Getting Ready for Zero Emissions and 100% Renewable Energy: Plans and Scenarios to Pave the Way for the Transition

10 December, 2015 - 11:15-12:45 - Room 2

Side event to the UNFCCC COP21, Climate Generation Area, Paris, France

Transitioning the UK to a Zero Carbon Society in 20 year by Paul Allen, Centre for Alternative Technology, UK

Centre for Alternative Technology
Canolfan y Dechnoleg Amgen

The event was organised by Nordic Folkecenter for Renewable Energy (Denmark) & NegaWatt (France) in cooperation with INFORSE, Track 0, Centre for Alternative Technology –CAT (UK).
The event was part of the "Climate Generation Area" Conference organised by the French Government parallel to the UNFCCC COP21 - www.cop21.gouv.fr/en/les-espaces-generations-climat/

ZERO CARBON BRITAIN

Rethinking the Future

Transitioning the UK to a Zero Carbon Society in 20 years

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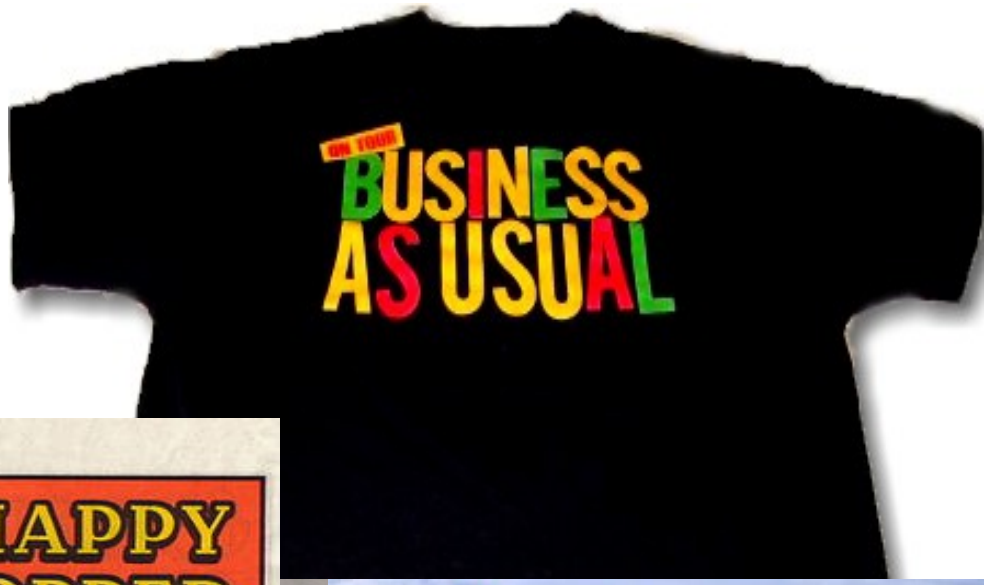
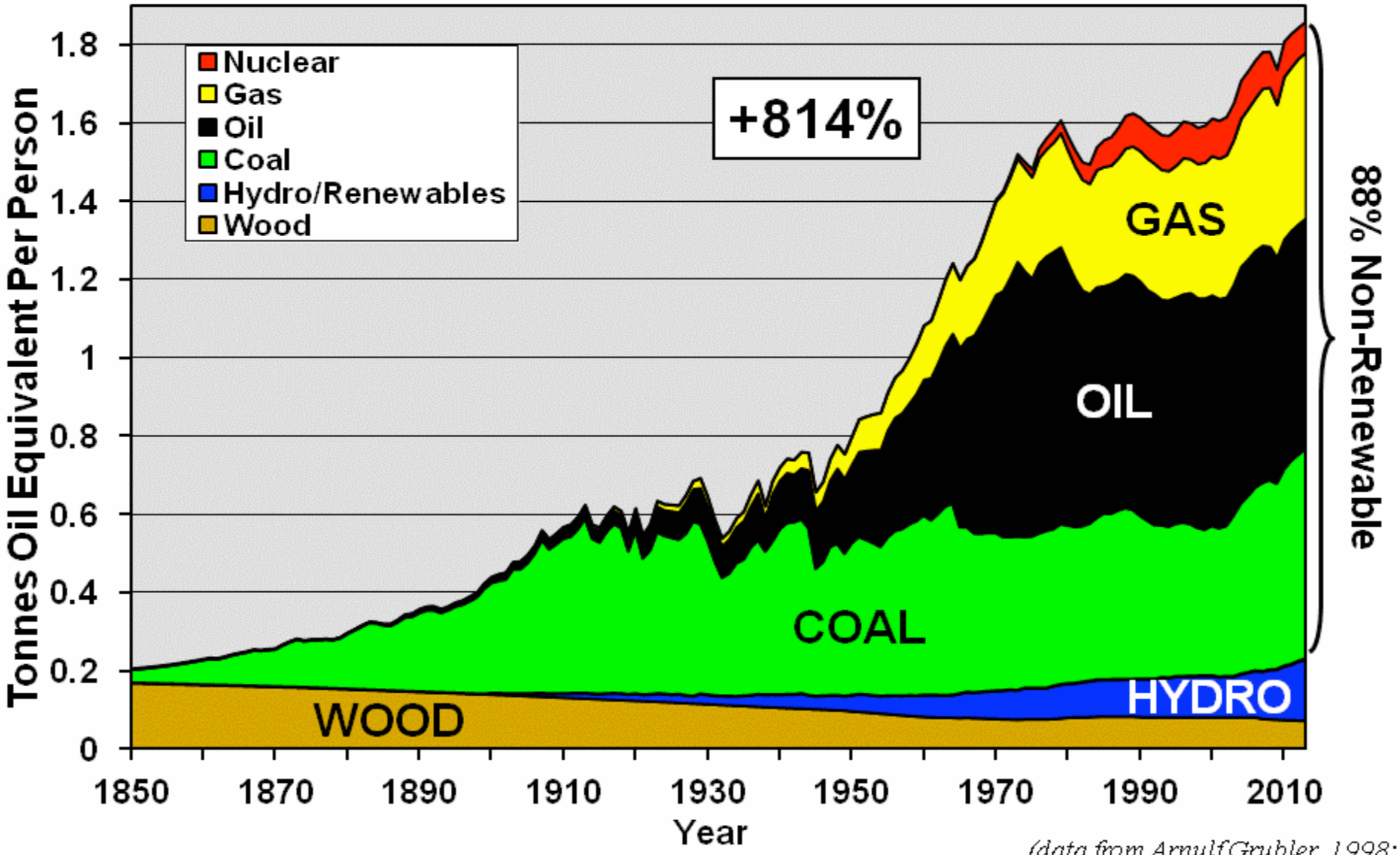
We now think of it as ‘normal’



World Per Capita Annual Primary Energy Consumption by Fuel 1850-2013



(data from Arnulf Grubler, 1998; BP Statistical Review of World Energy, 2014; EIA, 2014)


VISA
MasterCard
VISA

Powerdown

by 60% from our present *extreme energy* normality

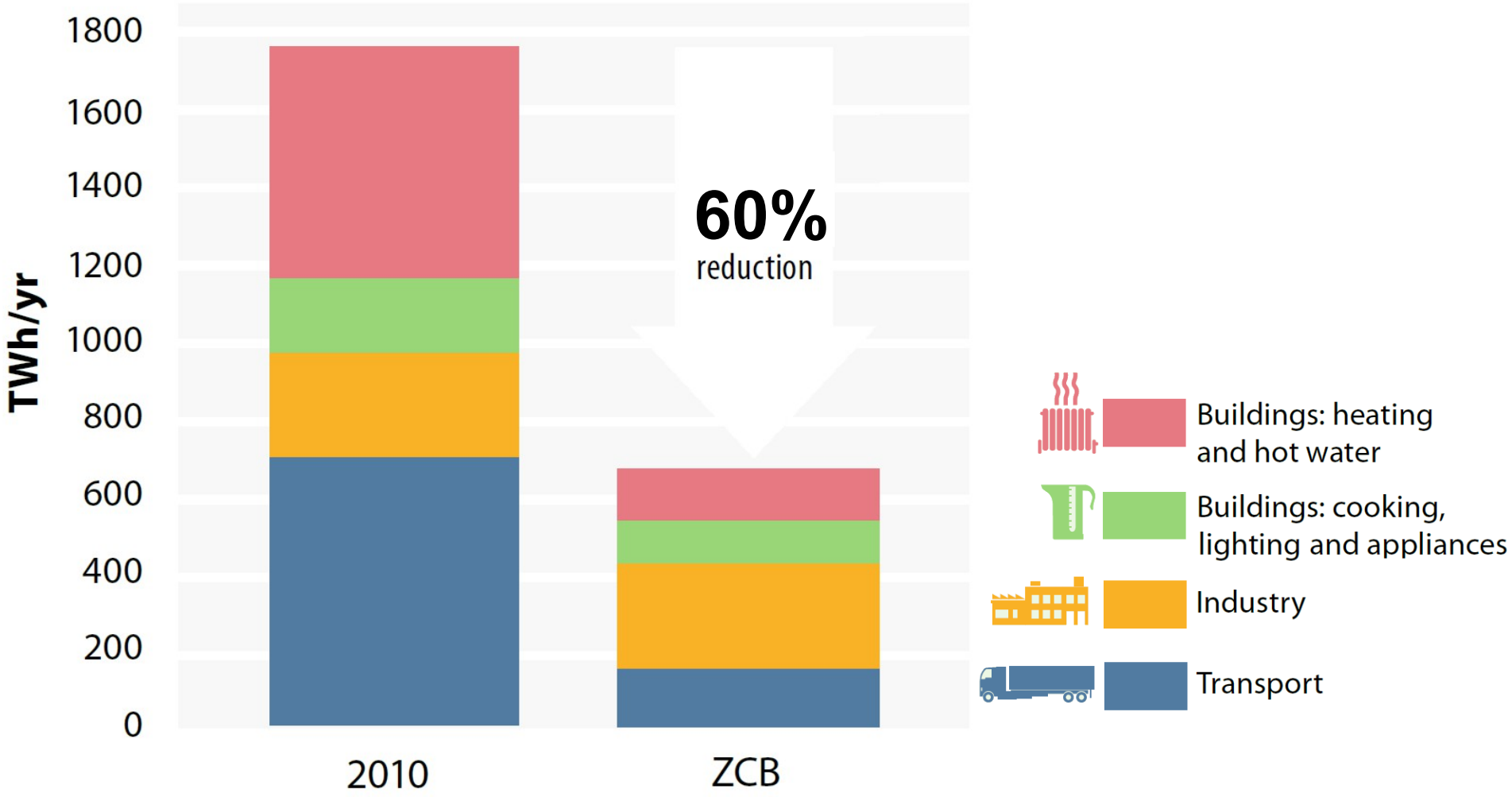
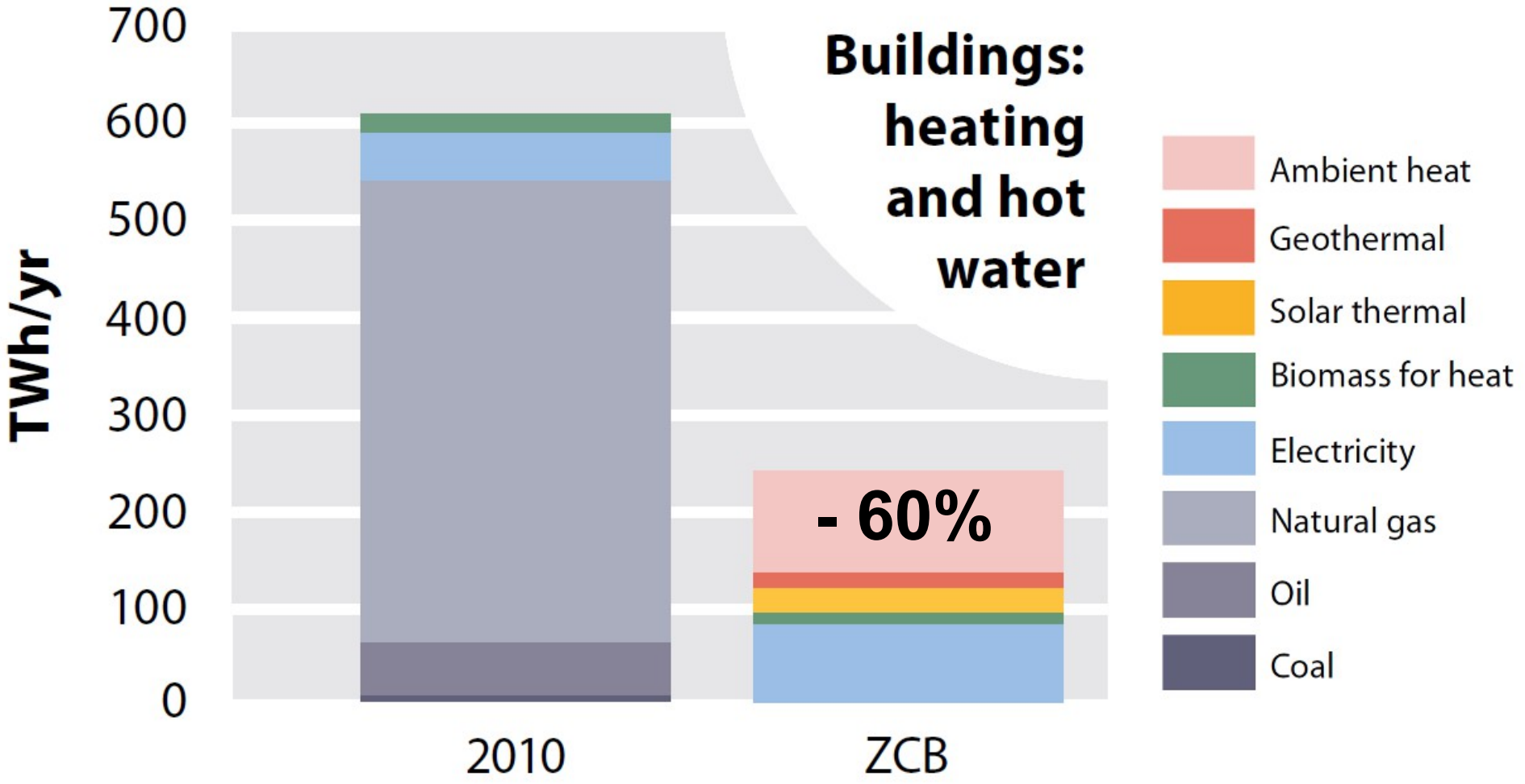


Figure 3.4: Total annual energy demand by sector in the UK in 2010 (DECC, 2012) and in our scenario.



From: Figure 3.10: The change in energy demand for heating and hot water; cooking, lighting and appliances; and industry between 2010 (DECC, 2012) and our scenario: by amount and type of fuel.

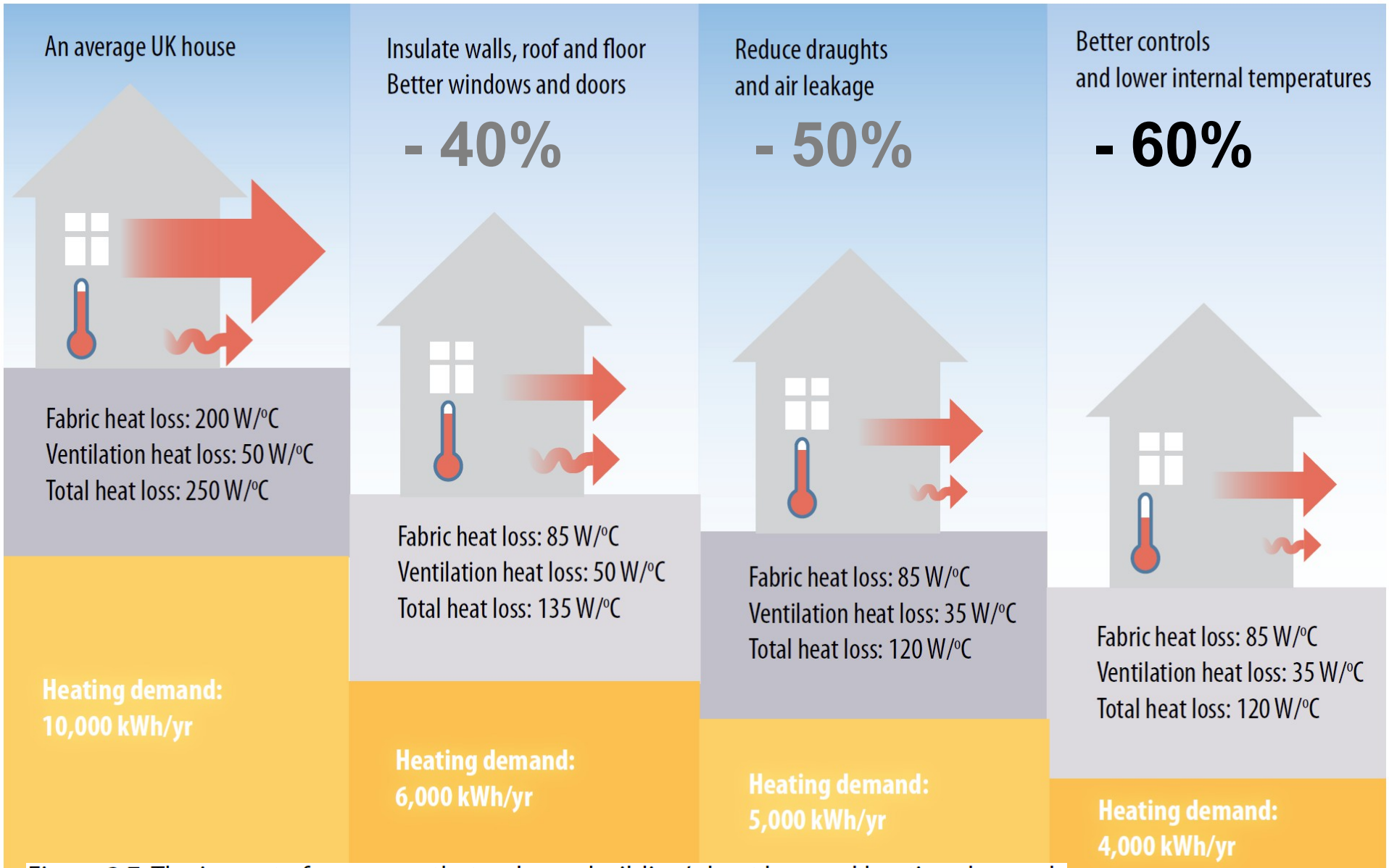


Figure 3.7: The impact of measures that reduce a building's heat loss and heating demand.

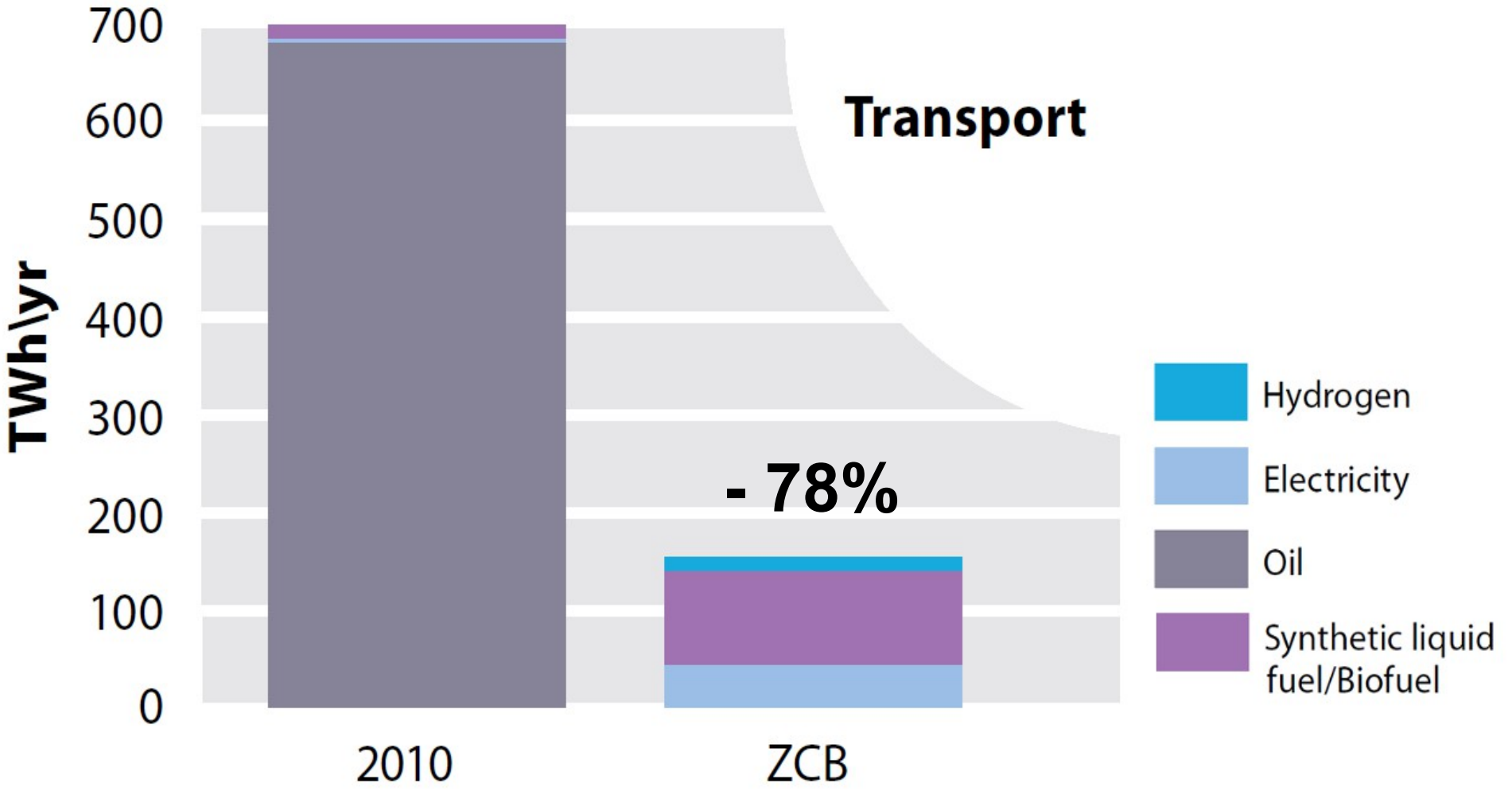


Figure 3.14: Change in total energy demand for transport and the types of fuel required in 2010 (DECC, 2012) and our scenario.

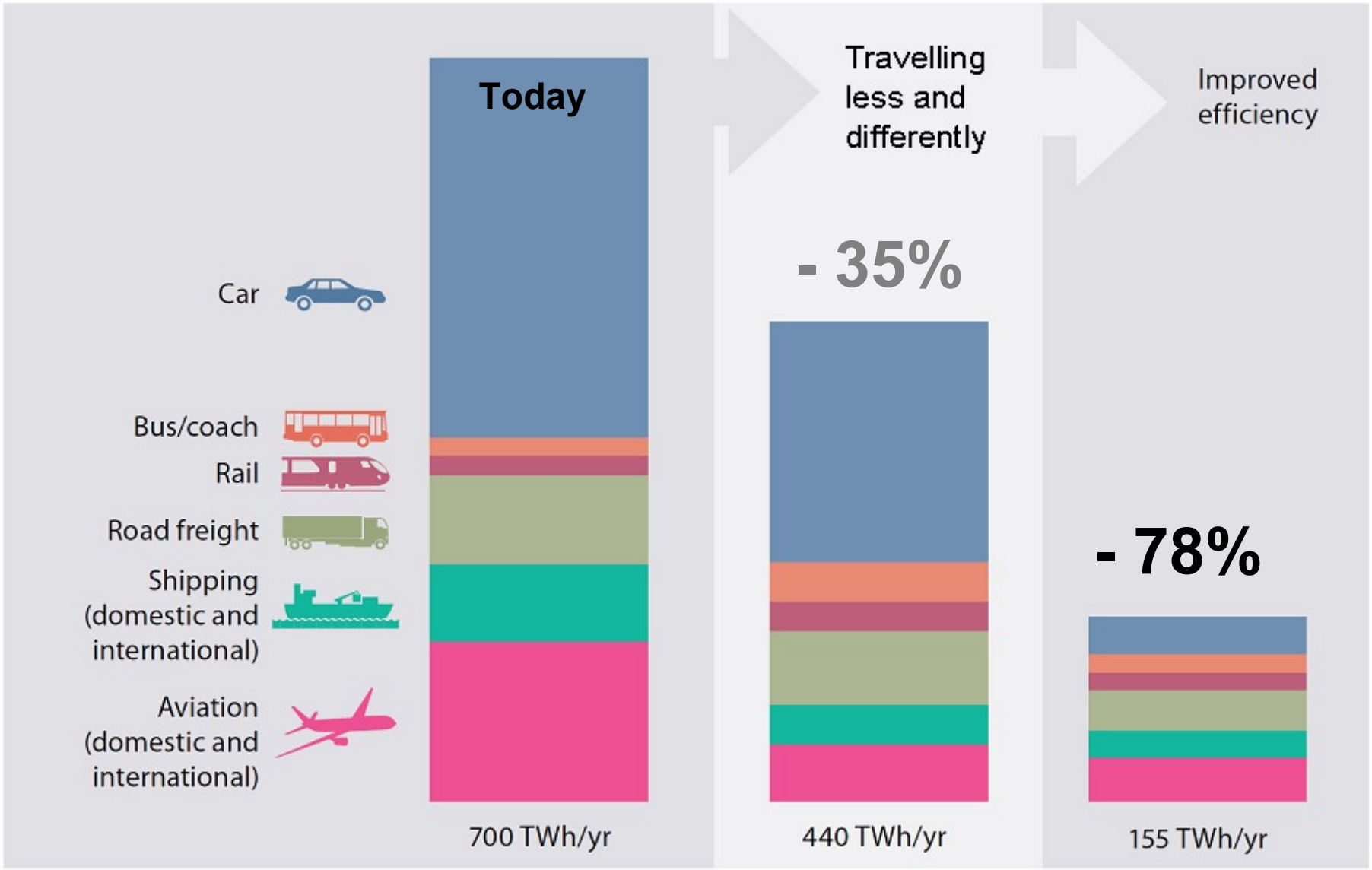
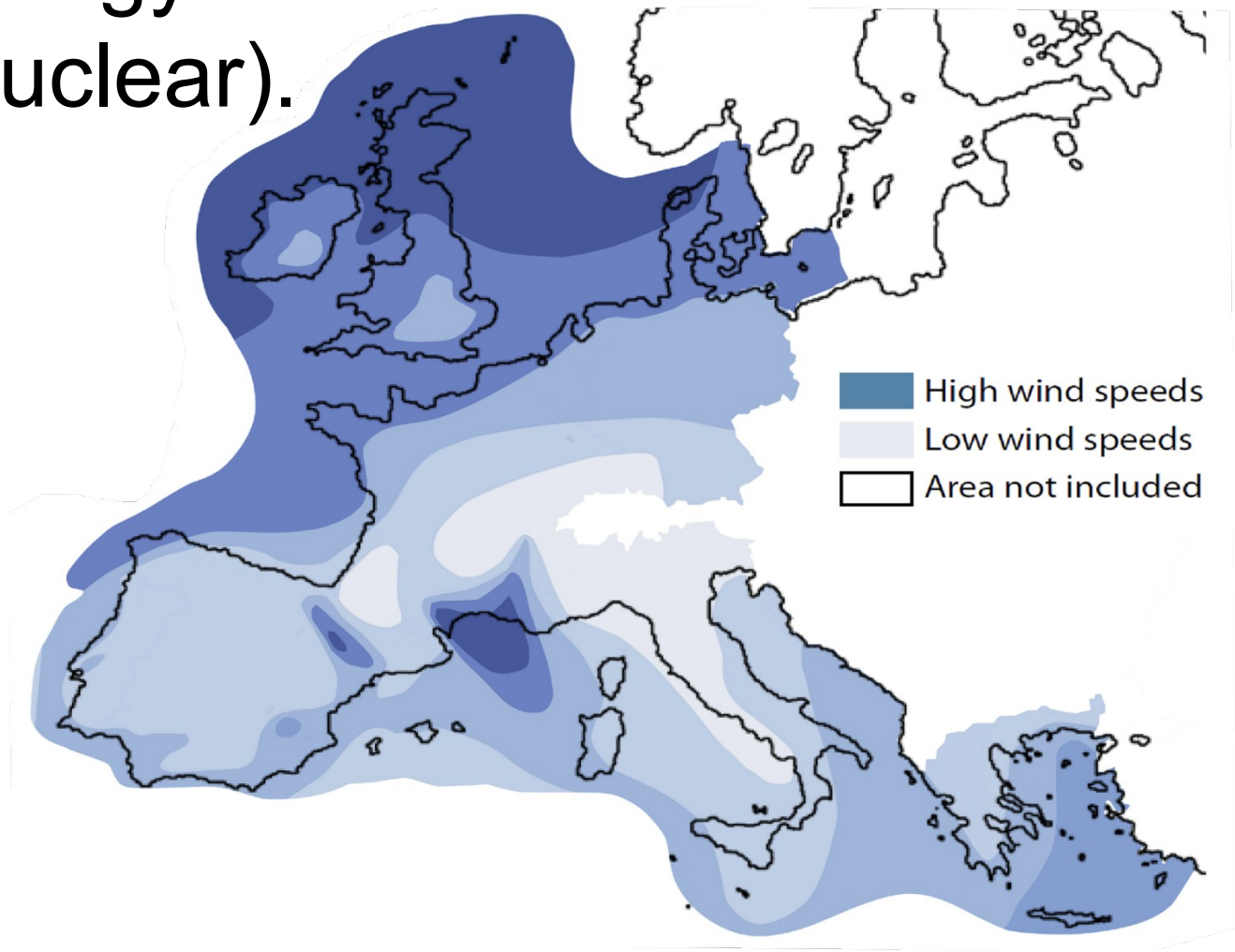


Figure 3.13: Reduction in energy demand for personal and commercial (freight) transport in our scenario (with initial figures from DECC, 2012).

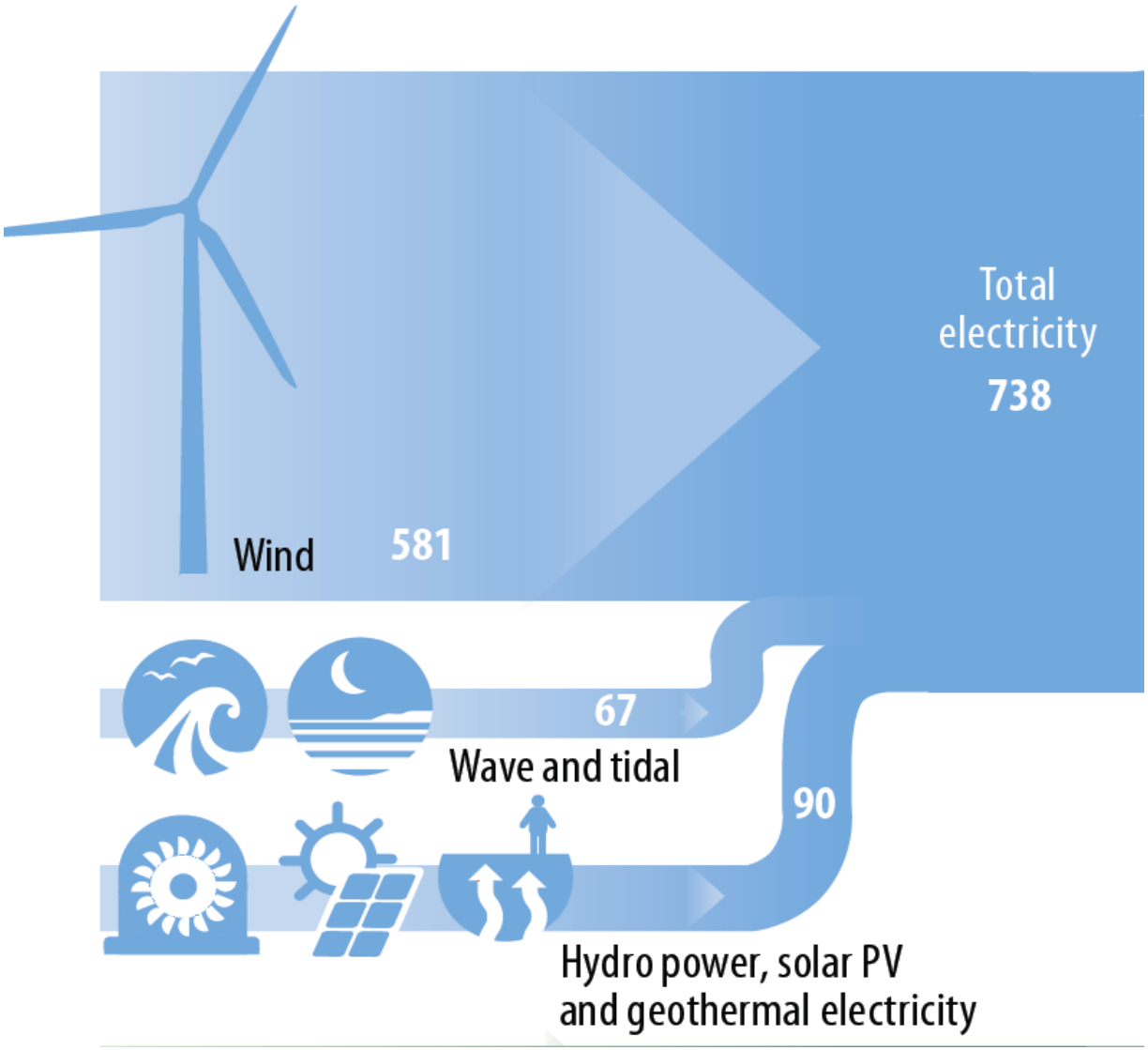
Power up

We can use **100% renewable** energy sources (no nuclear).



Key Question:

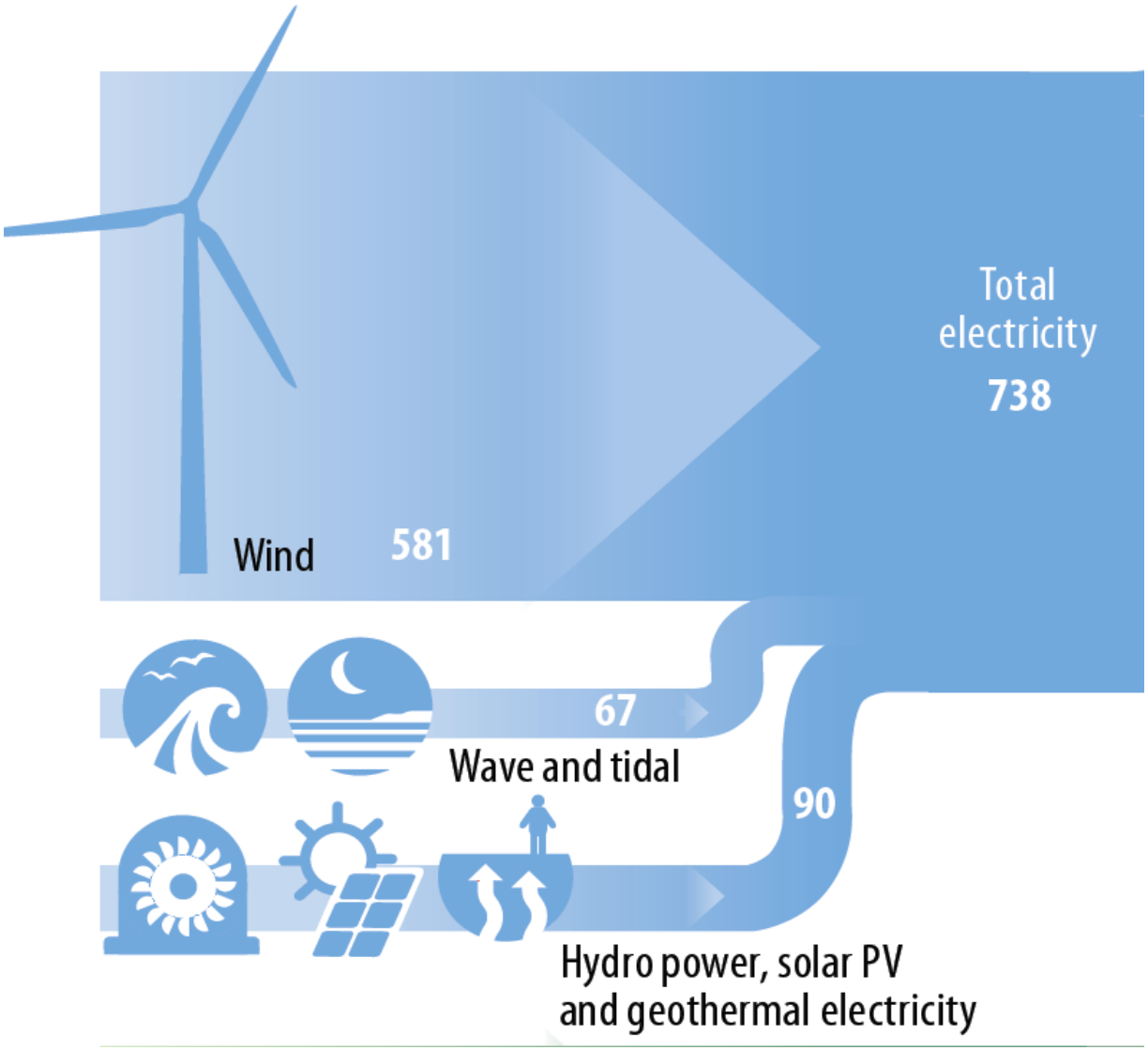
Can we "keep the lights on"?



The ZCB Energy Model:

Based on ten years of real-world hourly data

2002 - 2011
87,648 hours



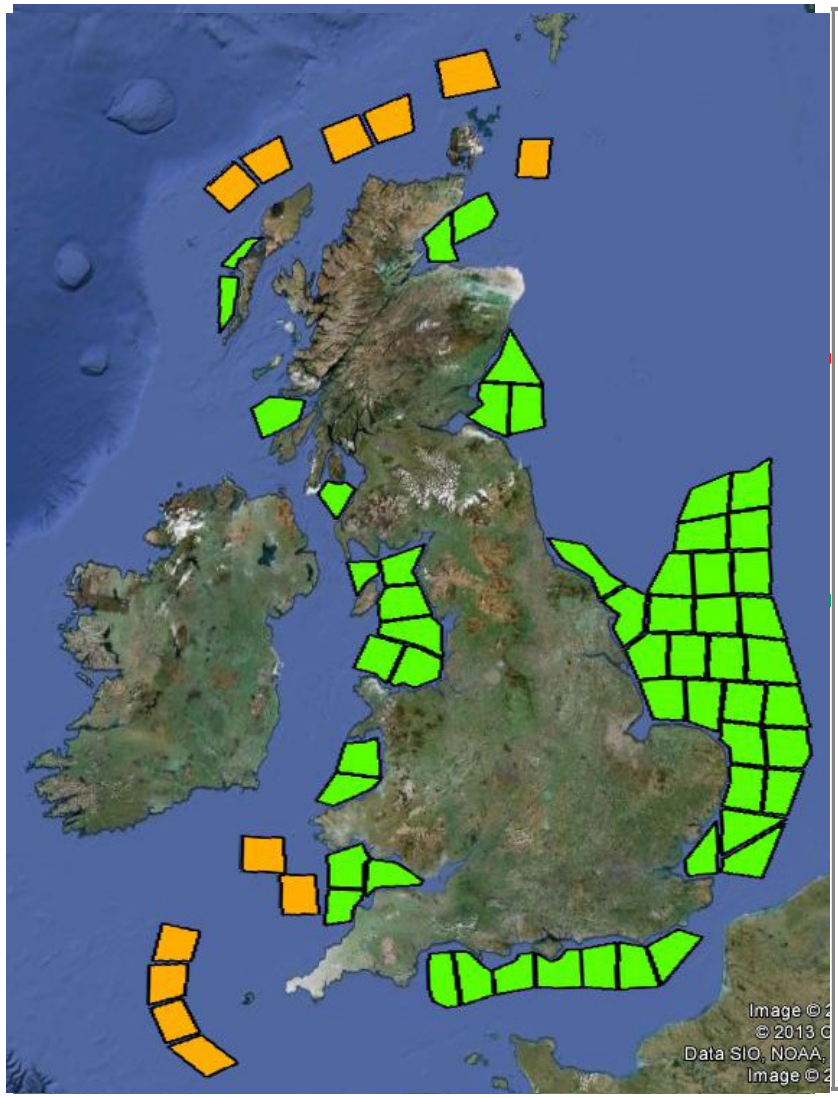

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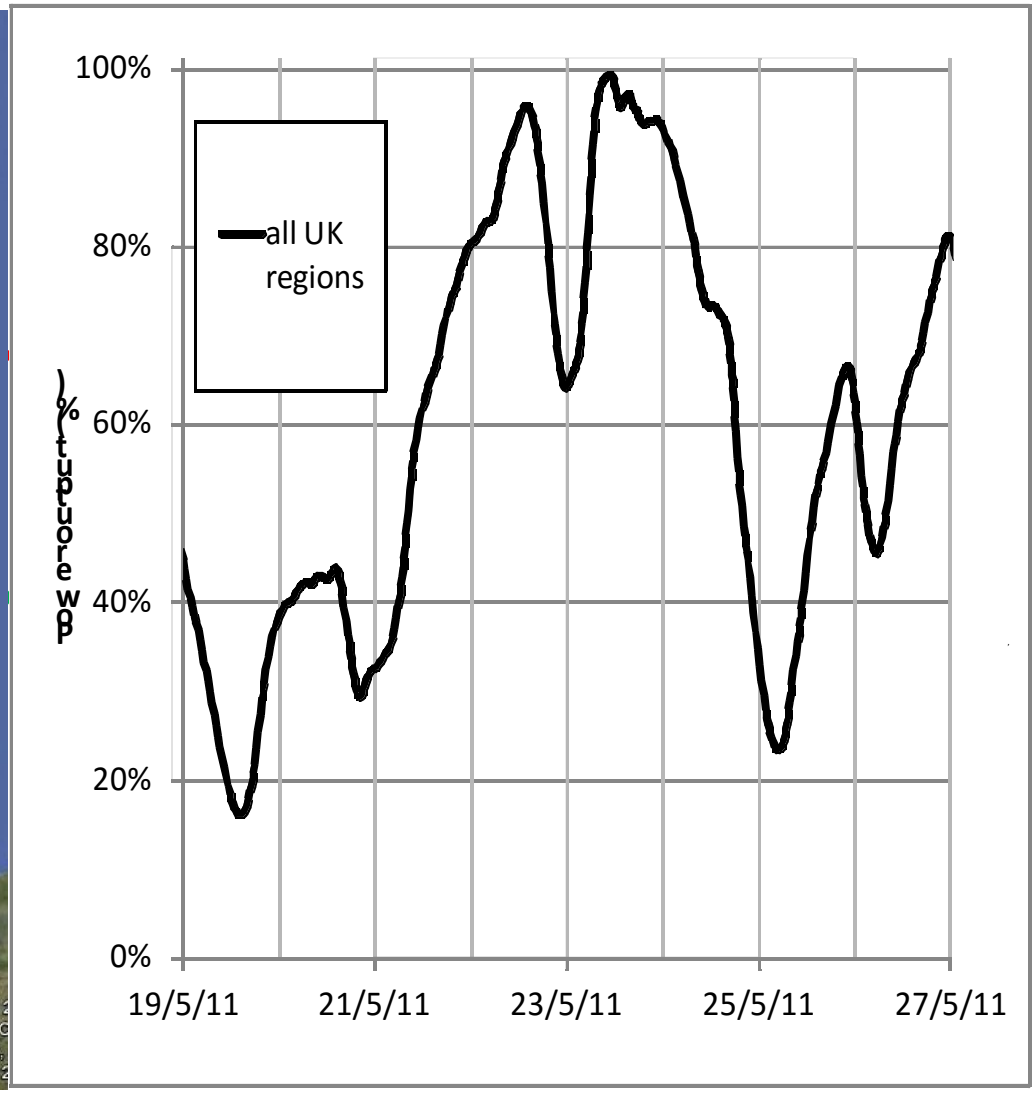
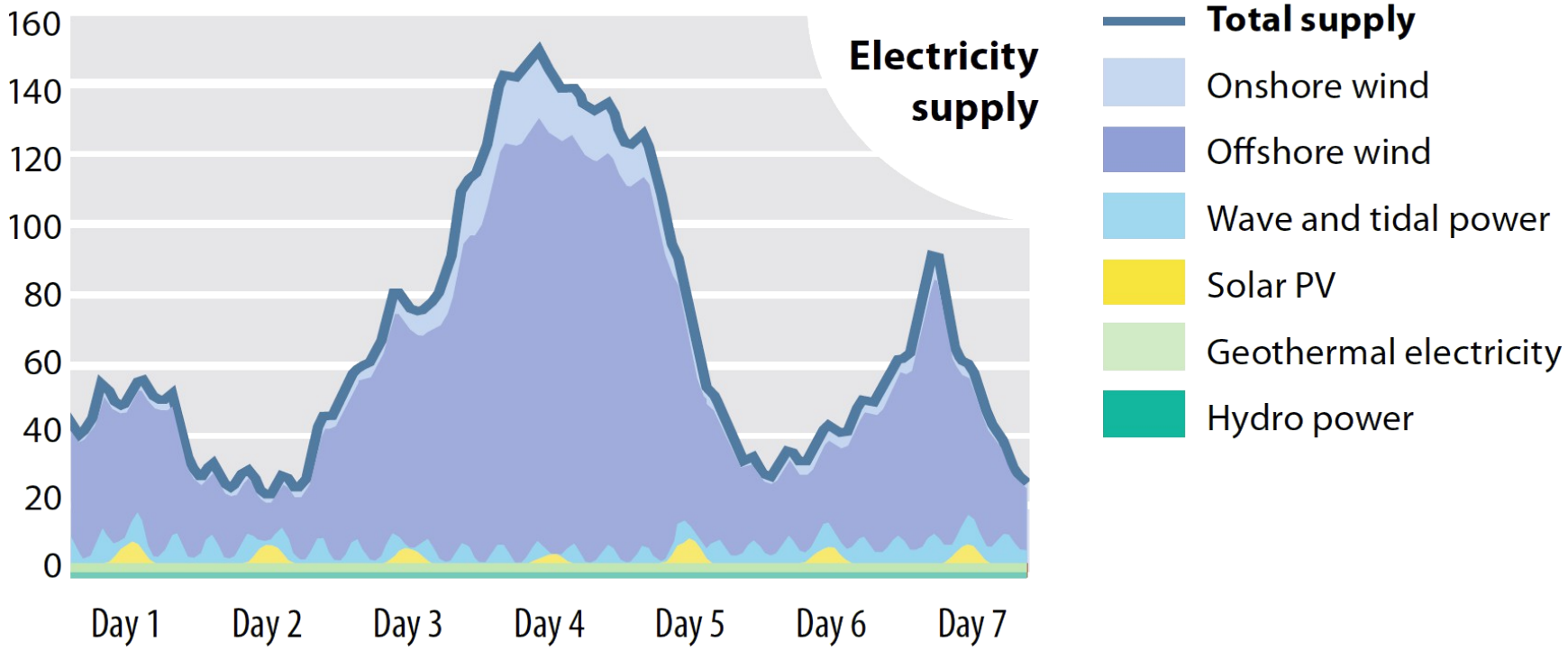
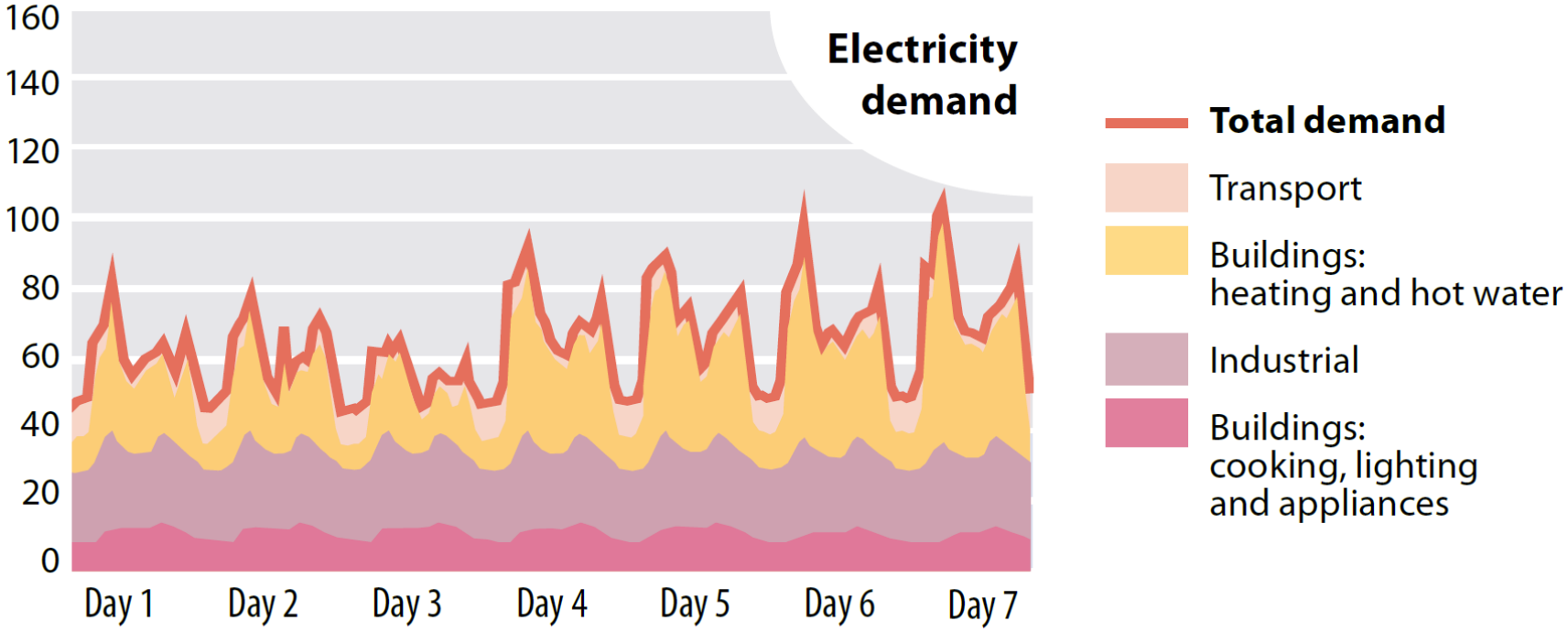
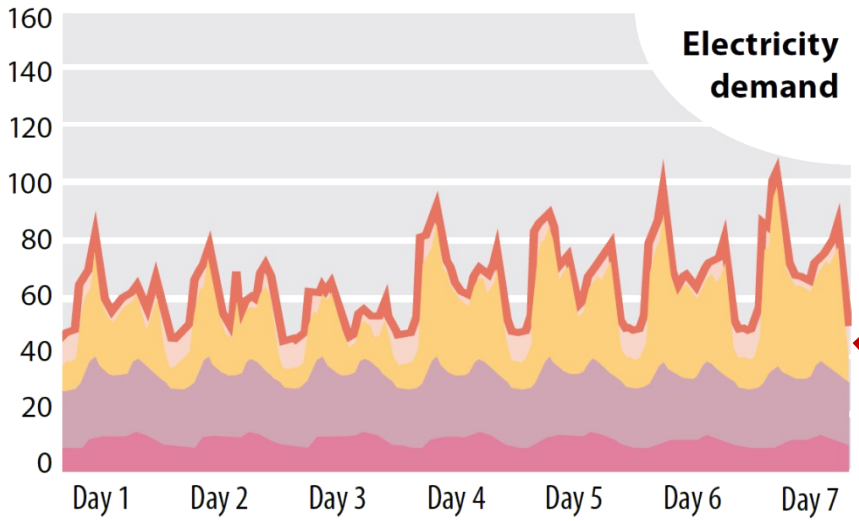
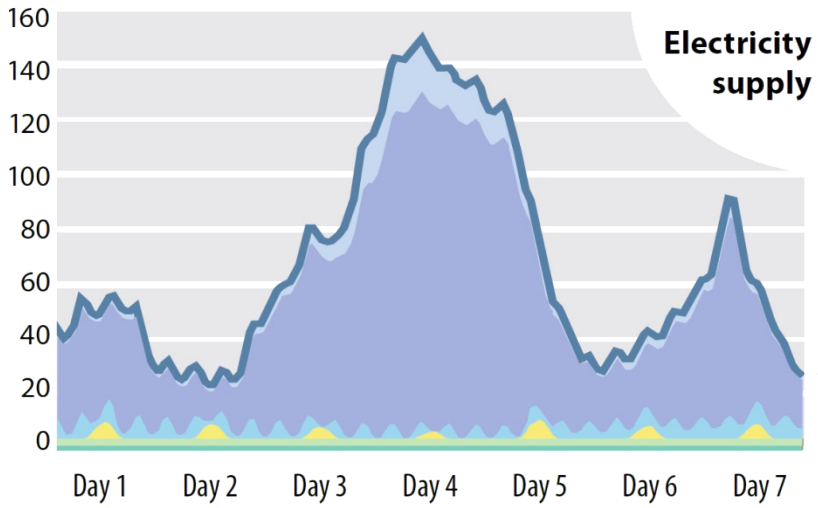
Image ©

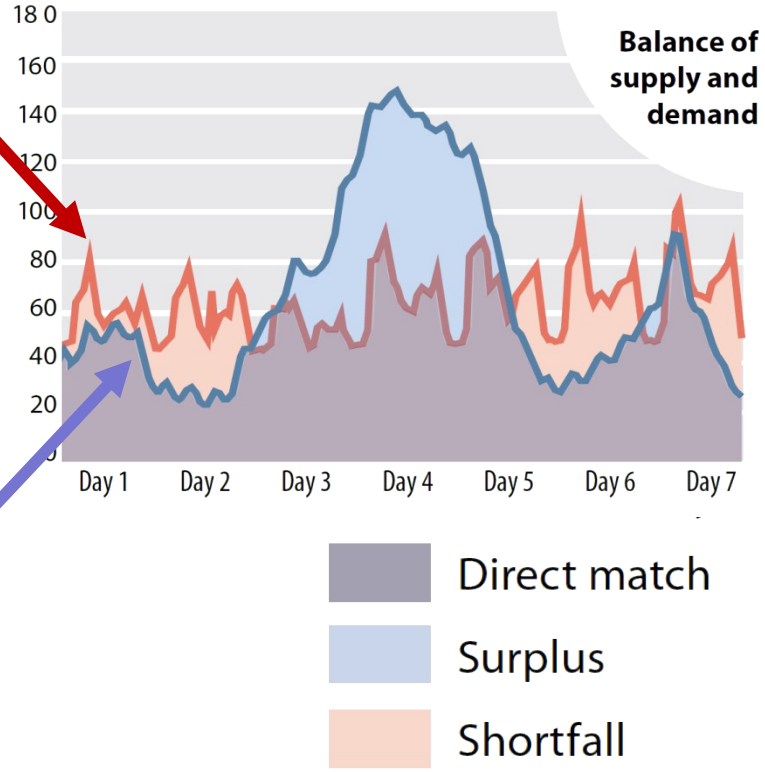

100%
80%
60%
40%
20%
0%
all UK regions
19/5/11
21/5/11
23/5/11
25/5/11
27/5/11


Electricity supply
160
140
120
100
80
60
40
20
0
Day 1
Day 2
Day 3
Day 4
Day 5
Day 6
Day 7
Total supply
Onshore wind
Offshore wind
Wave and tidal power
Solar PV
Geothermal electricity
Hydro power


Electricity demand
160
140
120
100
80
60
40
20
0
Day 1
Day 2
Day 3
Day 4
Day 5
Day 6
Day 7
Total demand
Transport
Buildings: heating and hot water
Industrial
Buildings: cooking, lighting and appliances

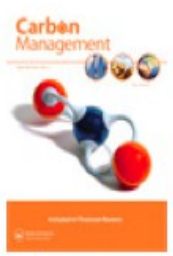

Electricity demand
160
140
120
100
80
60
40
20
0
Day 1
Day 2
Day 3
Day 4
Day 5
Day 6
Day 7


Electricity supply
160
140
120
100
80
60
40
20
0
Day 1
Day 2
Day 3
Day 4
Day 5
Day 6
Day 7


Balance of supply and demand
18 0
160
140
120
100
80
60
40
20
Day 1
Day 2
Day 3
Day 4
Day 5
Day 6
Day 7
Direct match
Surplus
Shortfall

ZCB Scenario demonstrates

- 82% of the time, the supply of renewable electricity exceeds demand (including electricity for heating and transport).
- However, 18% of the time, electricity supply does not fully meet demand.
- Short-term storage & 'shifting' demand can reduce this from 18% to 15%.
- Biogas and carbon neutral synthetic gas are burned in gas power stations to cover this.
- **Management of supply and demand with a 100% renewable energy system is possible with existing technology**



Carbon Management
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/tcmt20

Toward understanding the challenges and opportunities in managing hourly variability in a 100% renewable energy system for the UK

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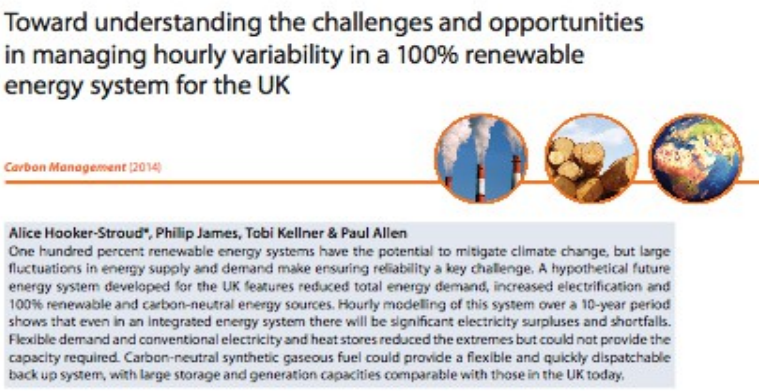
Published online: 22 Apr 2015.



Land use

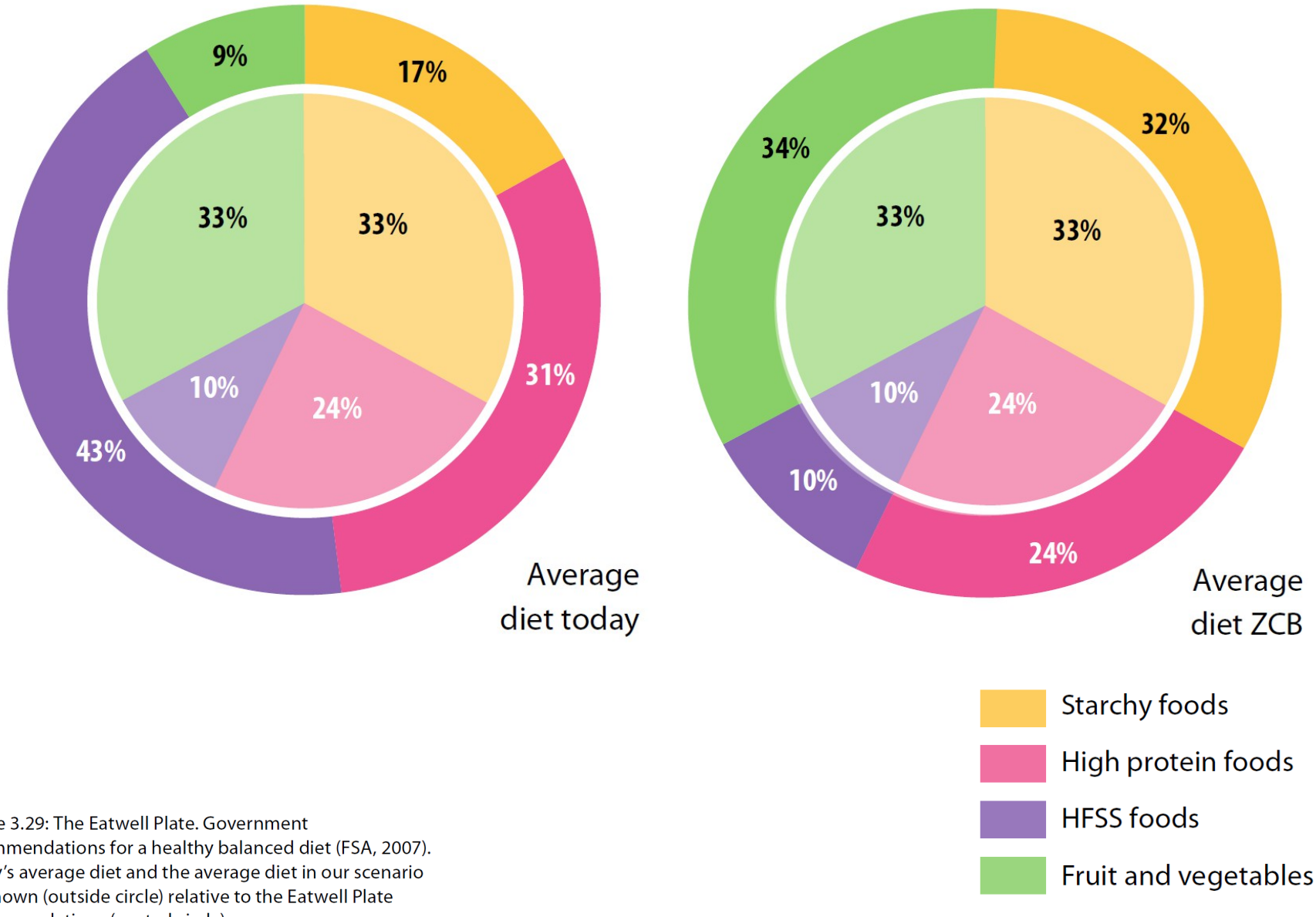


Figure 3.29: The Eatwell Plate. Government recommendations for a healthy balanced diet (FSA, 2007). Today's average diet and the average diet in our scenario are shown (outside circle) relative to the Eatwell Plate recommendations (central circle).

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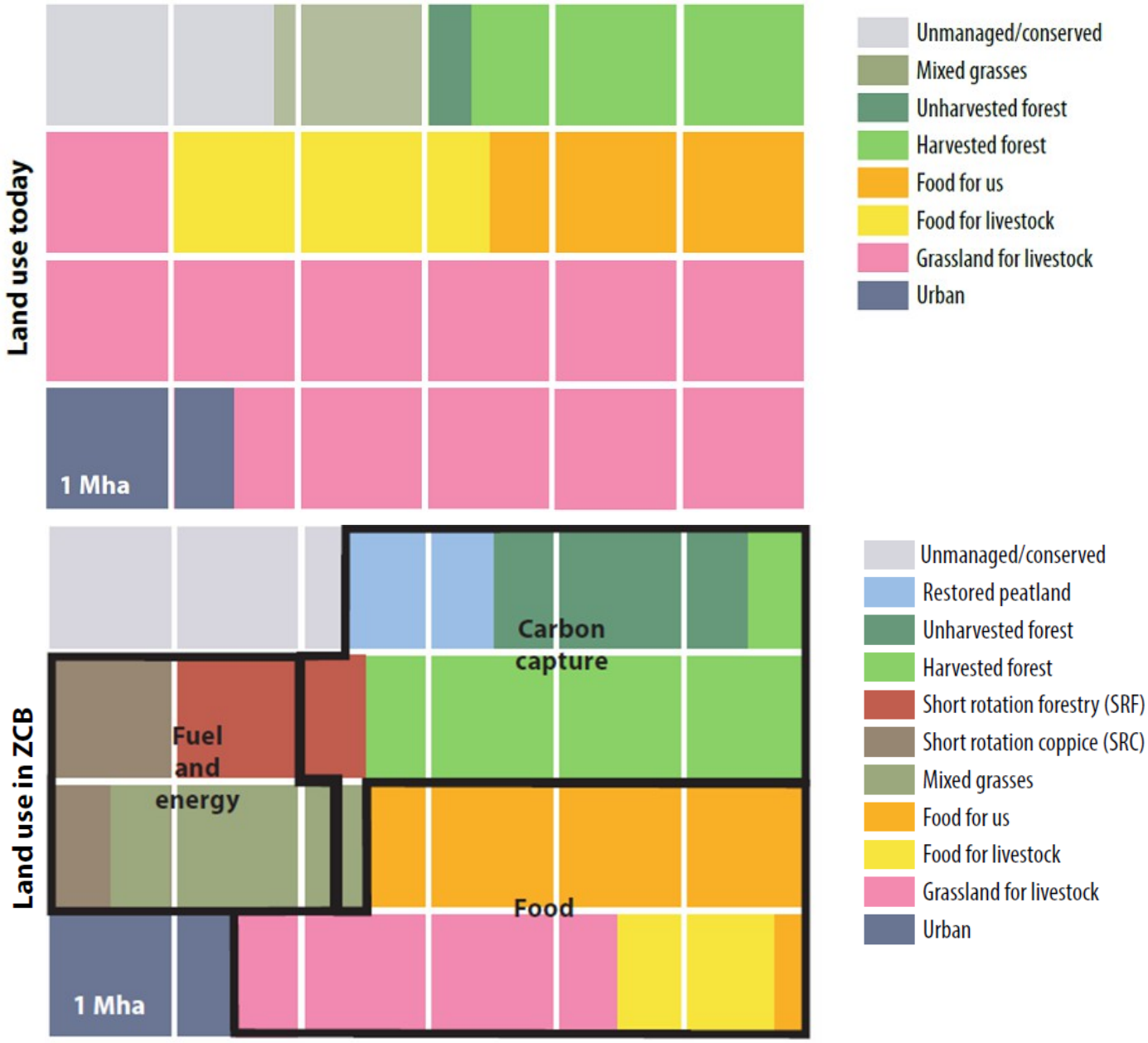

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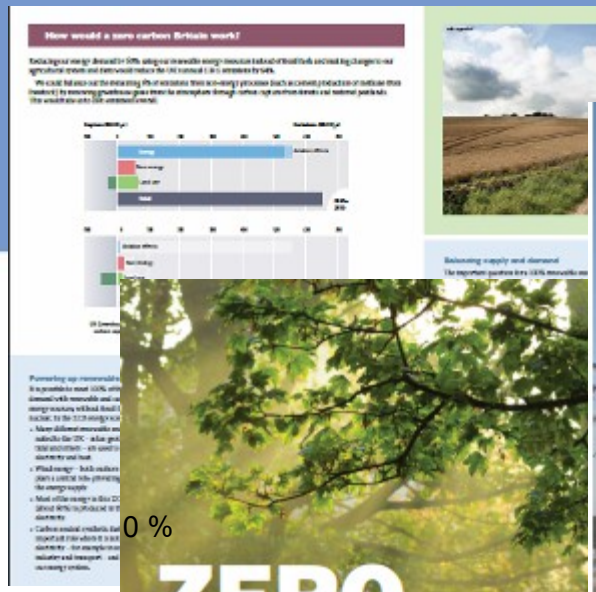
Rethinking the Future



selves with 100% ustainably and to our children and

Future models a the UK has risen ry.

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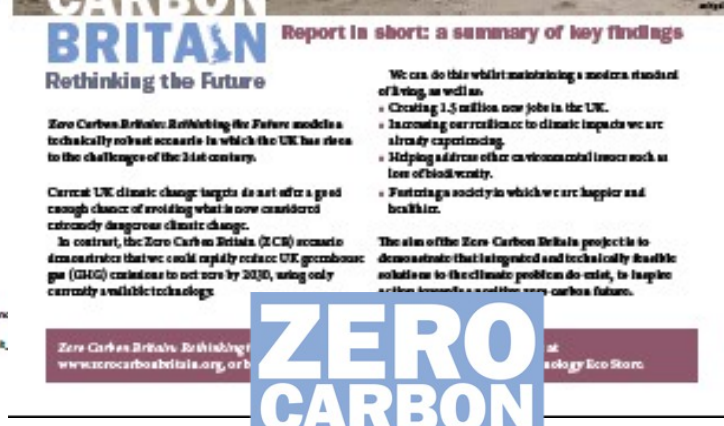

WHO'S GETTING READY FOR ZERO?

A report on the state of play of zero carbon modelling

ZERO CARBON MAKING IT HAPPEN

www.zerocarbonbritian.org