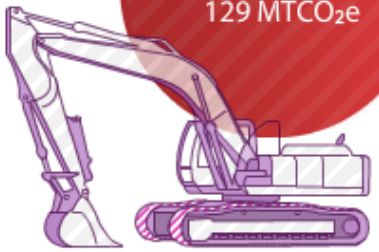
561.8 $MTCO_2e$

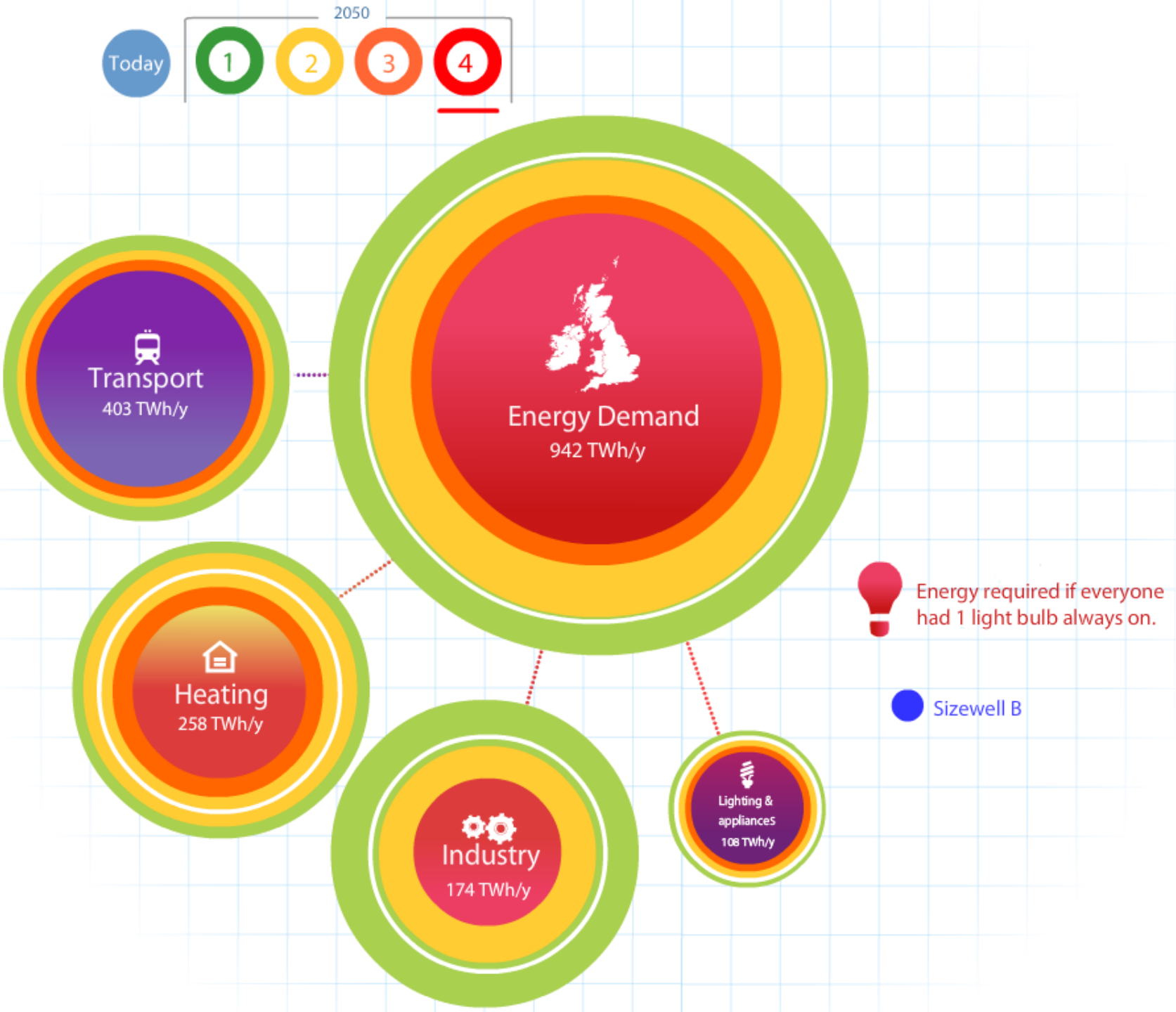
Exports
0 $MTCO_2e$

Buildings
97 $MTCO_2e$

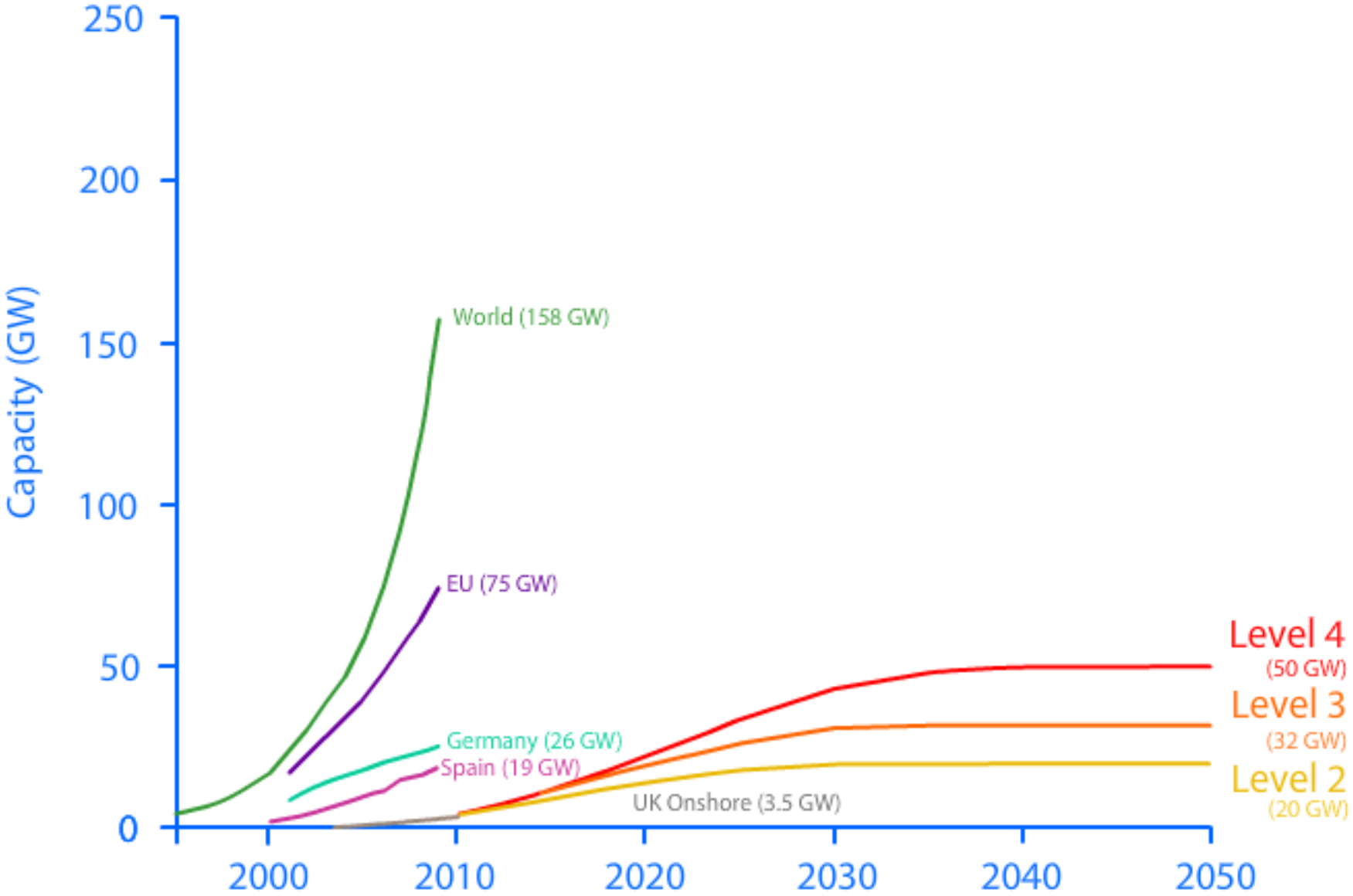
Agriculture, land use and waste
63 $MTCO_2e$

Industry
129 $MTCO_2e$

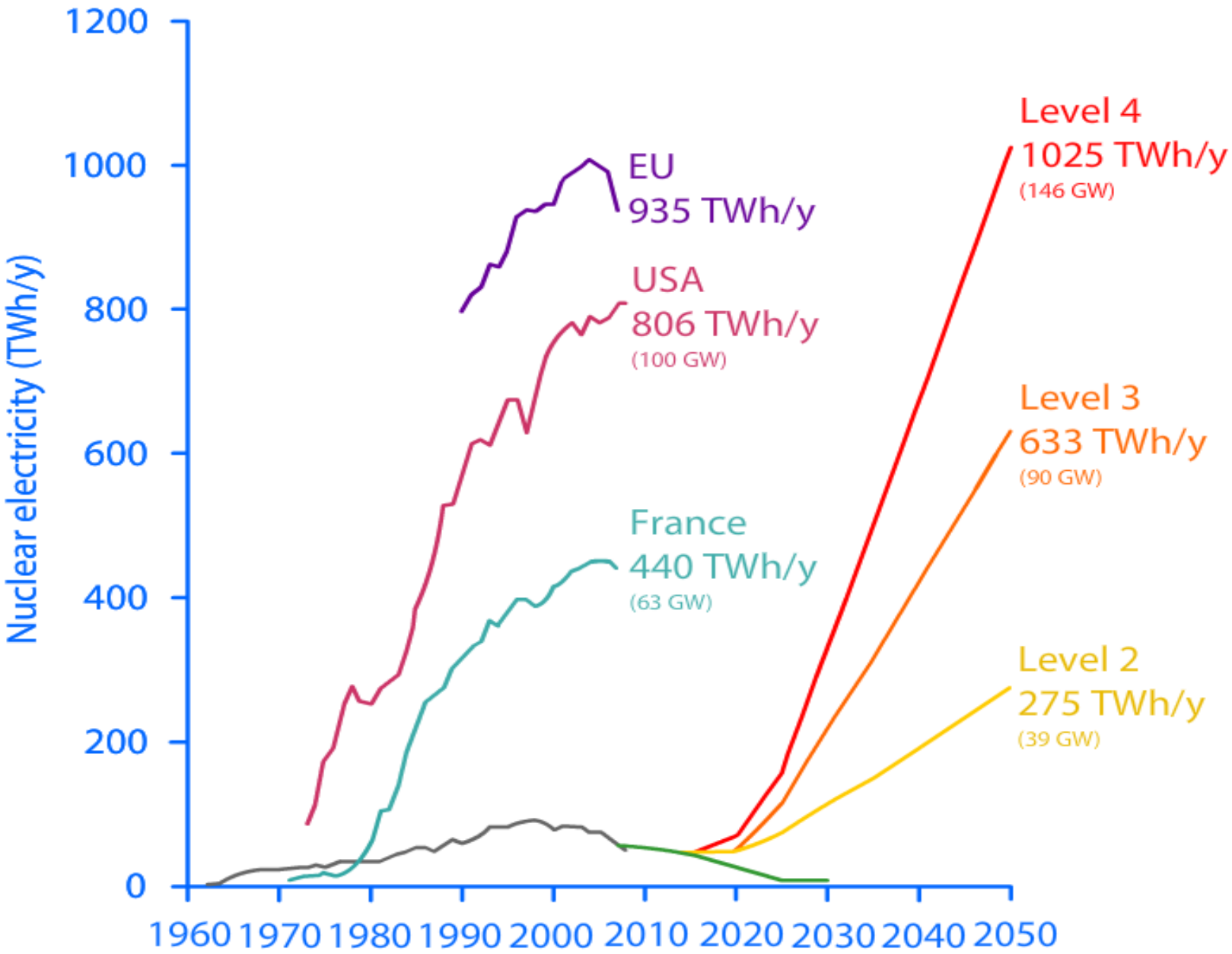



2050
Today
1
2
3
4
Transport
403 TWh/y
Energy Demand
942 TWh/y
Heating
258 TWh/y
Industry
174 TWh/y
Lighting &
appliances
108 TWh/y
Energy required if everyone
had 1 light bulb always on.
Sizewell B

Onshore Wind Build Rates



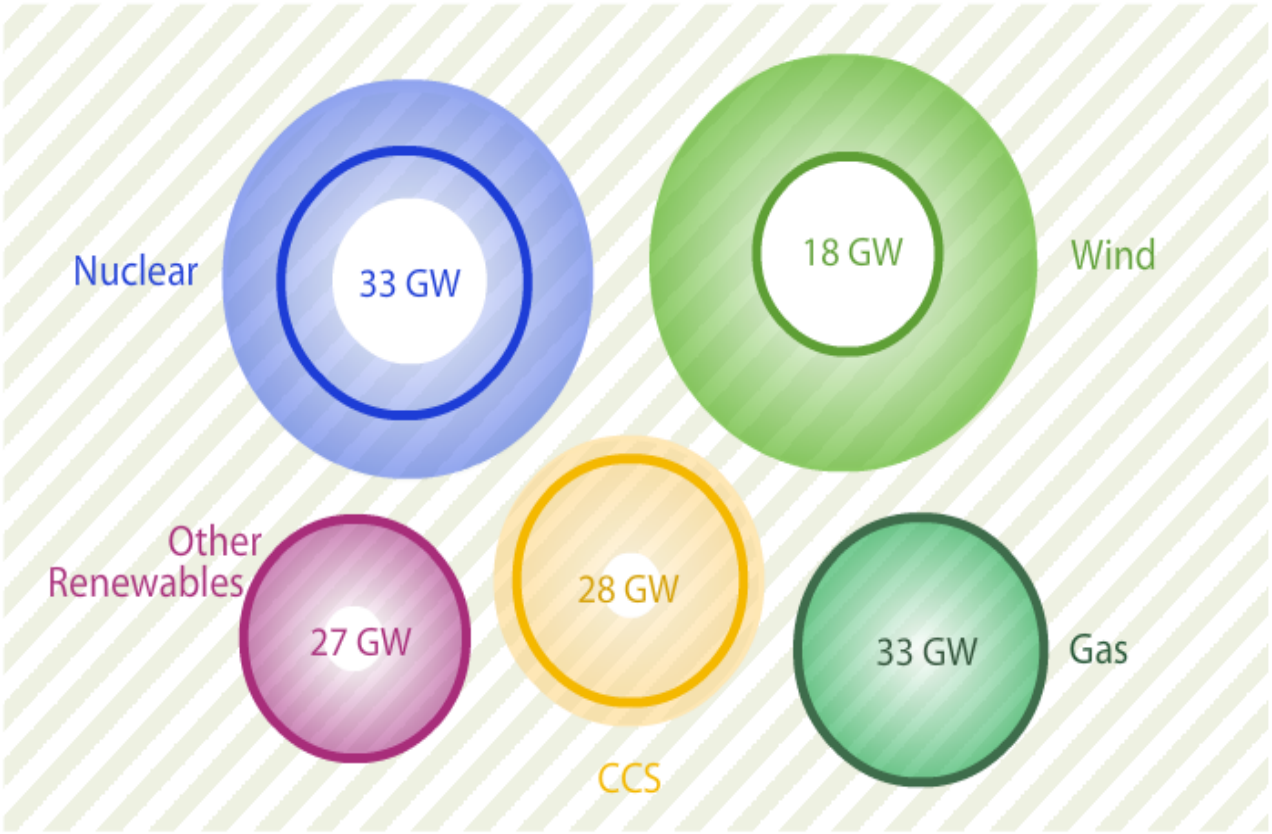
Nuclear Build Rates

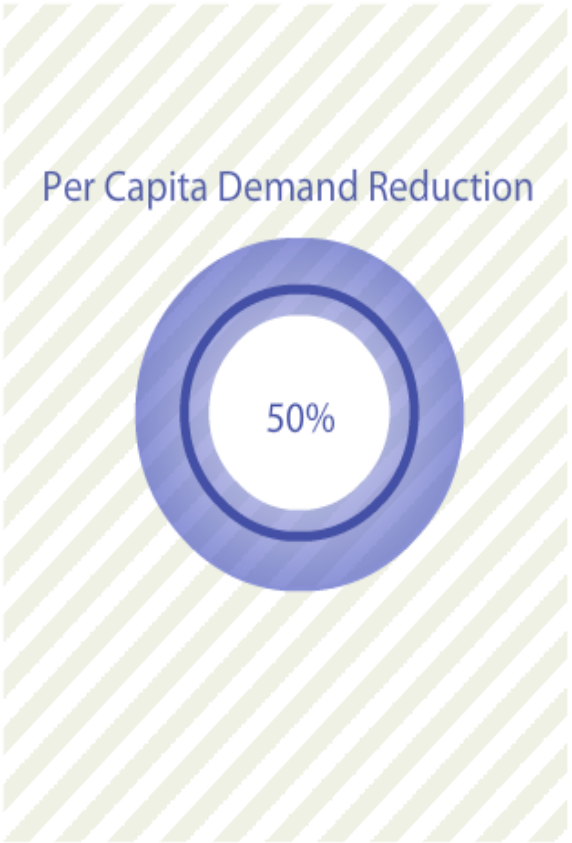


M R N C

MARKAL Scenario

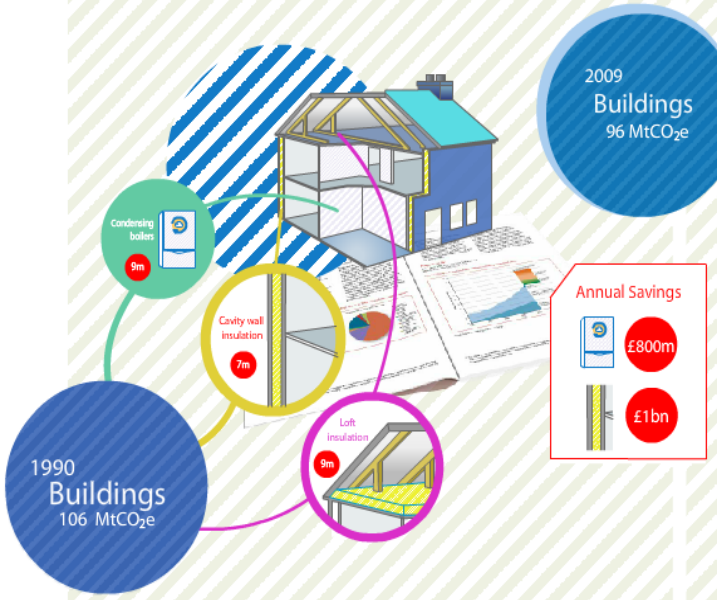
Under Markal, it will be £4598 - £84 cheaper than do nothing





1990 | 2011 | 2020

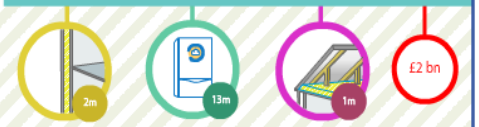
Progress so far



Complete and Prepare

Energy Efficiency

Complete Standard Energy Efficiency Measures



Initial deployment of solid wall insulation 1.5m

The Green Deal and ECO will continue the transformation of the energy efficiency of UK houses.

By 2020 we will have insulated all practical lofts and cavities - saving the UK a £1 billion a year

Low Carbon Heat

Initial uptake of renewable heat, especially in commercial buildings and houses of f the gas grid

The RHI and RHPP will support over 130,000 renewable heat installations by 2020

Mass Deployment

By 2030, we will have completed the mass deployment of household energy efficiency measures, insulating between 1 and 3.7 million more homes with solid wall insulation

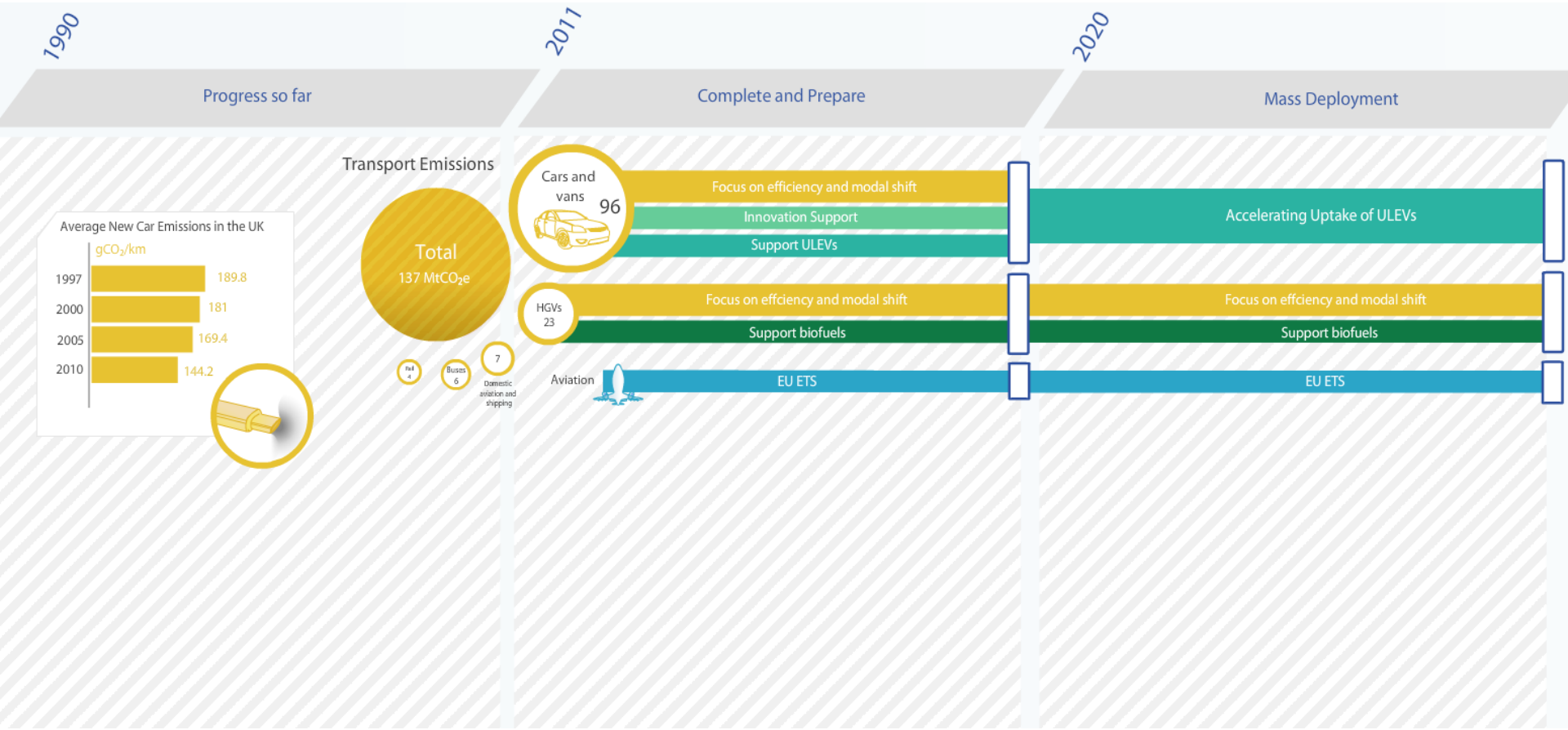
Accelerated deployment of solid wall insulation

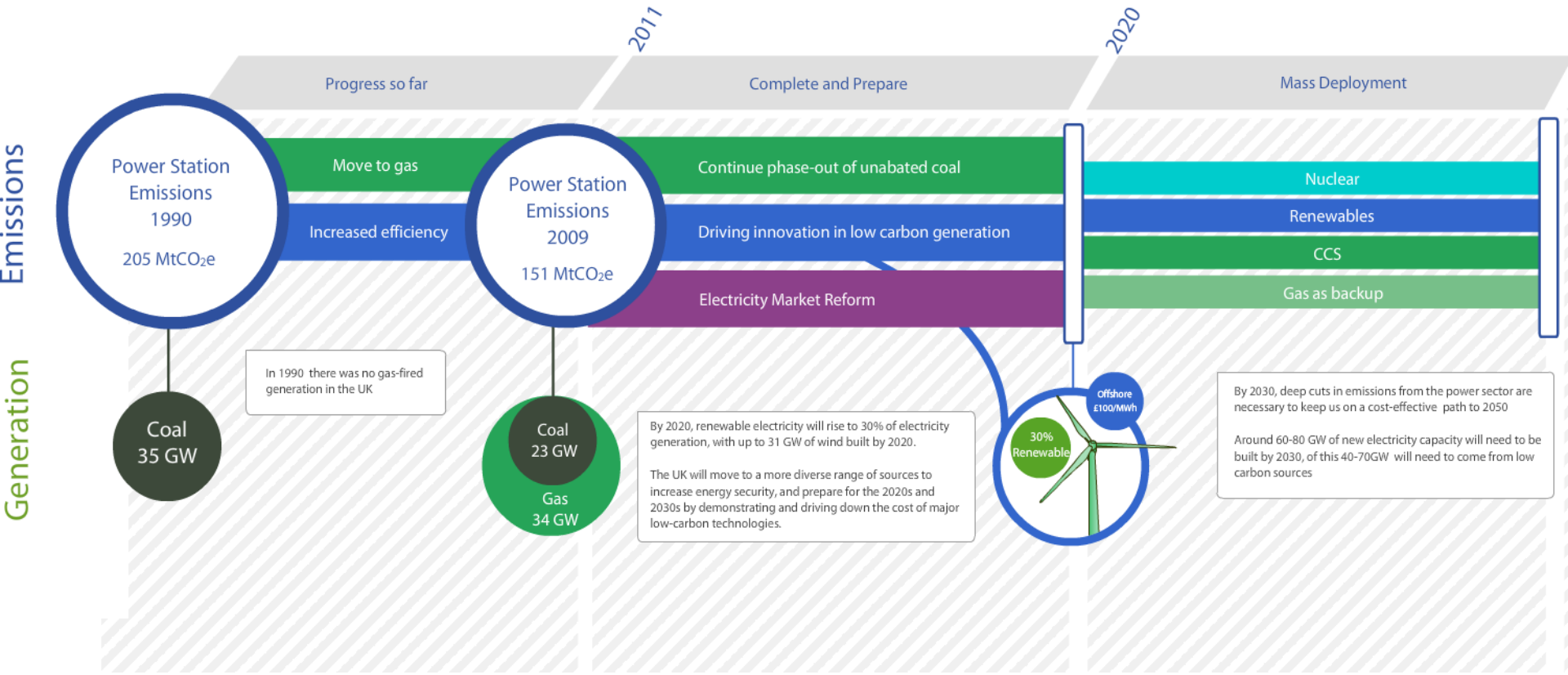
Heat Pumps

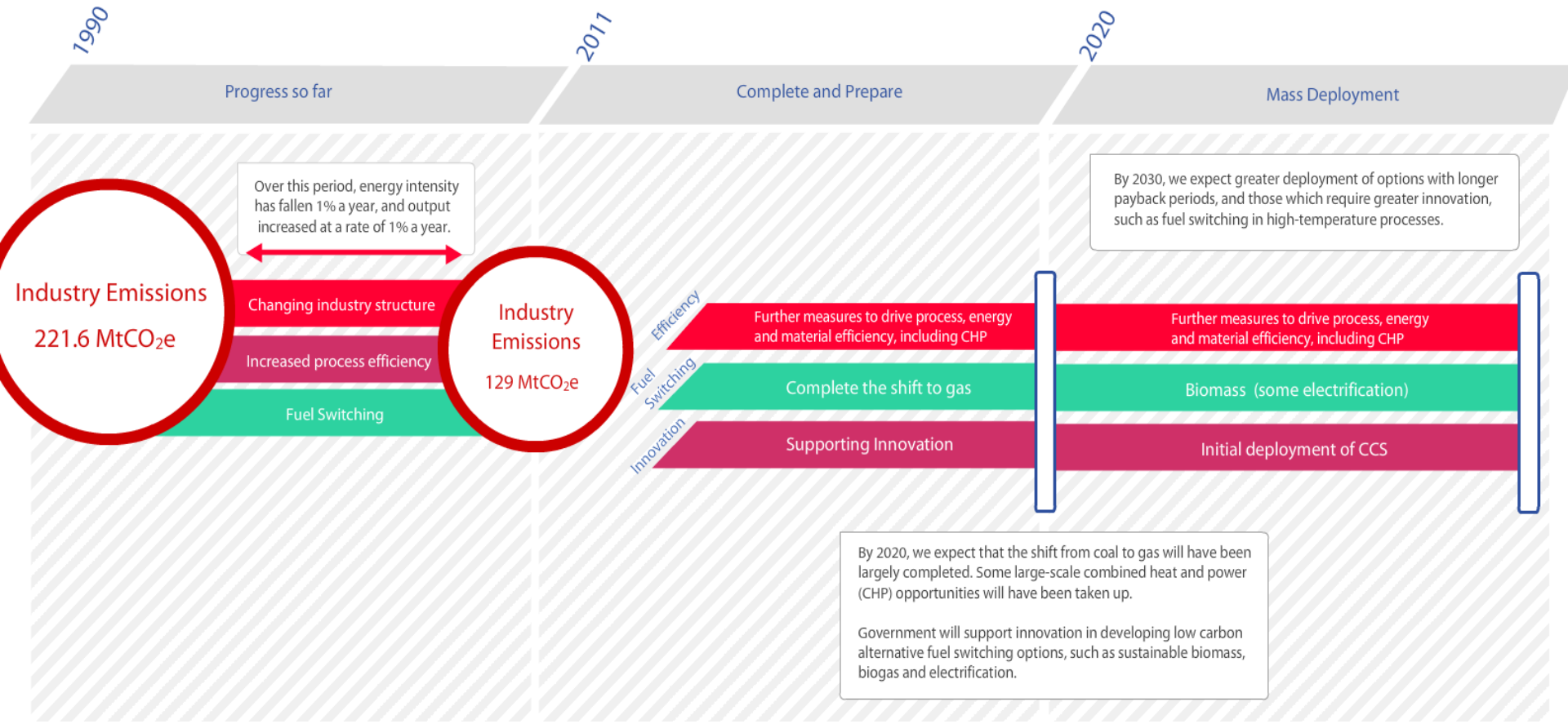
In rural areas, we will support the deployment of heat pumps to efficiently electrify heating

District Heating

In urban areas, we will support the development of heat networks to deliver heat from low carbon sources


1990
2011
2020
Progress so far
Complete and Prepare
Mass Deployment
Average New Car Emissions in the UK
gCO2/km
1997
189.8
2000
181
2005
169.4
2010
144.2
Transport Emissions
Total
137 MtCO2e
Rail 4
Buses 6
7
Domestic aviation and shipping
Cars and vans
96
Focus on efficiency and modal shift
Innovation Support
Support ULEVs
Accelerating Uptake of ULEVs
HGVs 23
Focus on effciency and modal shift
Support biofuels
Focus on effciency and modal shift
Support biofuels
Aviation
EU ETS
EU ETS


2011
2020
Progress so far
Complete and Prepare
Mass Deployment
Emissions
Generation
Power Station Emissions 1990
205 MtCO2e
Move to gas
Increased efficiency
Power Station Emissions 2009
151 MtCO2e
Continue phase-out of unabated coal
Driving innovation in low carbon generation
Electricity Market Reform
Nuclear
Renewables
CCS
Gas as backup
Coal 35 GW
In 1990 there was no gas-fired generation in the UK
Coal 23 GW
Gas 34 GW
By 2020, renewable electricity will rise to 30% of electricity generation, with up to 31 GW of wind built by 2020.
The UK will move to a more diverse range of sources to increase energy security, and prepare for the 2020s and 2030s by demonstrating and driving down the cost of major low-carbon technologies.
Offshore £100/MWh
30% Renewable
By 2030, deep cuts in emissions from the power sector are necessary to keep us on a cost-effective path to 2050
Around 60-80 GW of new electricity capacity will need to be built by 2030, of this 40-70GW will need to come from low carbon sources


1990
2011
2020
Progress so far
Complete and Prepare
Mass Deployment
Industry Emissions
221.6 MtCO2e
Over this period, energy intensity has fallen 1% a year, and output increased at a rate of 1% a year.
Changing industry structure
Increased process efficiency
Fuel Switching
Industry Emissions
129 MtCO2e
Efficiency
Further measures to drive process, energy and material efficiency, including CHP
Fuel Switching
Complete the shift to gas
Innovation
Supporting Innovation
By 2030, we expect greater deployment of options with longer payback periods, and those which require greater innovation, such as fuel switching in high-temperature processes.
Further measures to drive process, energy and material efficiency, including CHP
Biomass (some electrification)
Initial deployment of CCS
By 2020, we expect that the shift from coal to gas will have been largely completed. Some large-scale combined heat and power (CHP) opportunities will have been taken up.
Government will support innovation in developing low carbon alternative fuel switching options, such as sustainable biomass, biogas and electrification.

Energy system costs

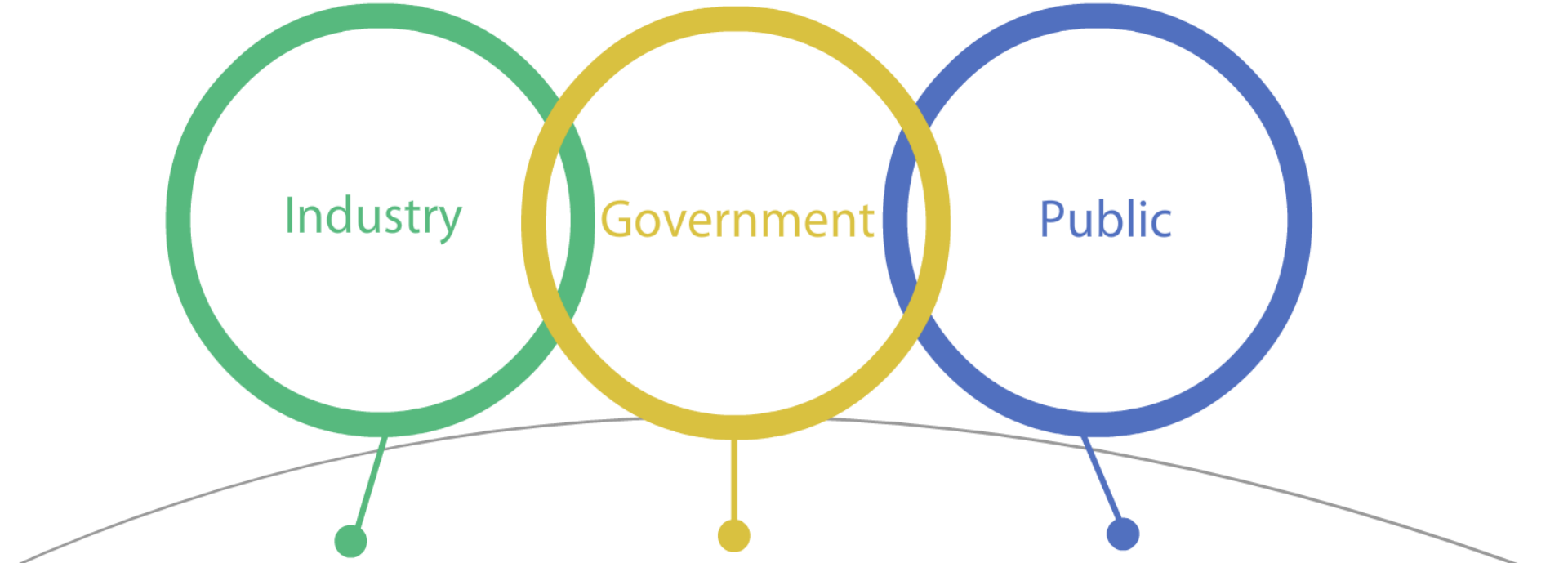
- We currently spend about £3,700 per person per year on our energy system through taxes and bills
- This includes buying and running cars, heating homes, generating electricity and powering industry
- Whether we tackle climate change or not energy costs are likely to go up significantly
- If by 2050, we do nothing and still have an inefficient, high carbon system the total cost will be £4,682 in today's money
- Under a least-cost (MARKAL-based) scenario that meets our 2050 decarbonisation target, the total cost would be £4,598
- This is saving of about £90 compared with doing nothing

Energy system costs

- The expected NPV of current policies that are set to deliver emissions reduction under the first three carbon budgets is £25bn
- These policies are expected to impose a slight drag on narrowing measured real GDP growth, excluding the value of carbon savings
- Adding policies to deliver the 4th Carbon Budget would put the policy NPV in the range of £1bn to -£26bn
- This range range reflects alternative combinations of policies and emission reduction pathways that could deliver the 4th Carbon Budget
- They are in addition subject to considerable uncertainty, including a range of technology costs and fossil fuel prices

Building a coalition for change

Investment in new technologies will require



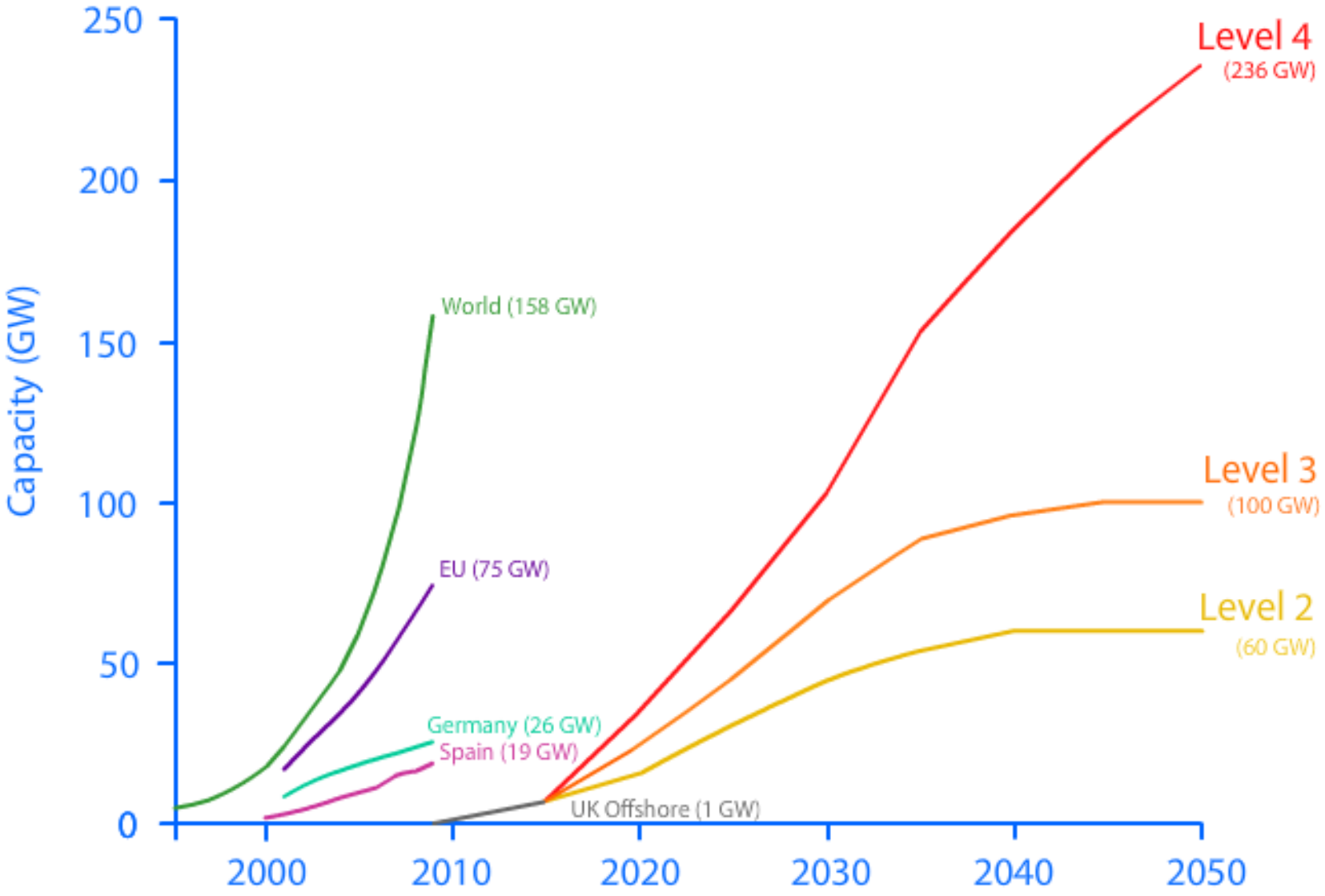
New business models to reflect high capital costs but low operating costs.

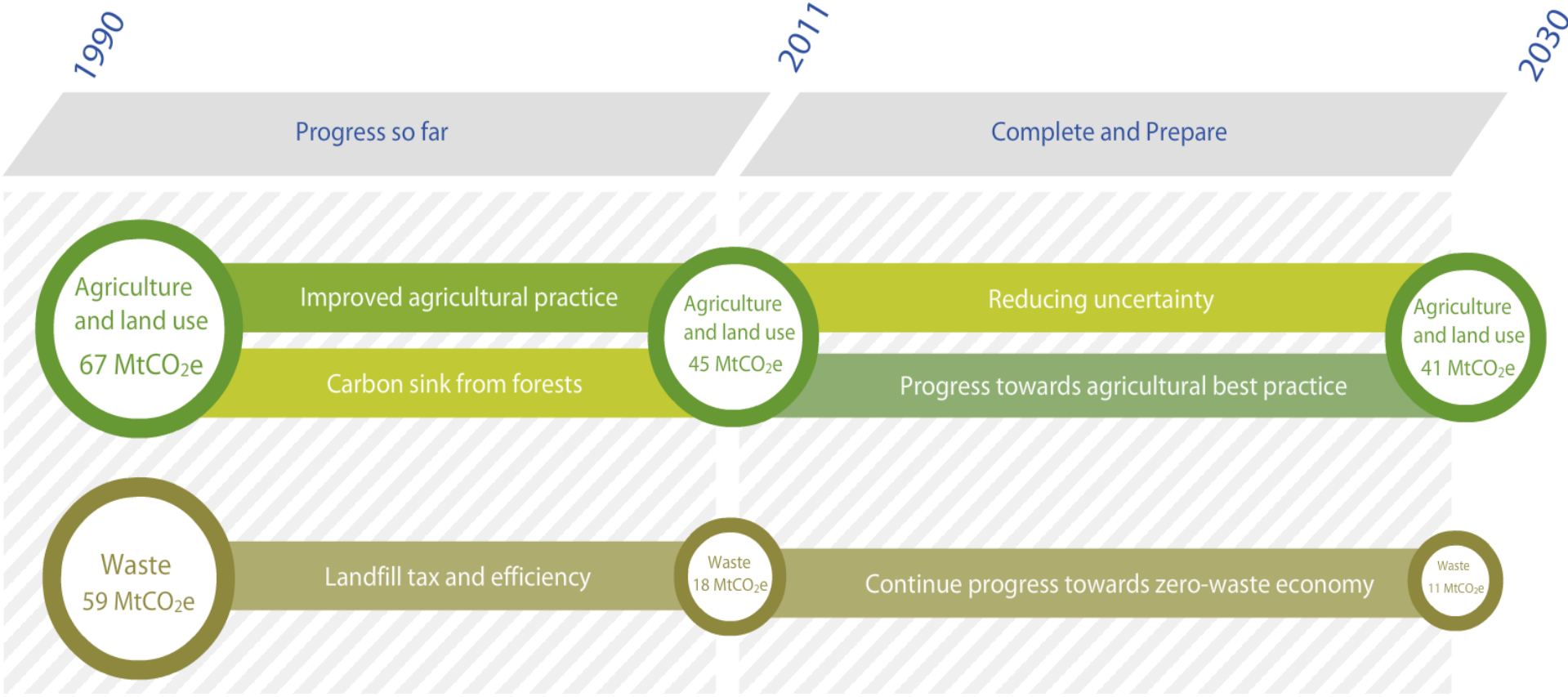
New institutional frameworks like EMR and the Green Deal.

Underpinned by new norms and public acceptance of technologies and their impact.

Thank you

Offshore Wind Build Rates




1990
2011
2030
Progress so far
Complete and Prepare
Agriculture and land use
67 MtCO2e
Improved agricultural practice
Carbon sink from forests
Agriculture and land use
45 MtCO2e
Reducing uncertainty
Progress towards agricultural best practice
Agriculture and land use
41 MtCO2e
Waste
59 MtCO2e
Landfill tax and efficiency
Waste
18 MtCO2e
Continue progress towards zero-waste economy
Waste
11 MtCO2e

Energy system costs

- To illustrate how uncertain these policy cost are, take transport as an example
- IF we assume a high crude oil price of $170 per barrel in 2030 instead of $130 per barrel, the cost the transport pathway falls to £6bn from £12bn
- If battery costs fall to £150kWh in 2030 rather than to £300kWh in the central case, the cost of the pathway falls to £3bn from £12bn
- If we do not count the rebound effect, the cost of the whole pathway fall to £10bn from £12bn