

**Fair Low/Zero Carbon & 100% RE Strategies,
South & North Countries, Villages,
including Women Initiatives**

**UNFCCC COP21 Side Event, Paris, France
December 3, 2015**



**Rethinking
the Future**

Transitioning the UK to a Zero Carbon Society in 20 years By Paul Allen, CAT, UK

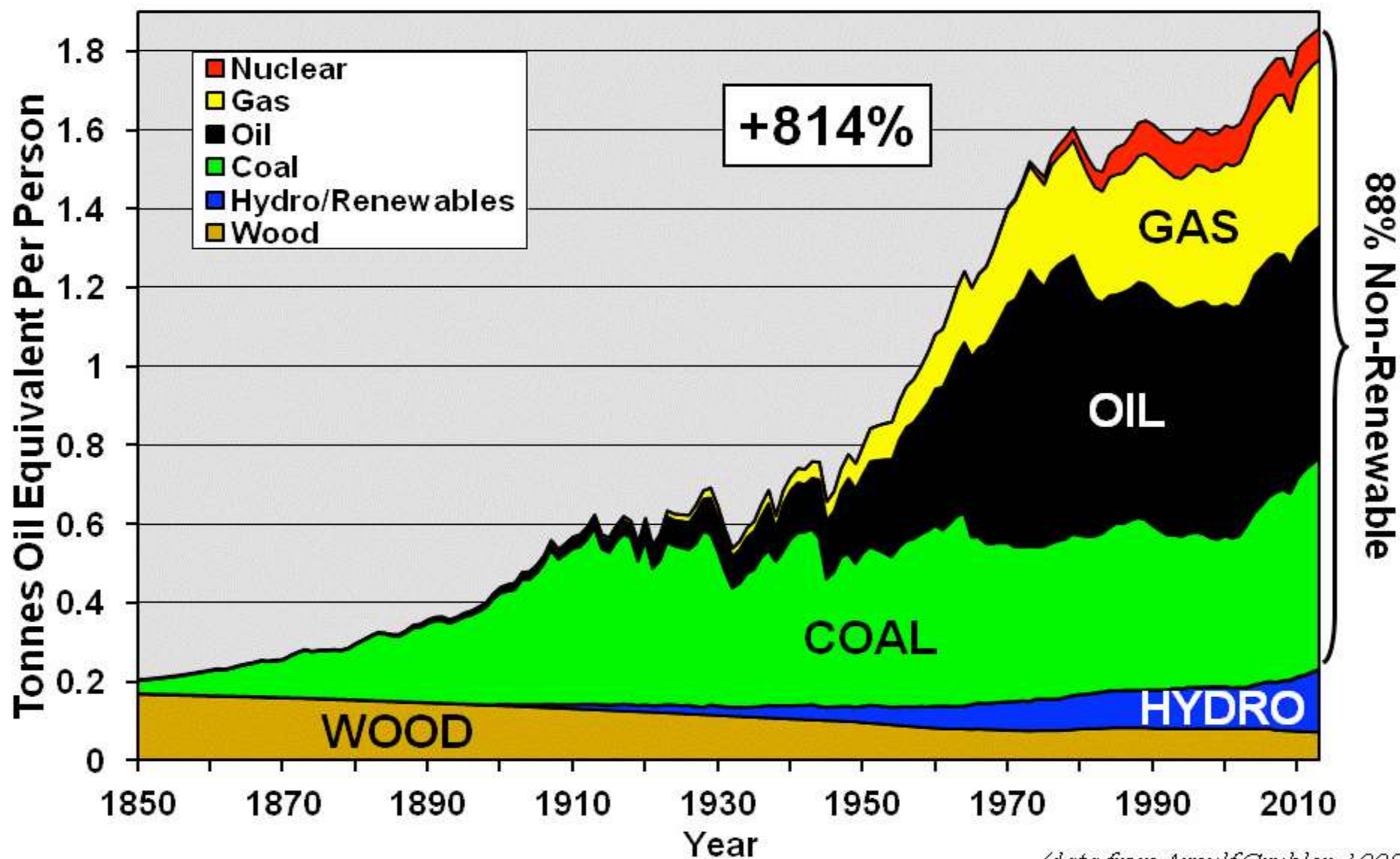


Presentations are available at the UNFCCC web site and at INFORSE:
www.inforse.org/europe/conf15_COP21.htm

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)



Powerdown
by 60% from our present
extreme energy normality

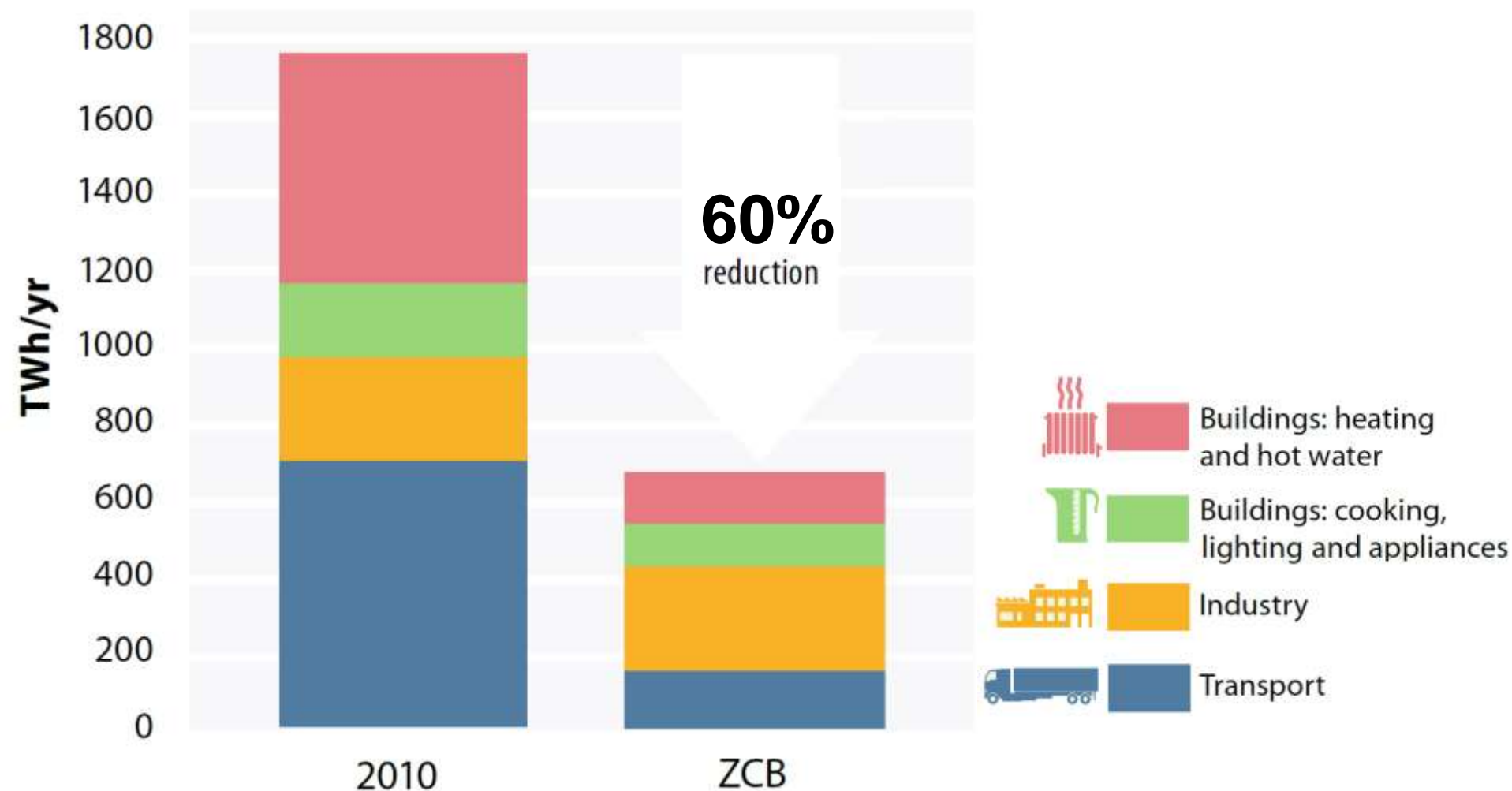
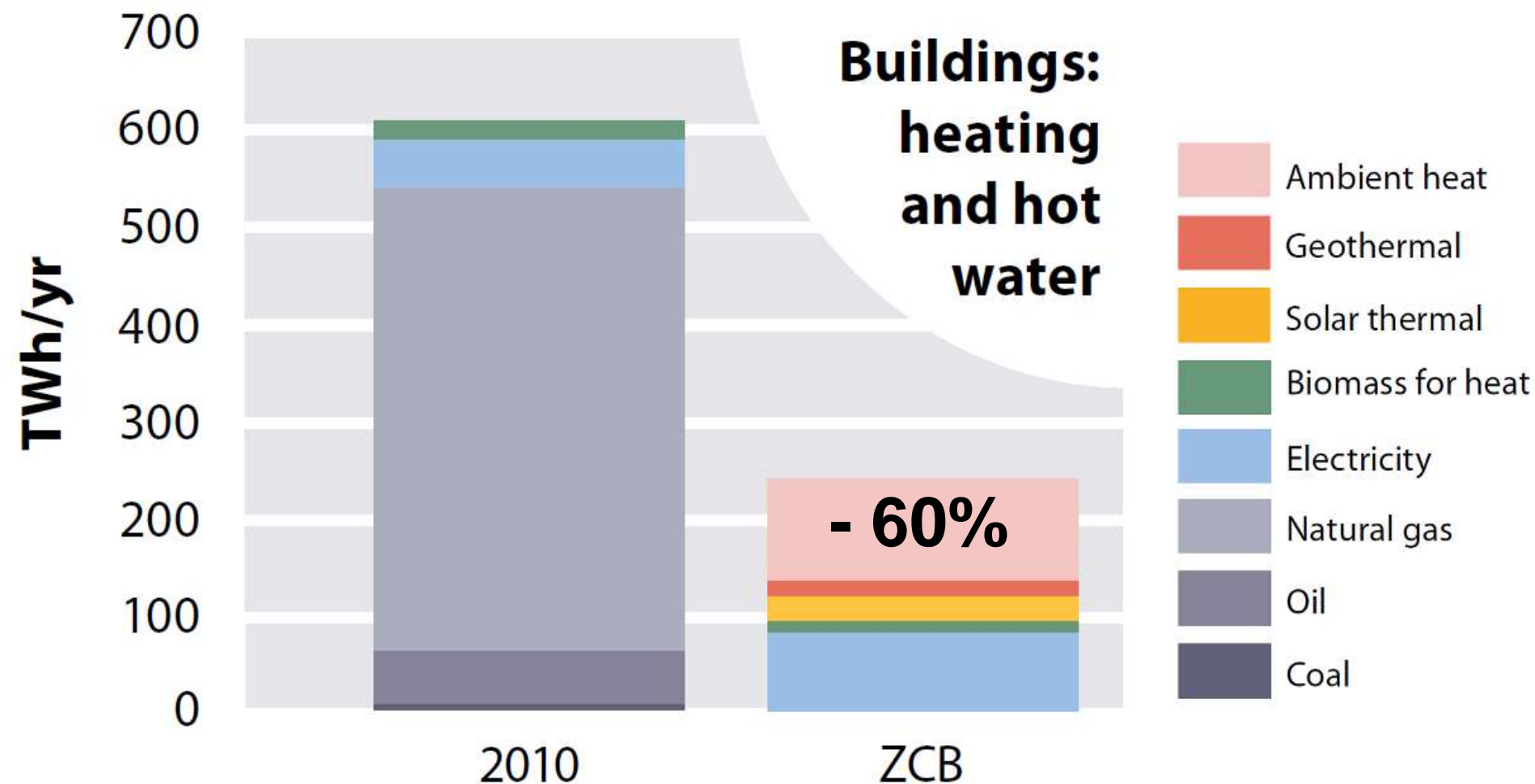


Figure 3.4: Total annual energy demand by sector in the UK in 2010 (DECC, 2012) and in our scenario.



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.

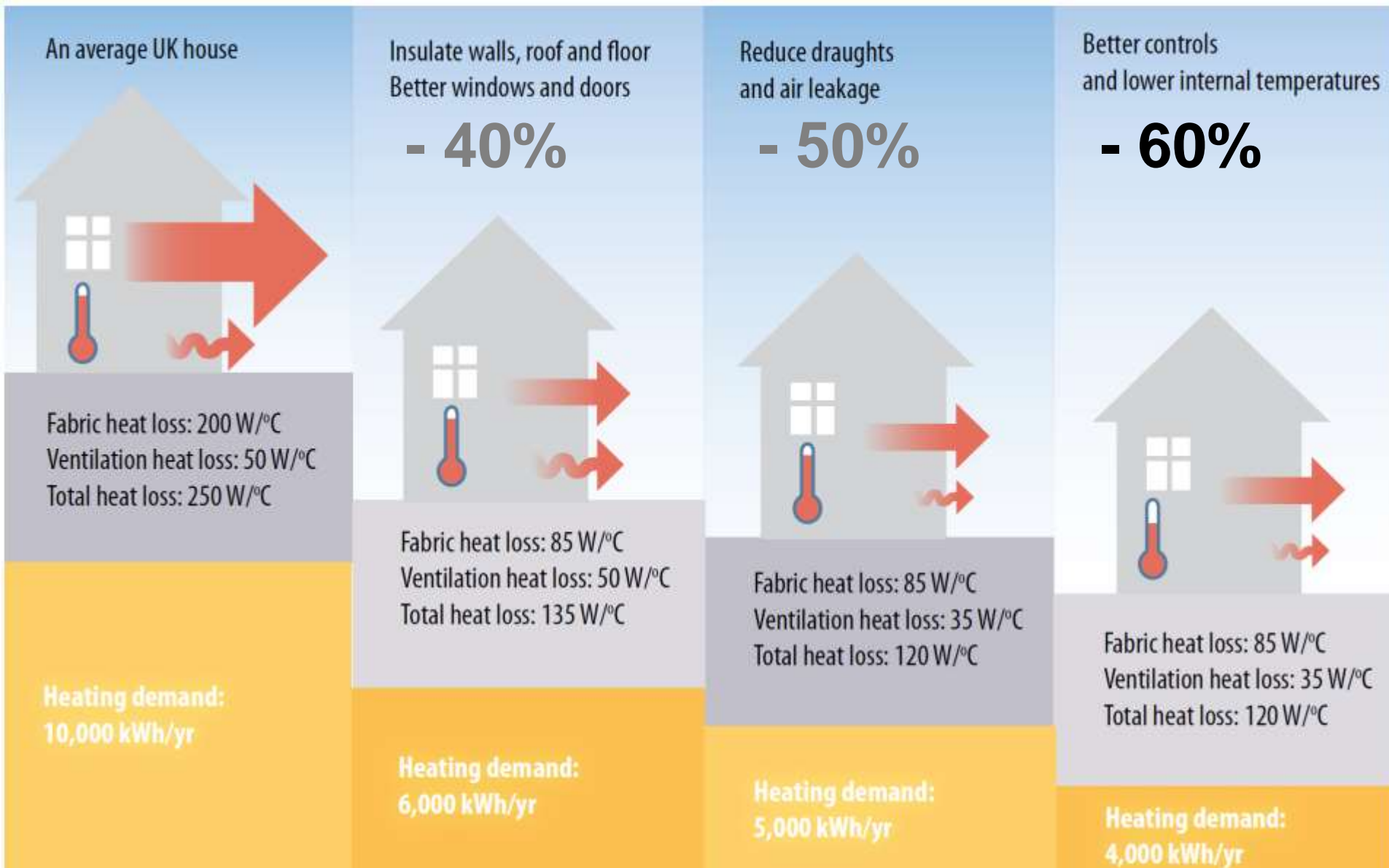


Figure 3.7: The impact of measures that reduce a building's heat loss and heating demand.

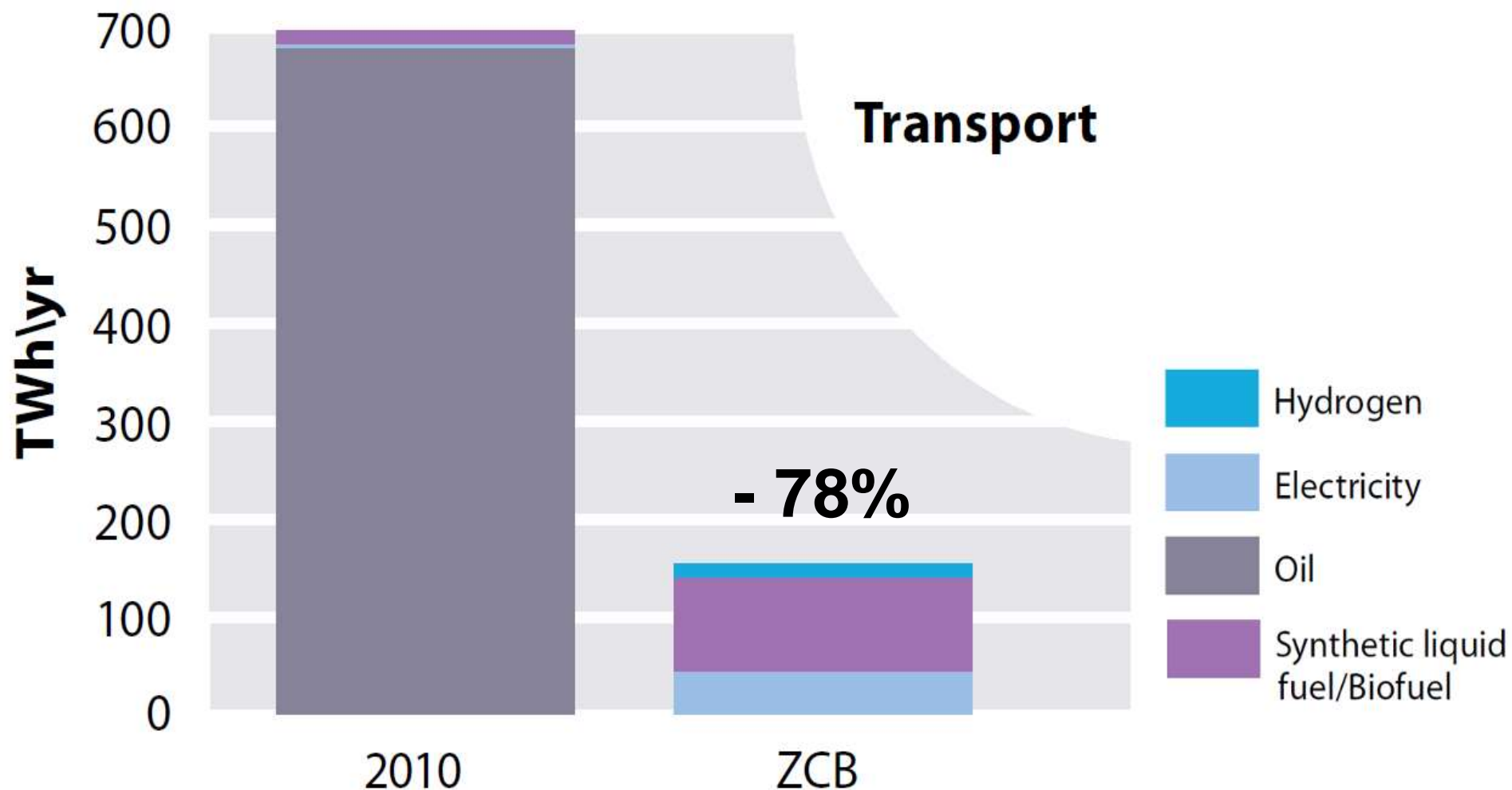


Figure 3.14: Change in total energy demand for transport and the types of fuel required in 2010 (DECC, 2012) and our scenario.

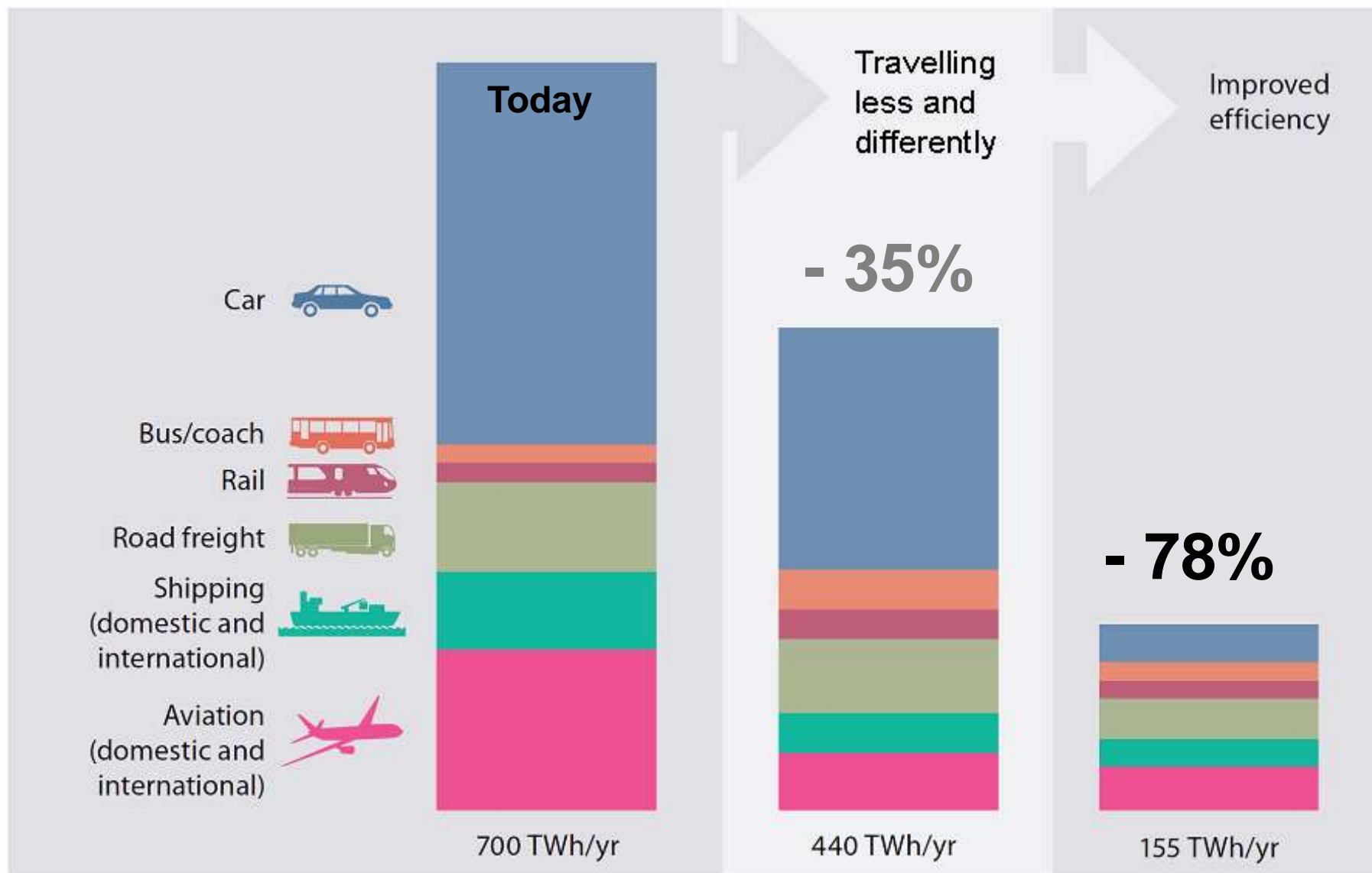
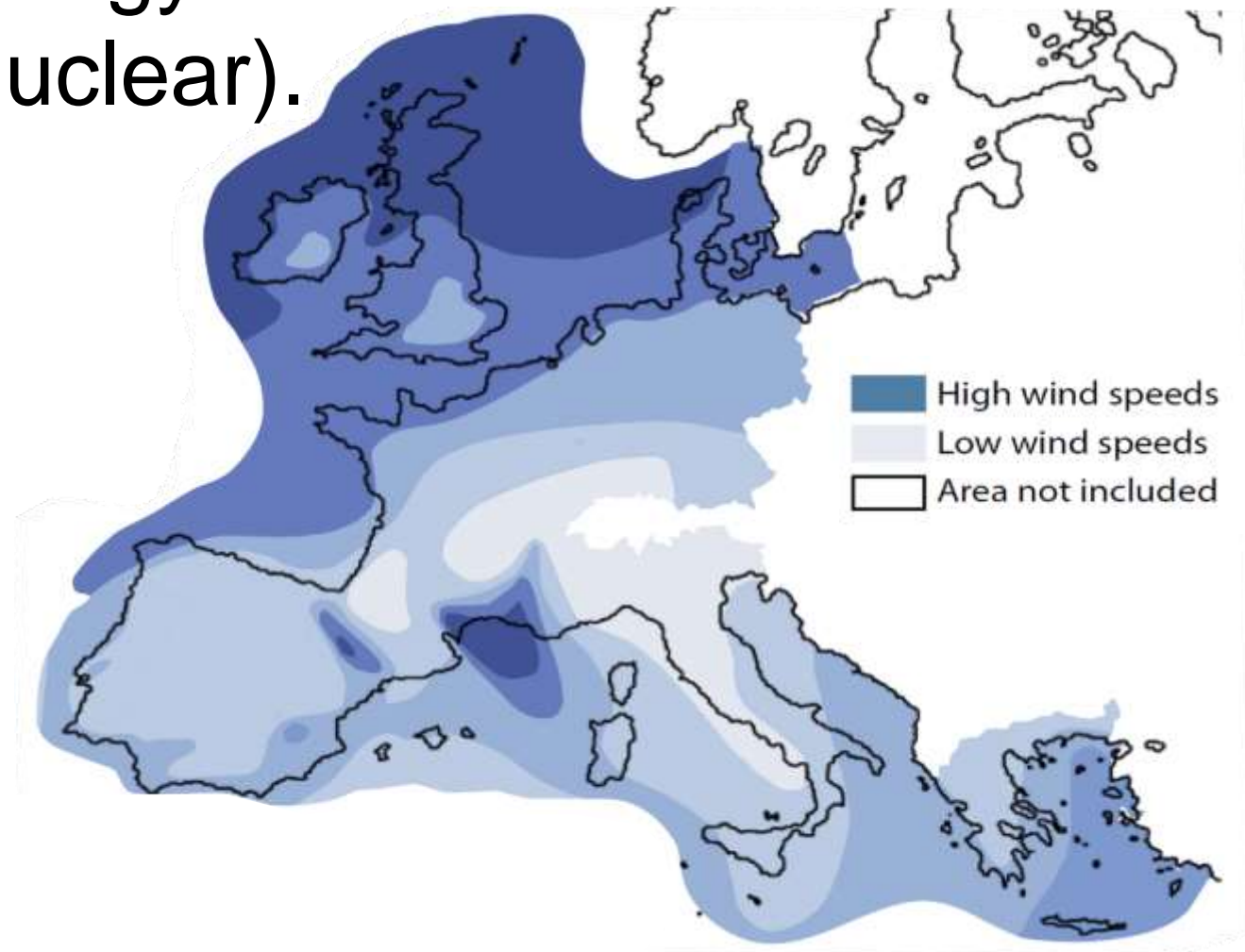


Figure 3.13: Reduction in energy demand for personal and commercial (freight) transport in our scenario (with initial figures from DECC, 2012).

Power up

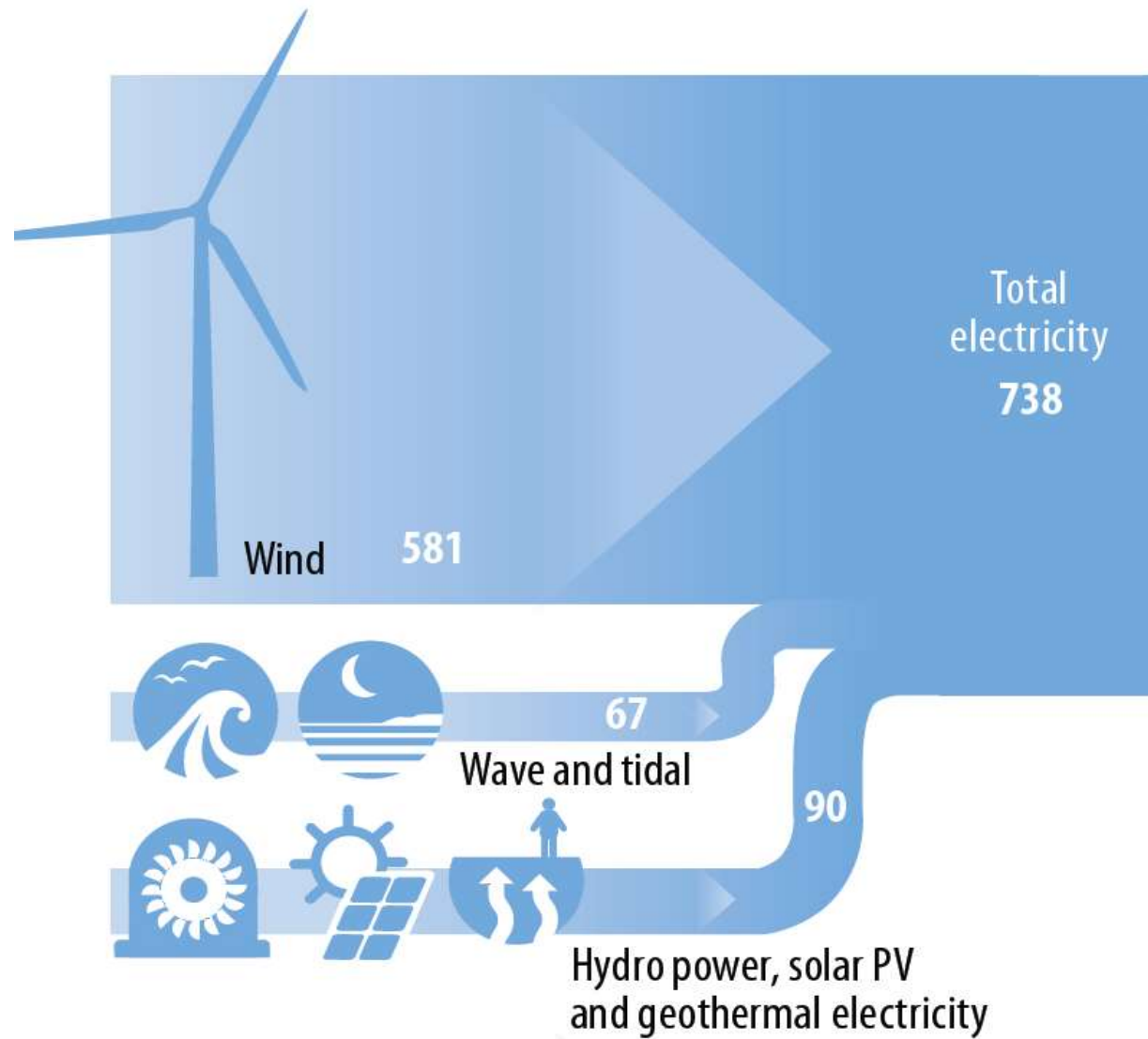


We can use **100% renewable** energy sources (no nuclear).



Key Question:

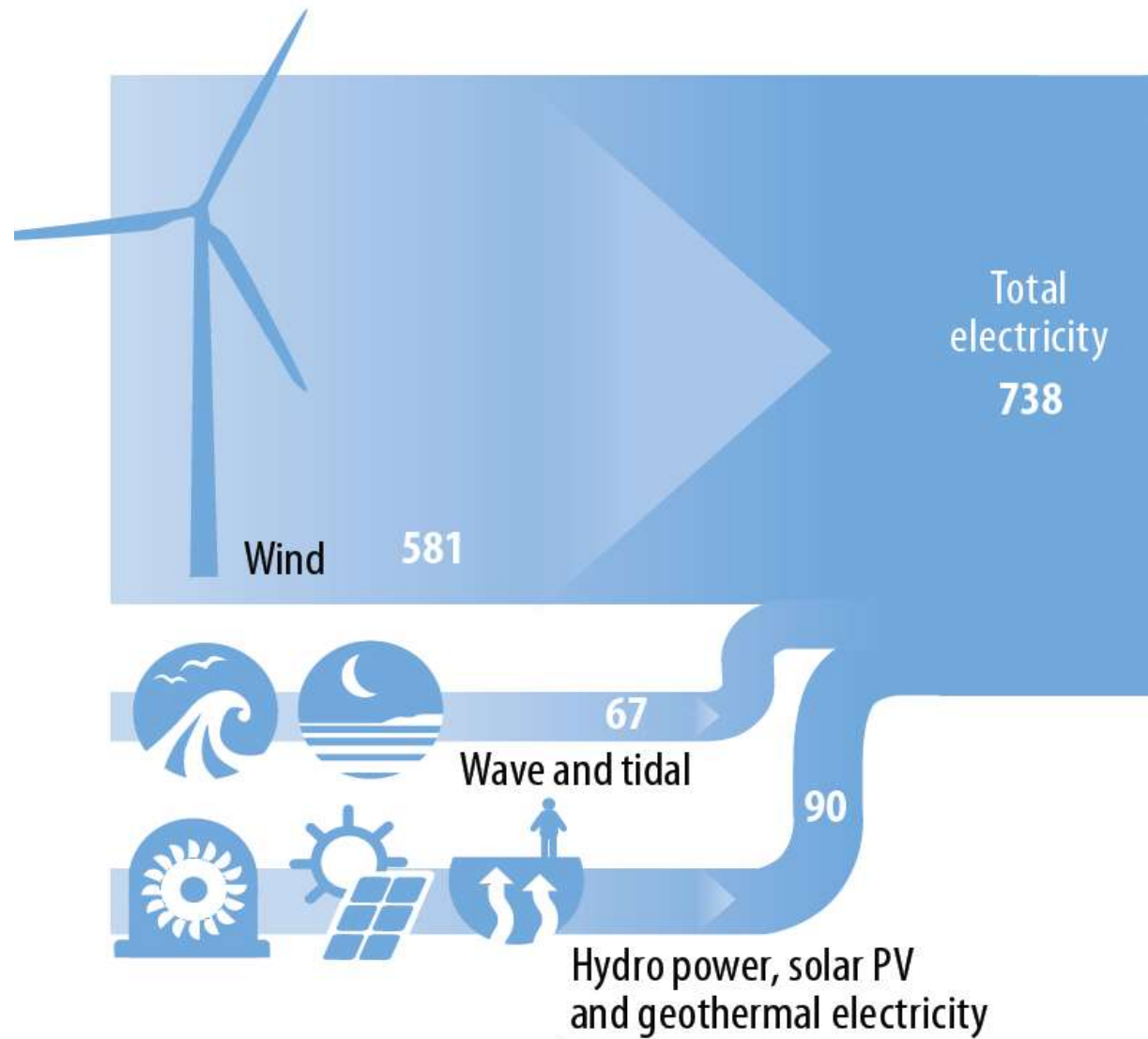
**Can we
“keep the
lights on”?**

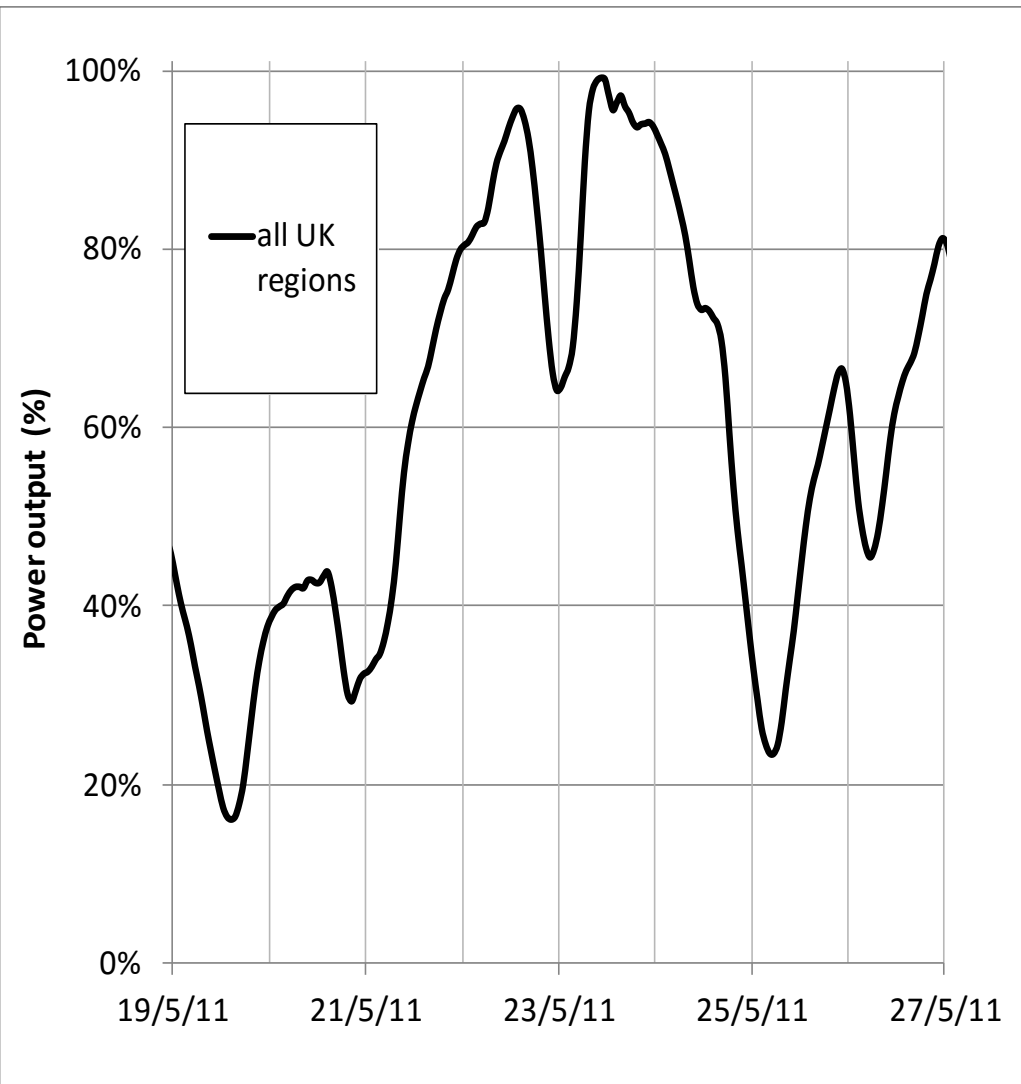
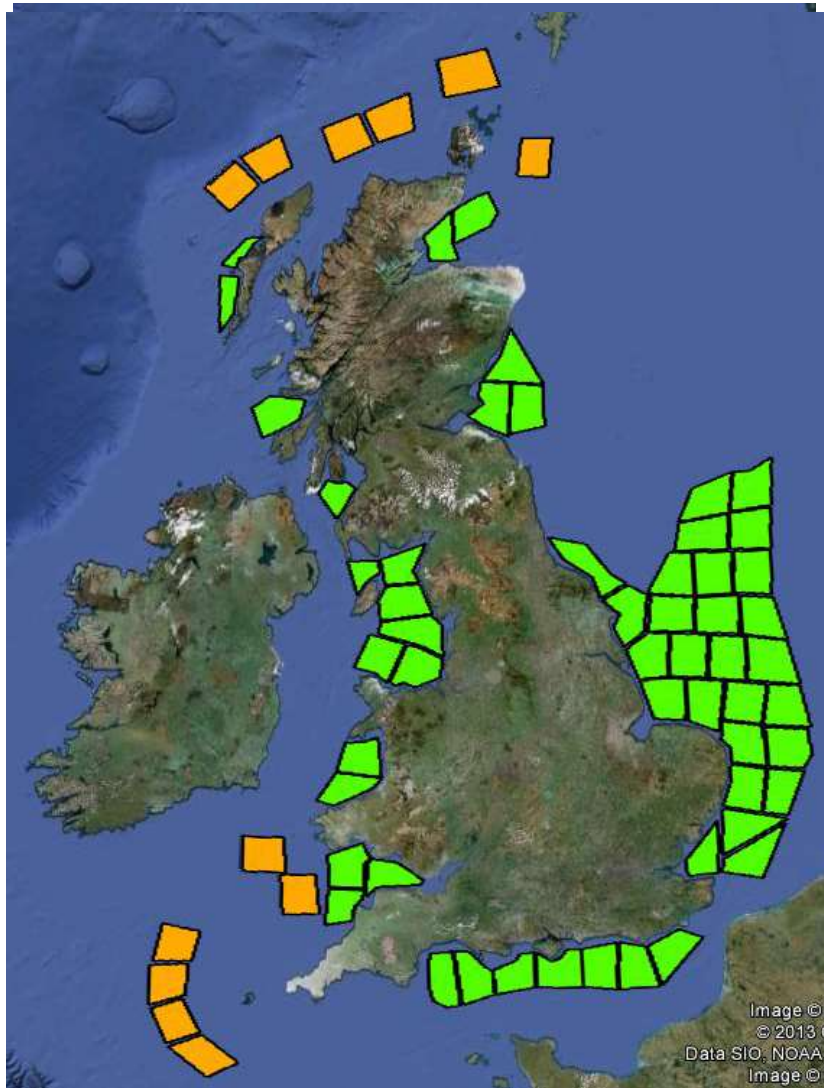


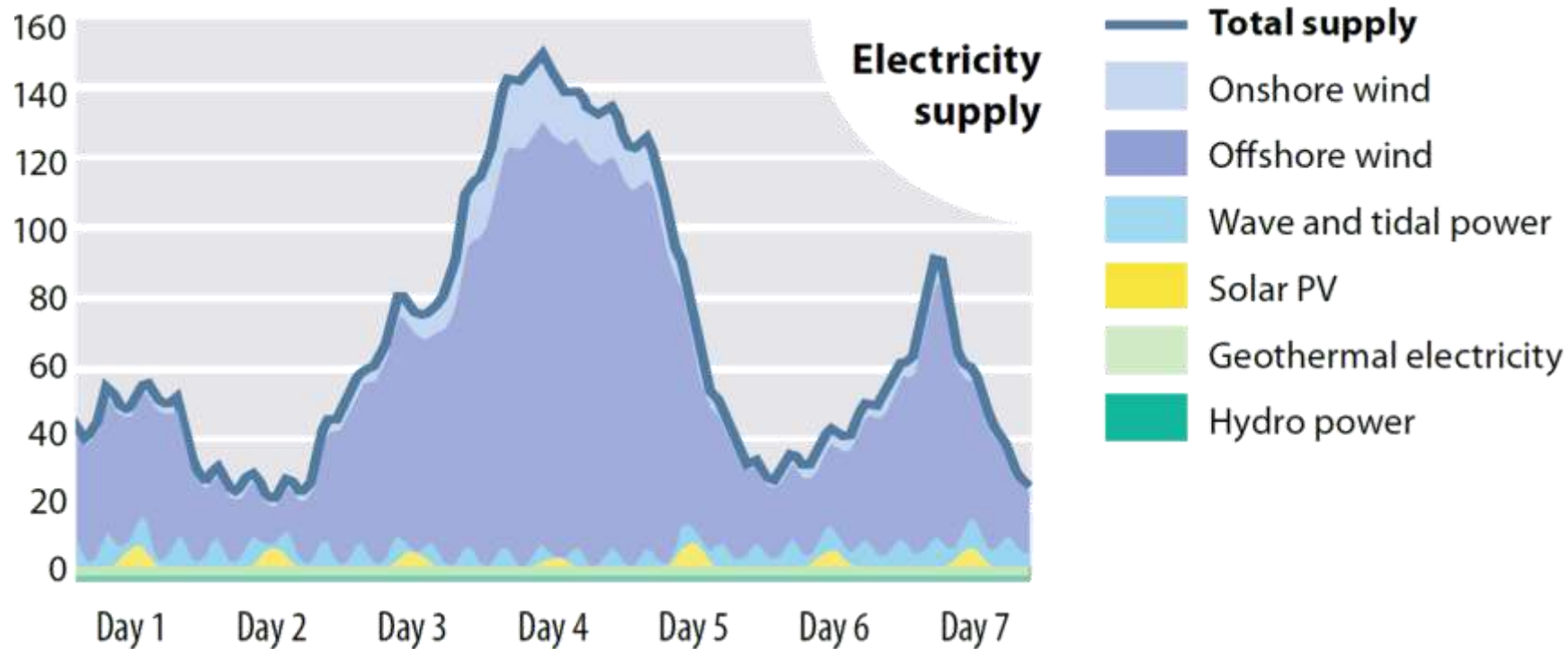
The ZCB Energy Model:

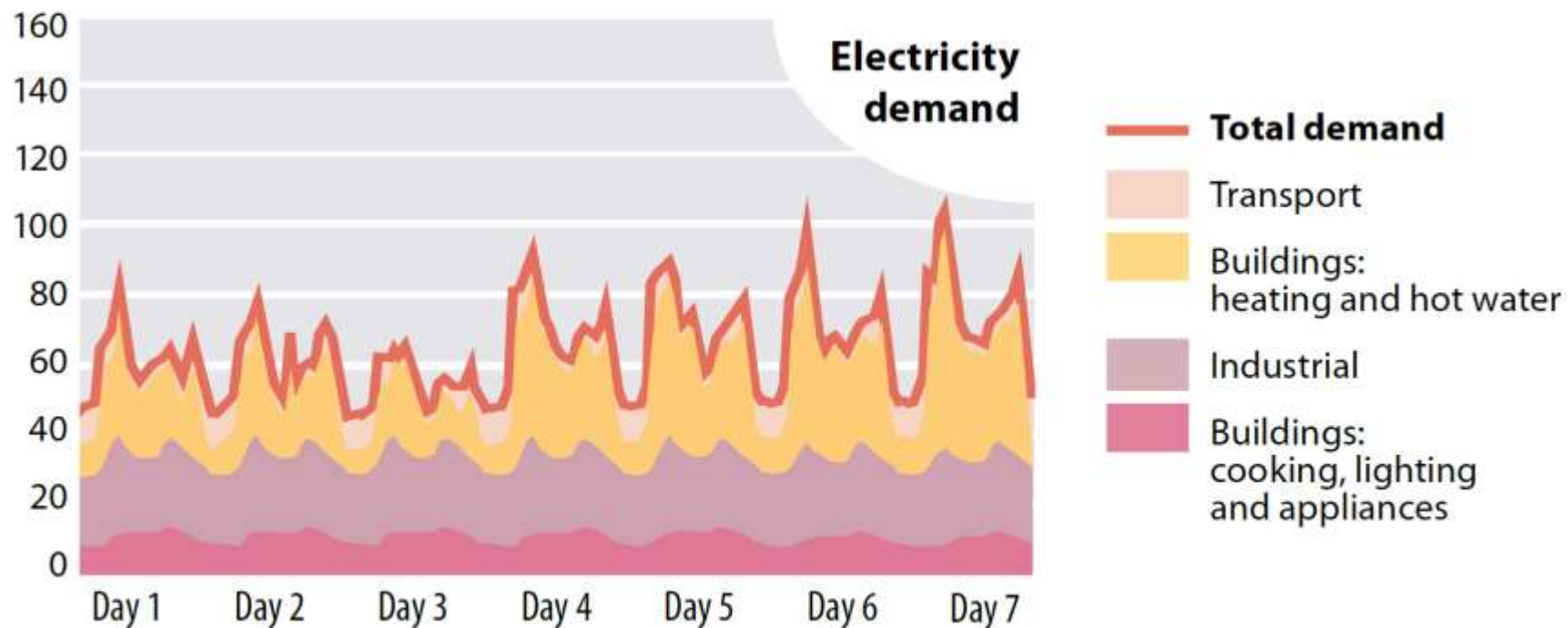
**Based on ten
years of
real-world
hourly data**

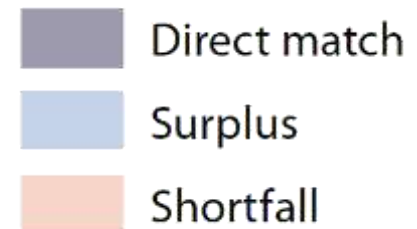
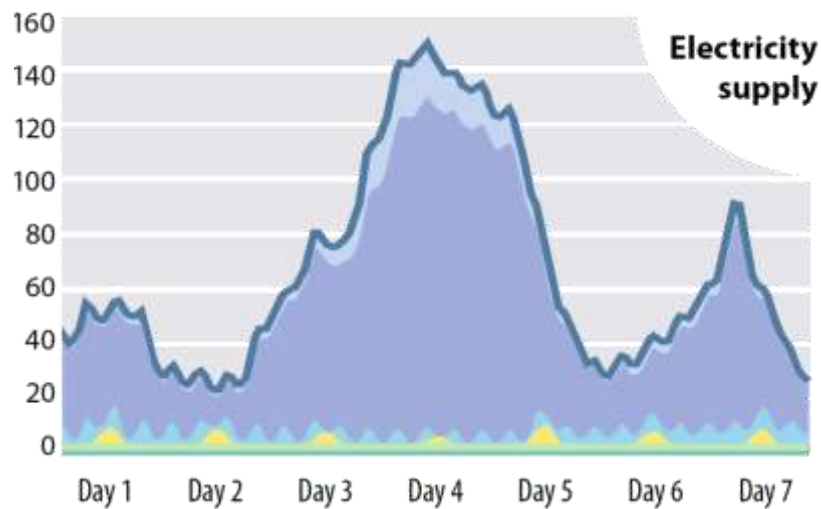
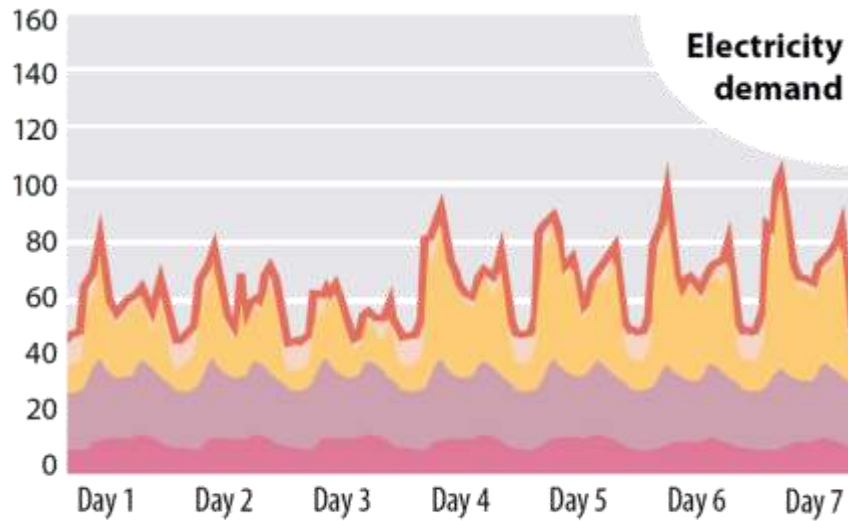
**2002 - 2011
87,648 hours**











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

Alice Hooker-Stroud^a, Philip James^a, Tobi Kellner^a & Paul Allen^a

^a Centre for Alternative Technology, Llwyngwern Quarry, Machynlleth, Powys, SY20 9AZ
Published online: 22 Apr 2015.

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

Carbon Management (2014)



Alice Hooker-Stroud^a, Philip James, Tobi Kellner & Paul Allen

One hundred percent renewable energy systems have the potential to mitigate climate change, but large fluctuations in energy supply and demand make ensuring reliability a key challenge. A hypothetical future energy system developed for the UK features reduced total energy demand, increased electrification and 100% renewable and carbon-neutral energy sources. Hourly modelling of this system over a 10-year period shows that even in an integrated energy system there will be significant electricity surpluses and shortfalls. Flexible demand and conventional electricity and heat stores reduced the extremes but could not provide the capacity required. Carbon-neutral synthetic gaseous fuel could provide a flexible and quickly dispatchable back up system, with large storage and generation capacities comparable with those in the UK today.

Land use



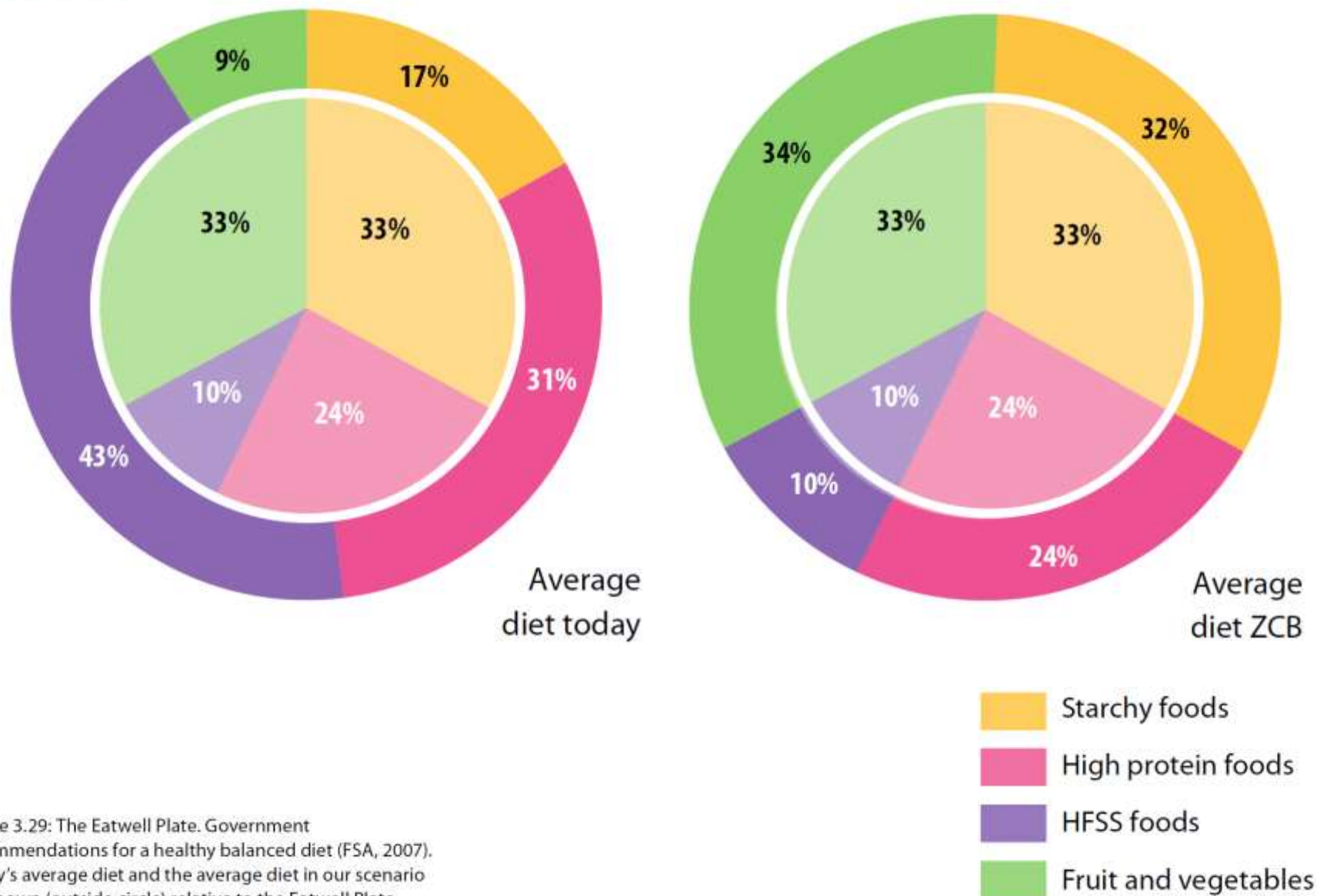
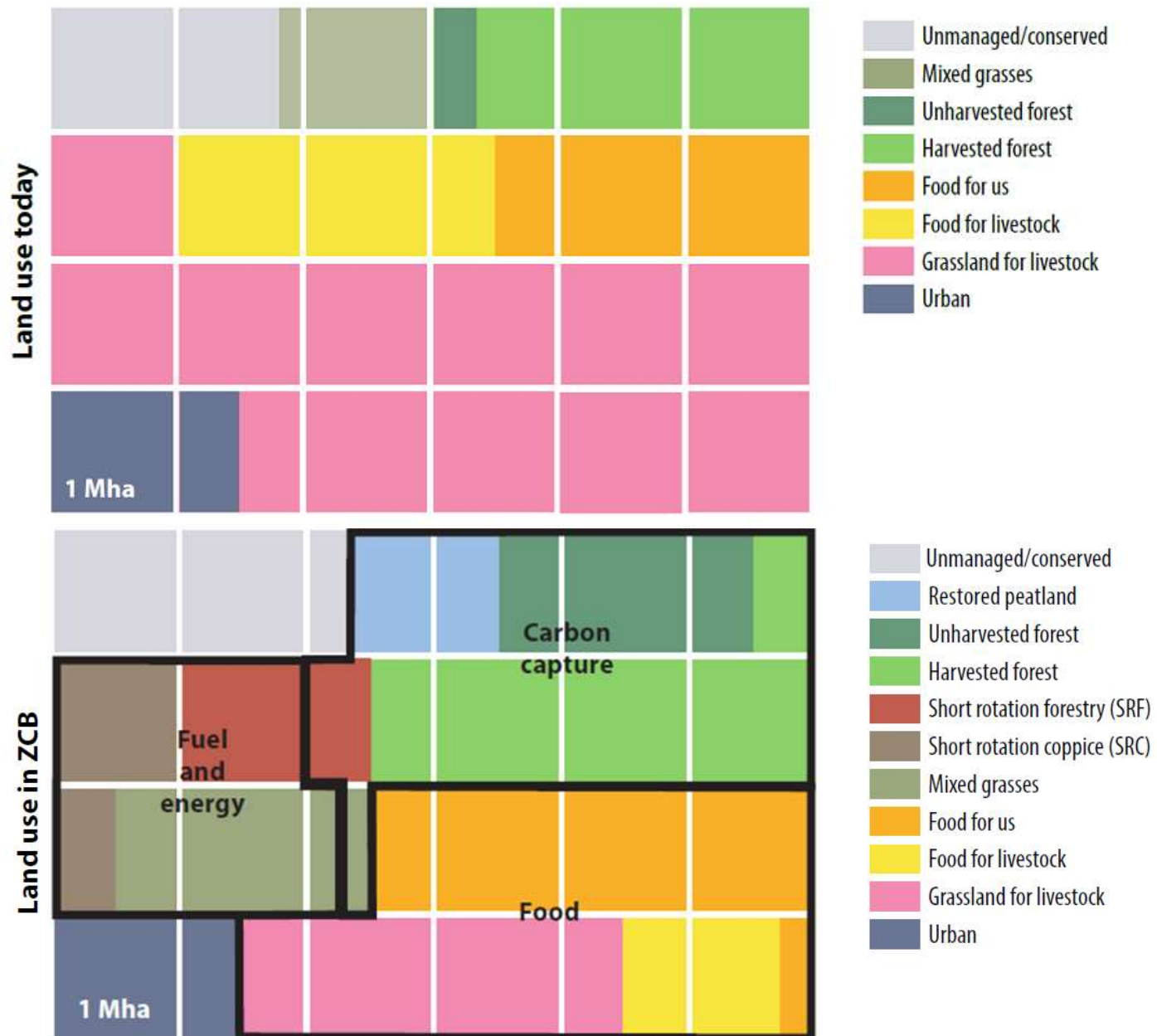


Figure 3.29: The Eatwell Plate. Government recommendations for a healthy balanced diet (FSA, 2007). Today's average diet and the average diet in our scenario are shown (outside circle) relative to the Eatwell Plate recommendations (central circle).





What are the barriers & How do we overcome them?

- Changing how millions of people live is a very special kind of problem
- The forces that shape our lives exist on many different levels.
- Tackling such a complex global challenge requires a new kind of approach
- Joining up research and practice across disciplines, borders, sectors and scales.



What are the barriers & How do we overcome them?

- Science
- Technology
- Economics
- Psychology
- Philosophy
- Sociology
- History
- Democracy
- Law
- Culture
- Spirit



ZERO CARBON BRITAIN

Rethinking the Future

WHO'S GETTING READY FOR ZERO?

A report on the state of play of zero carbon modelling

www.zerocarbonbritain.org

How would a zero carbon Britain work?

Technology: energy demand in 2050, alongside renewable energy resources (excluding wind and solar) and large scale energy storage and transmission capacity. The UK is a small island with a high proportion of its energy demand met by imported energy. We need to reduce our energy demand and increase our renewable energy production to meet our energy needs. This can be achieved by a combination of energy efficiency measures, renewable energy sources and energy storage.

Energy demand in 2050: 100 TWh/yr. Renewable energy resources: 100 TWh/yr. Energy efficiency measures: 100 TWh/yr. Total energy supply: 100 TWh/yr.

Energy efficiency measures: 100 TWh/yr. Renewable energy resources: 100 TWh/yr. Total energy supply: 100 TWh/yr.

Renewable energy and storage

100% renewable energy and storage

100% renewable energy and storage

How would a zero carbon Britain work?

100% renewable energy and storage

100% renewable energy and storage

100% renewable energy and storage

ZERO CARBON BRITAIN

Rethinking the Future

ZERO CARBON BRITAIN

Rethinking the Future

Report in short: a summary of key findings

We can do this whilst maintaining a modern standard of living, as well as:

- Creating 1.5 million new jobs in the UK.
- Increasing our resilience to climate impacts we are already experiencing.
- Helping address other environmental issues such as loss of biodiversity.
- Fast-tracking society in which we are happier and healthier.

The aim of the Zero Carbon Britain project is to demonstrate that integrated and technically feasible solutions to the climate problem do exist, to inspire others to do the same, and to show a zero carbon future.

...selves with 100% sustainably and to our children and

Future models a ... the UK has risen ... y.

Centre for Alternative Techno

KCB0 g000000_00

Zero Carbon Britain: Rethinking the Future models a technically relevant scenario in which the UK has risen to the challenges of the 21st century.

Current UK climate change targets do not offer a good enough chance of avoiding what is now considered extremely dangerous climate change.

In contrast, the Zero Carbon Britain (ZCB) scenario demonstrates that we could rapidly reduce UK greenhouse gas (GHG) emissions to net zero by 2050, using only currently available technology.

Zero Carbon Britain: Rethinking the Future

www.zerocarbonbritain.org

ZERO CARBON

MAKING IT HAPPEN