



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

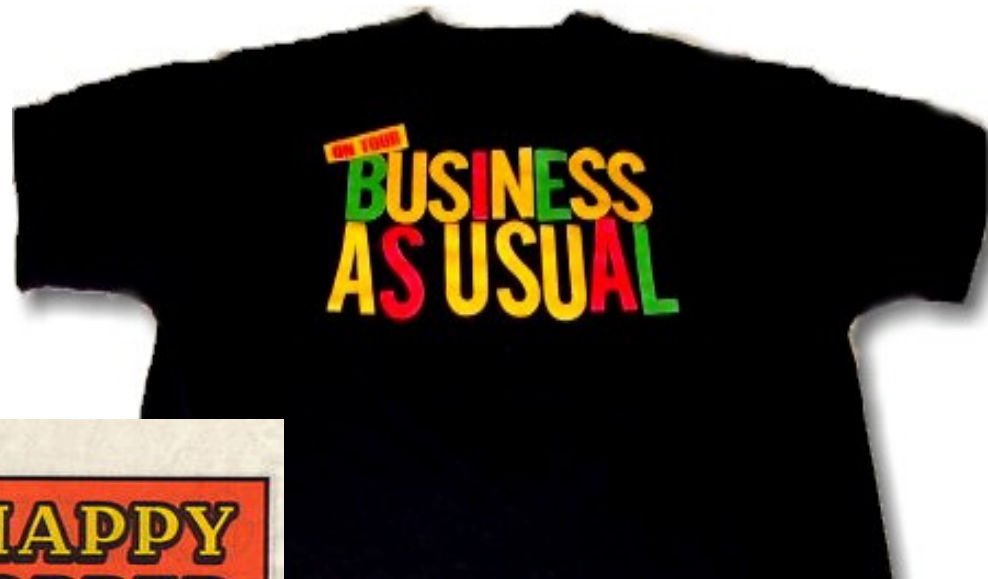
**Rethinking
the Future**

**Transitioning the UK to a
Zero Carbon Society in 20 years**

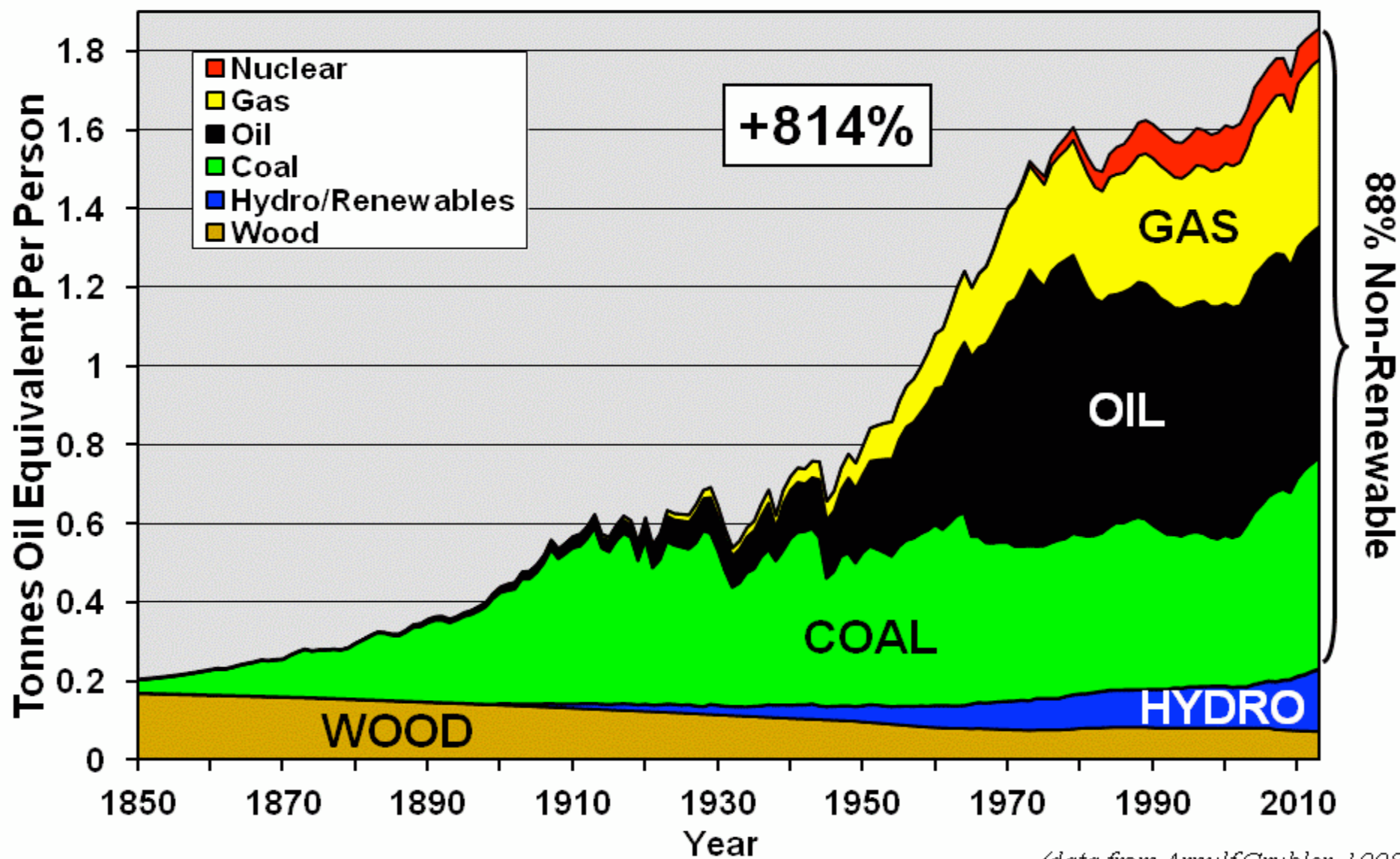


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We now think of it as 'normal'



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)



Powerdown
by 60% from our present
extreme energy normality

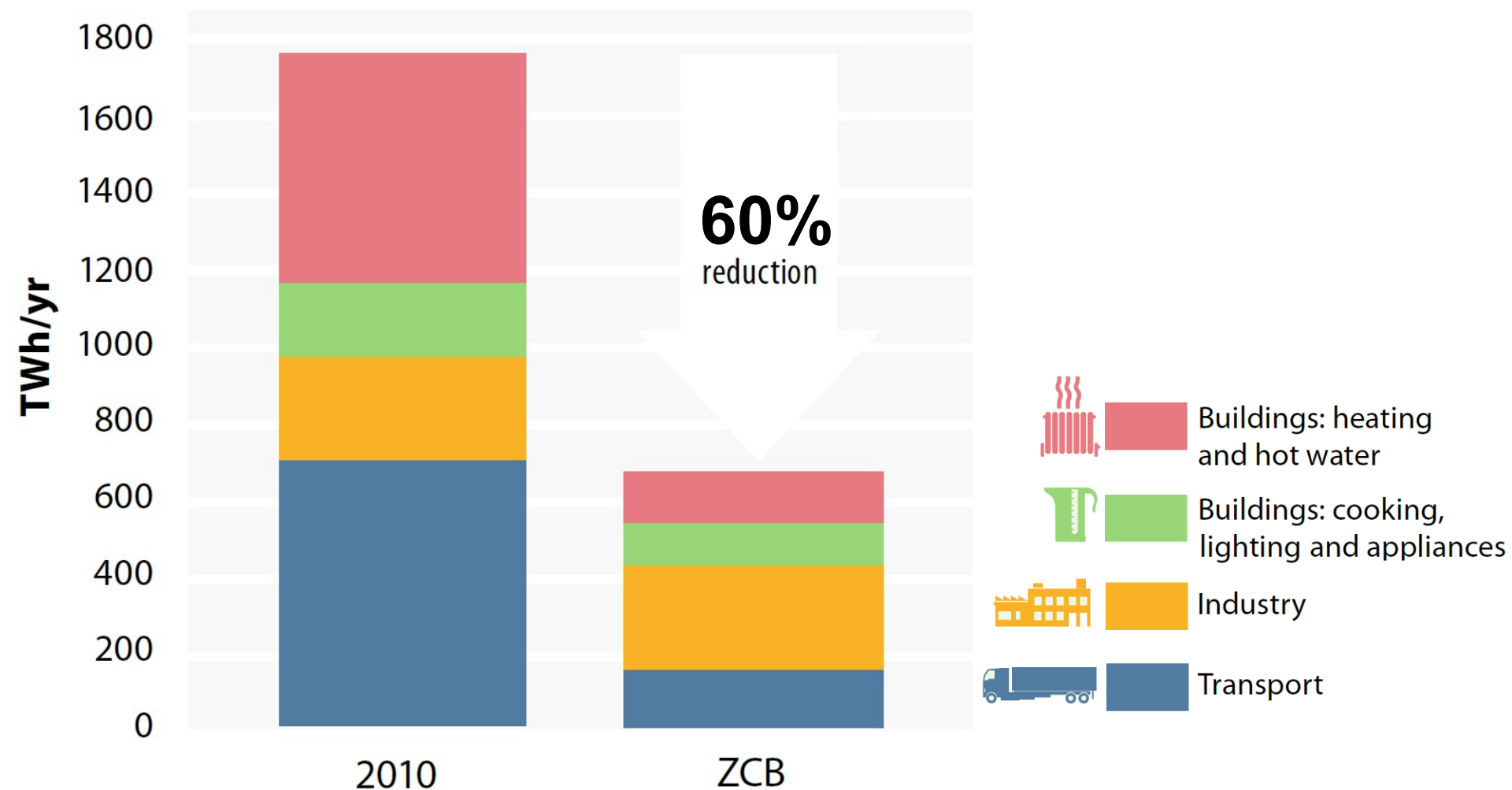
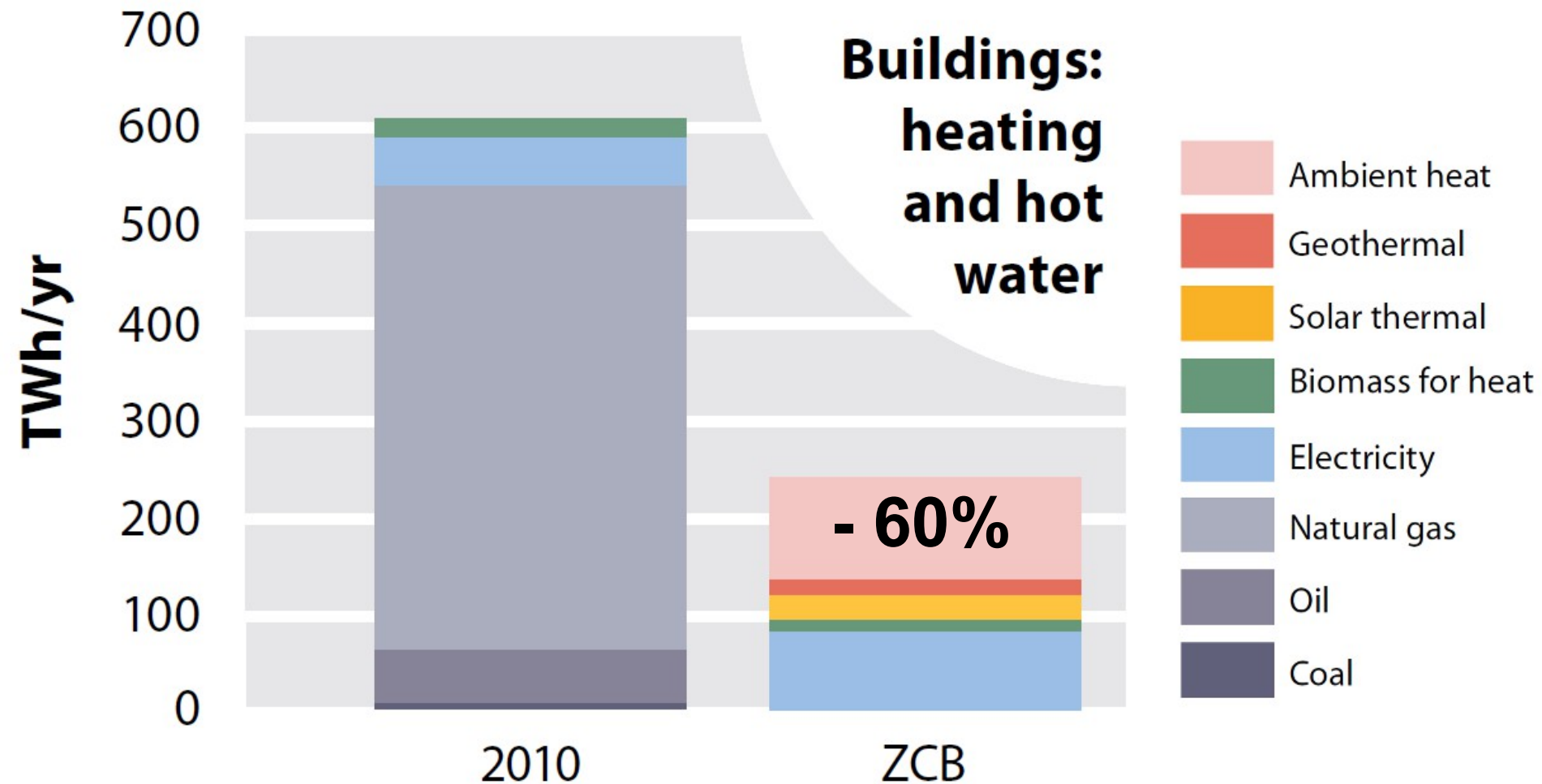
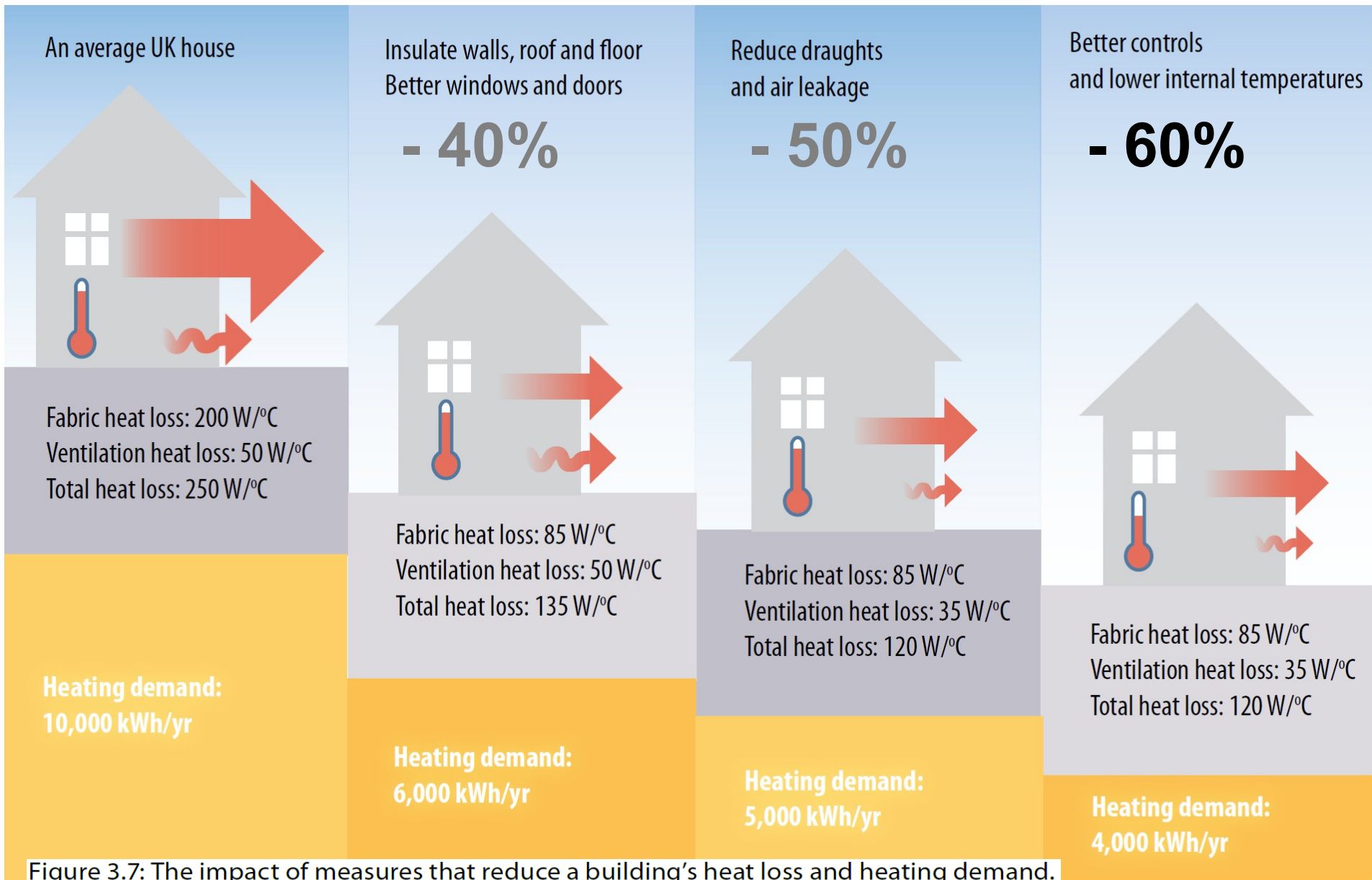


Figure 3.4: Total annual energy demand by sector in the UK in 2010 (DECC, 2012) and in our scenario.



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.



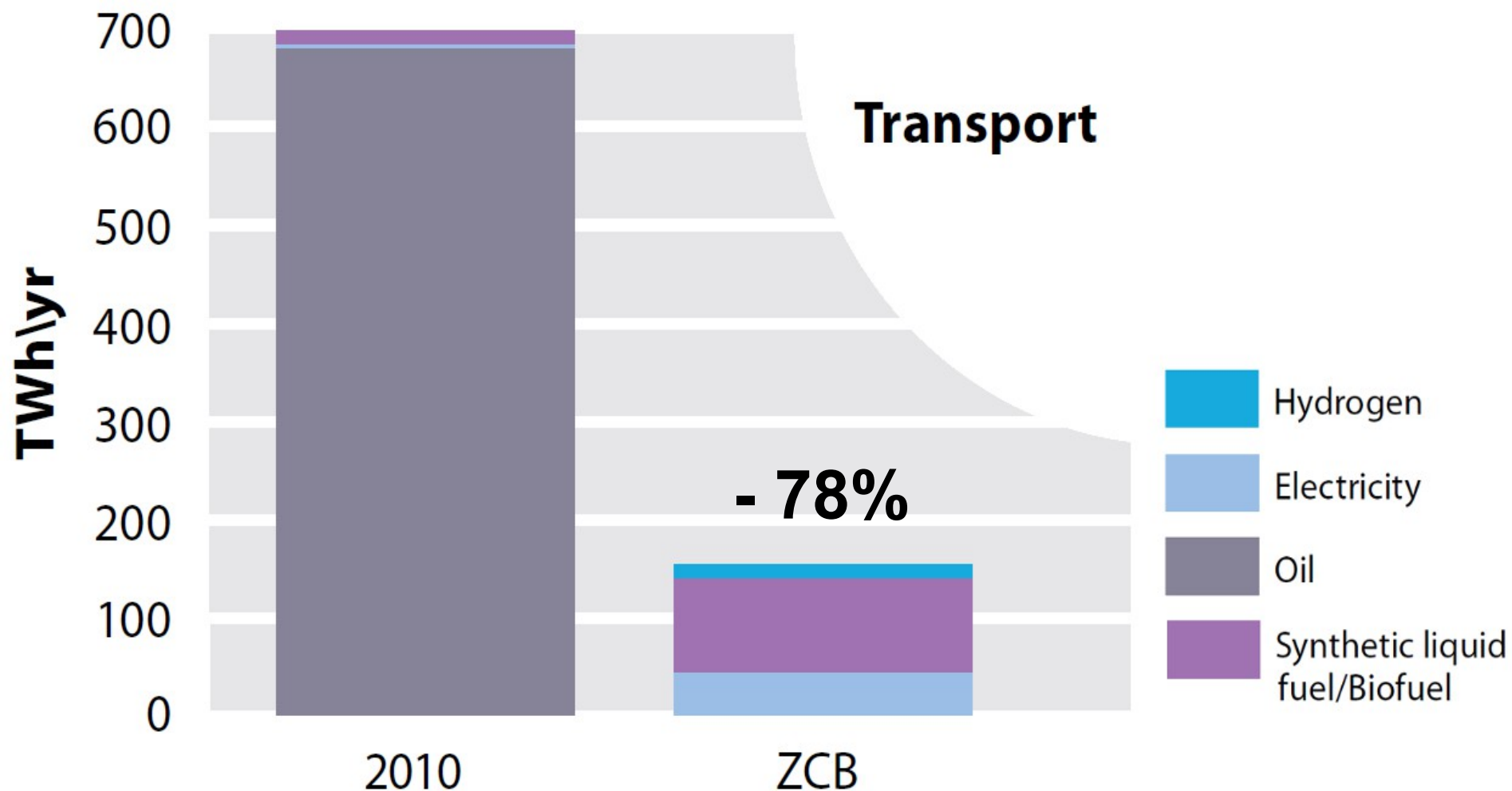


Figure 3.14: Change in total energy demand for transport and the types of fuel required in 2010 (DECC, 2012) and our scenario.

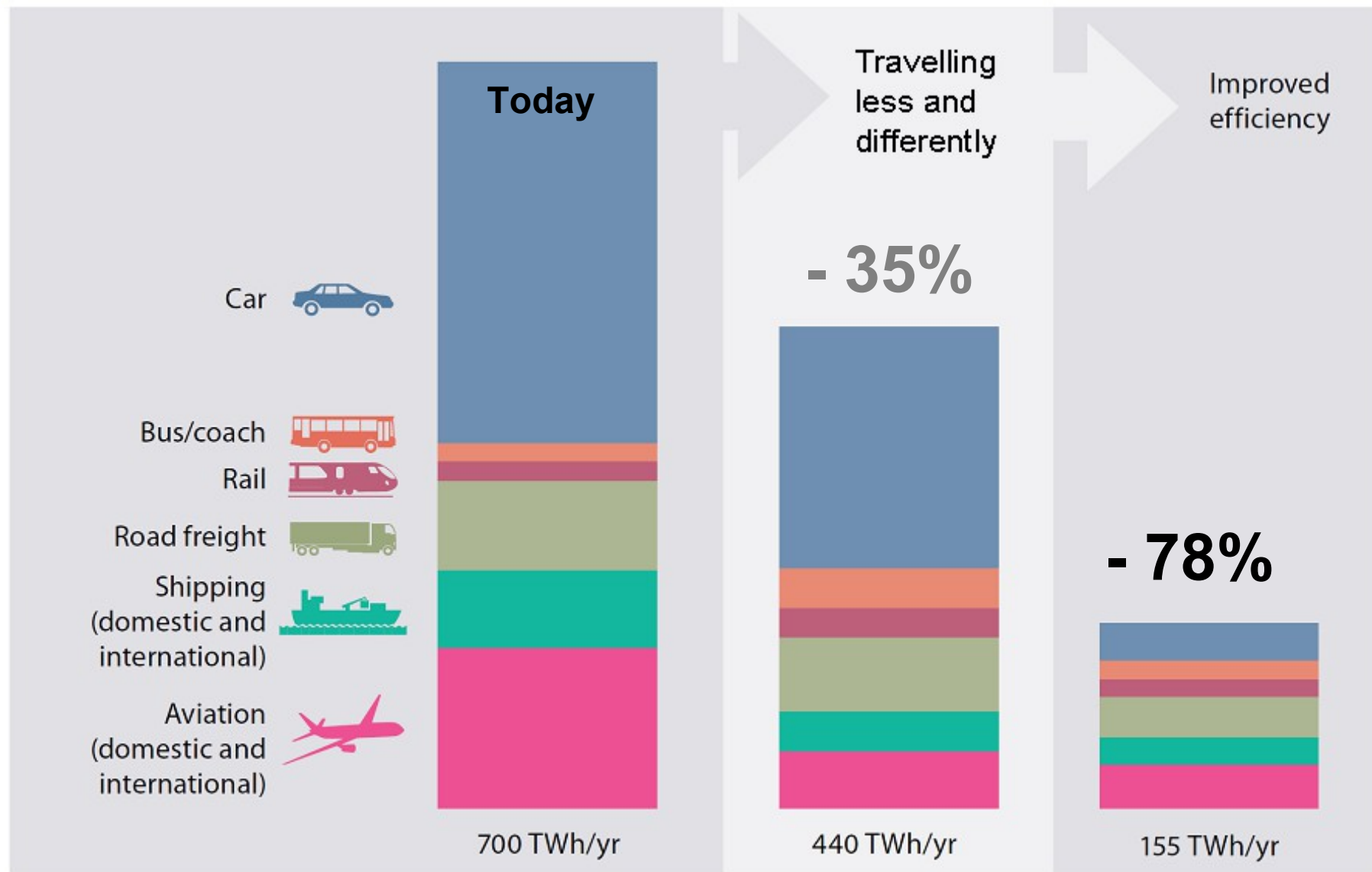
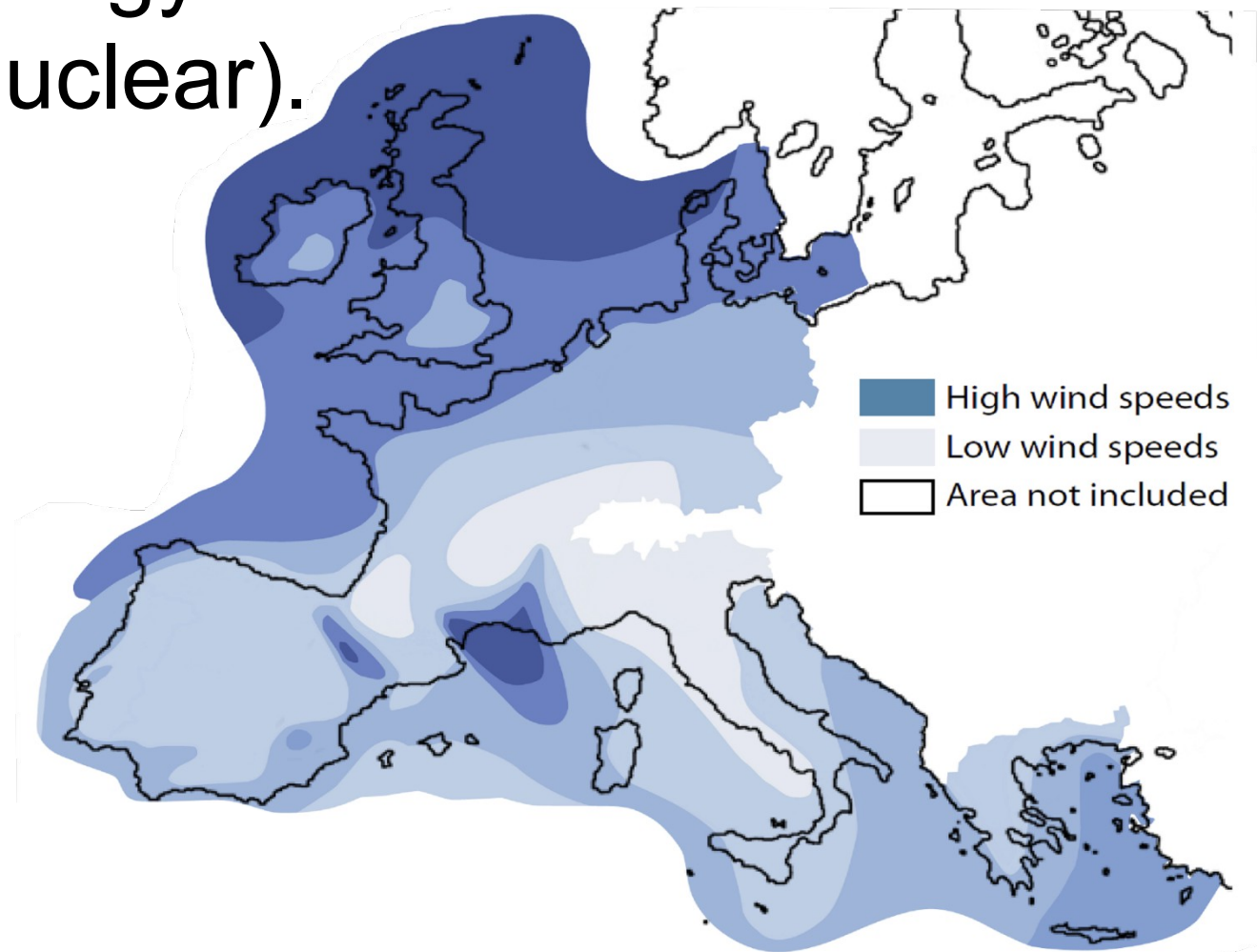


Figure 3.13: Reduction in energy demand for personal and commercial (freight) transport in our scenario (with initial figures from DECC, 2012).

Power up

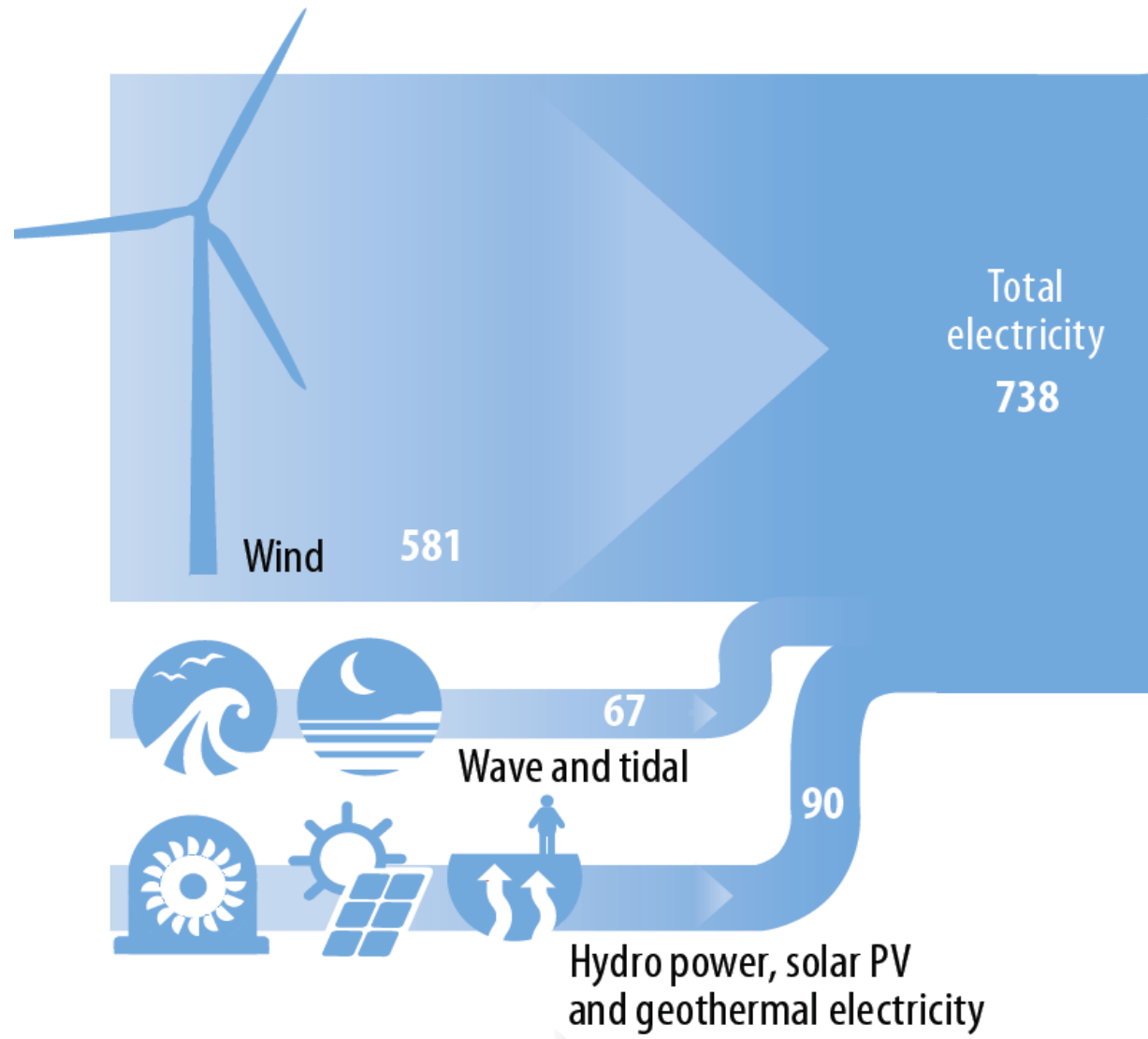


We can use **100% renewable** energy sources (no nuclear).



Key Question:

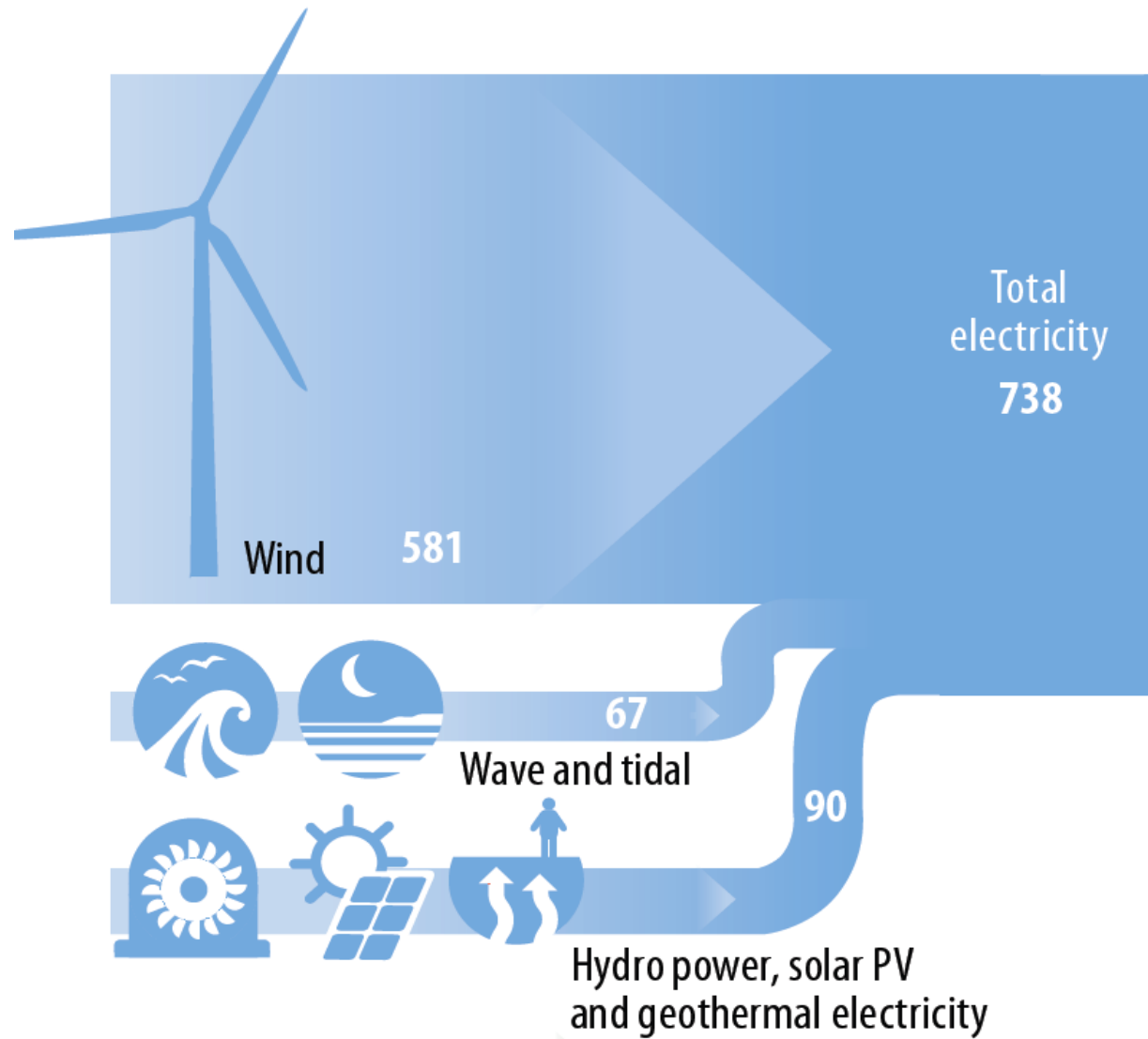
**Can we
“keep the
lights on”?**

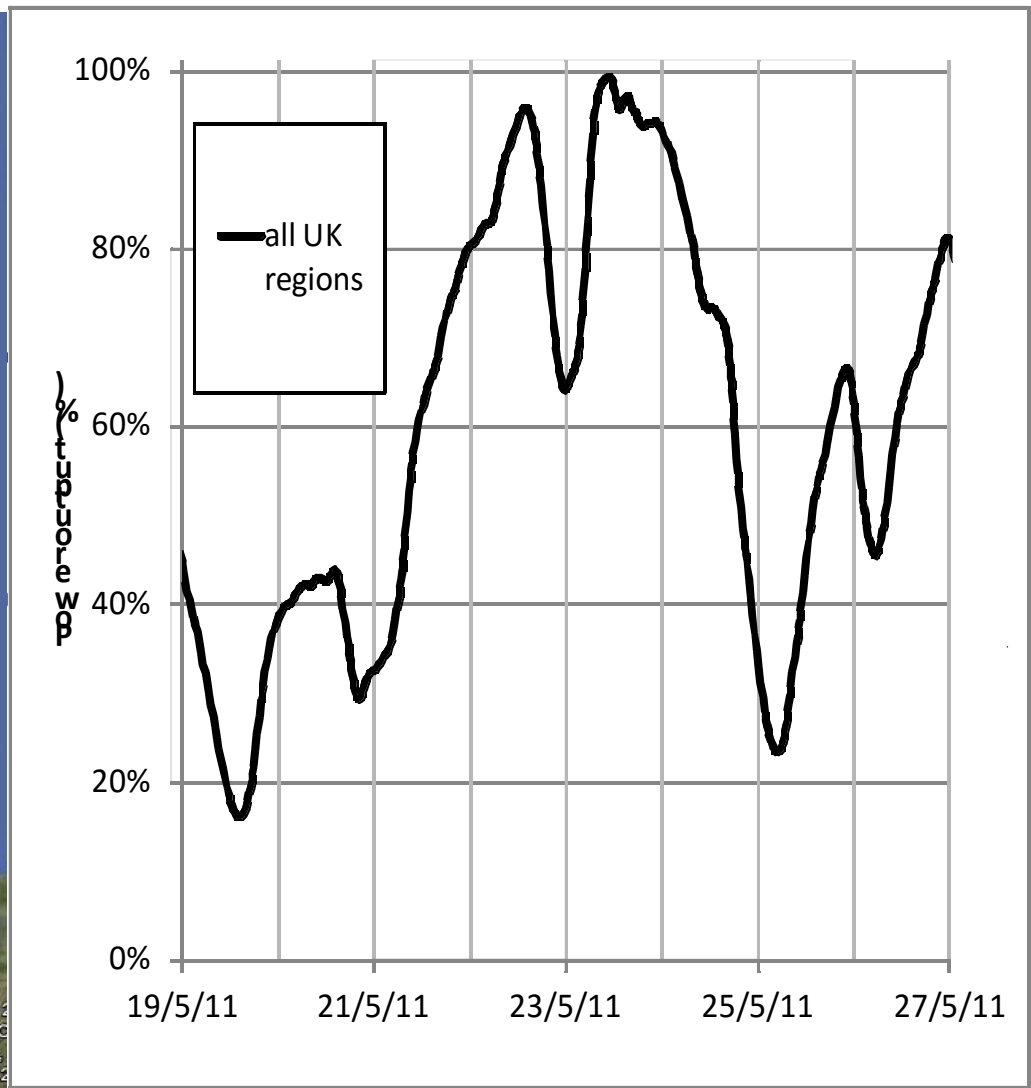
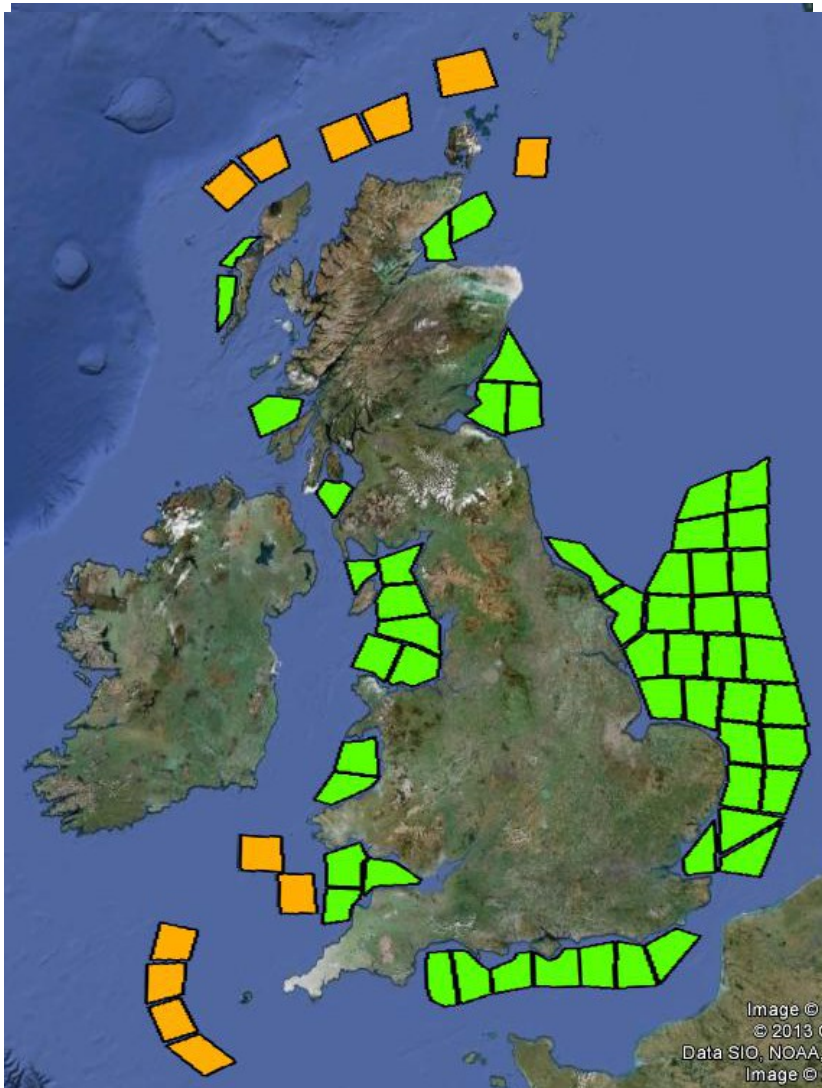


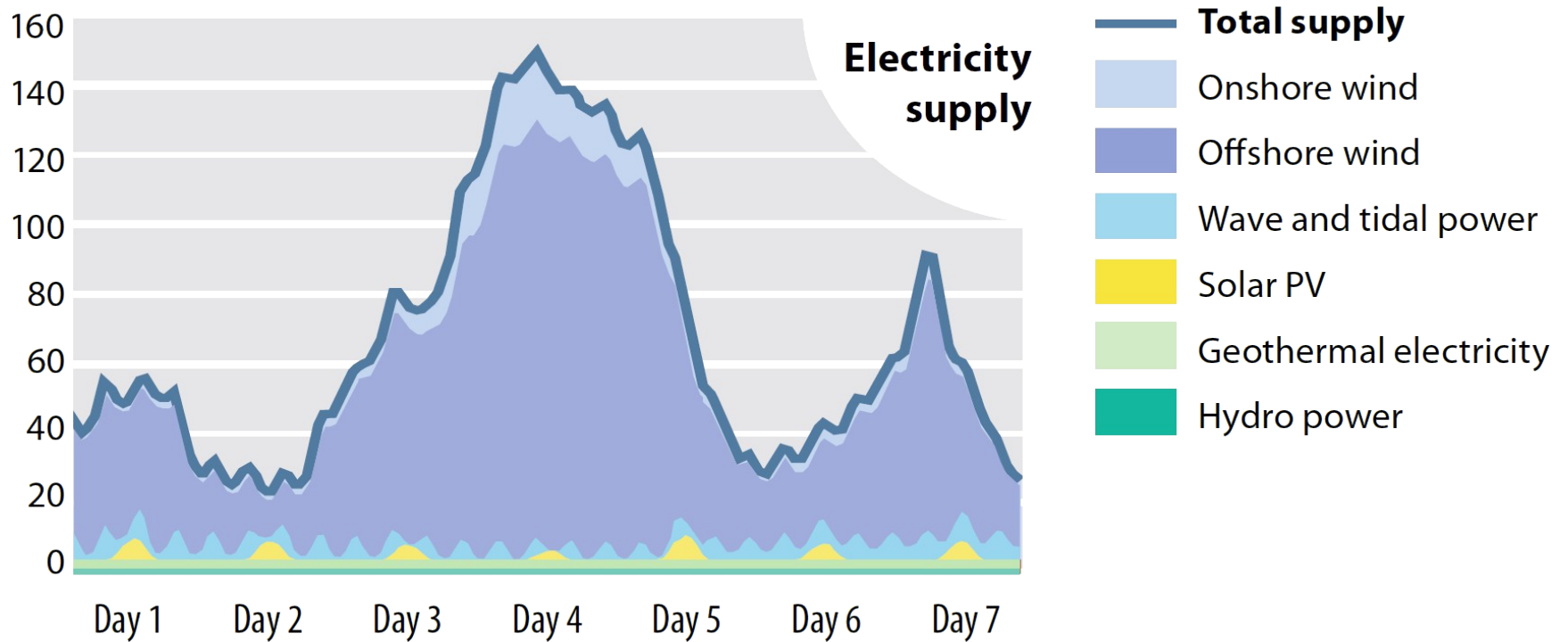
The ZCB Energy Model:

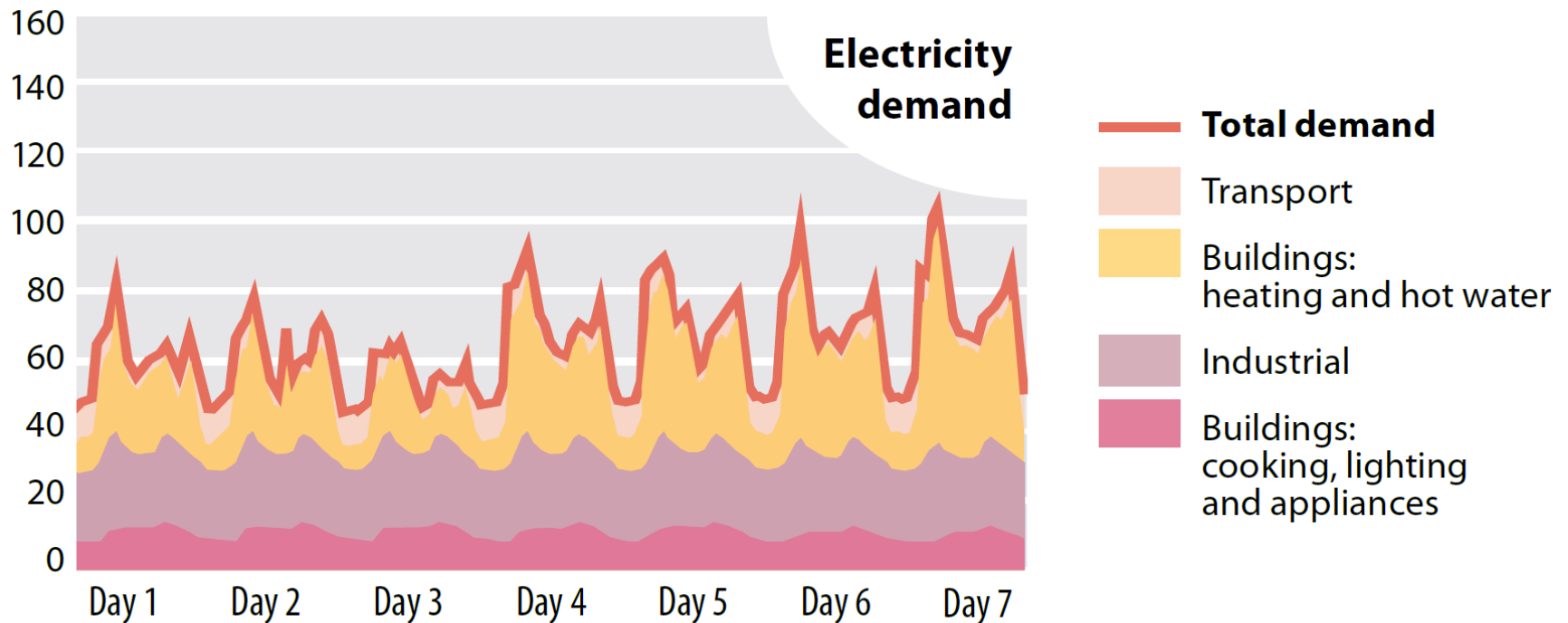
**Based on ten
years of
real-world
hourly data**

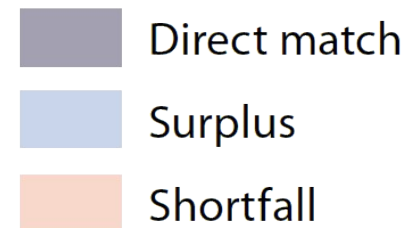
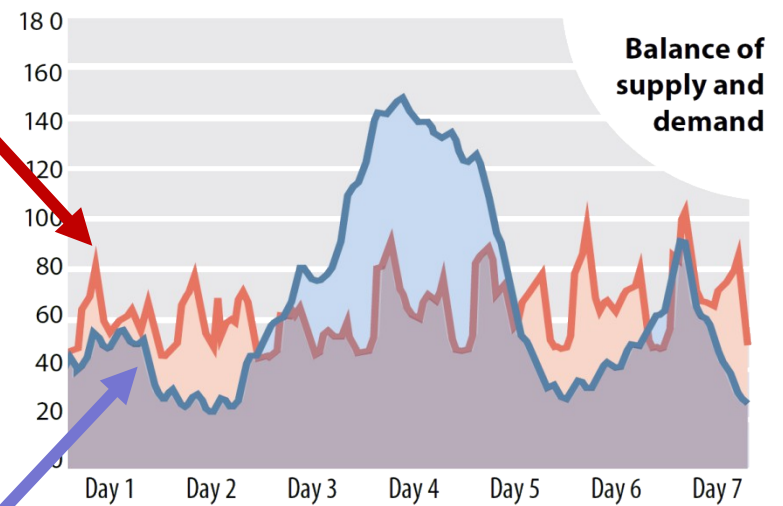
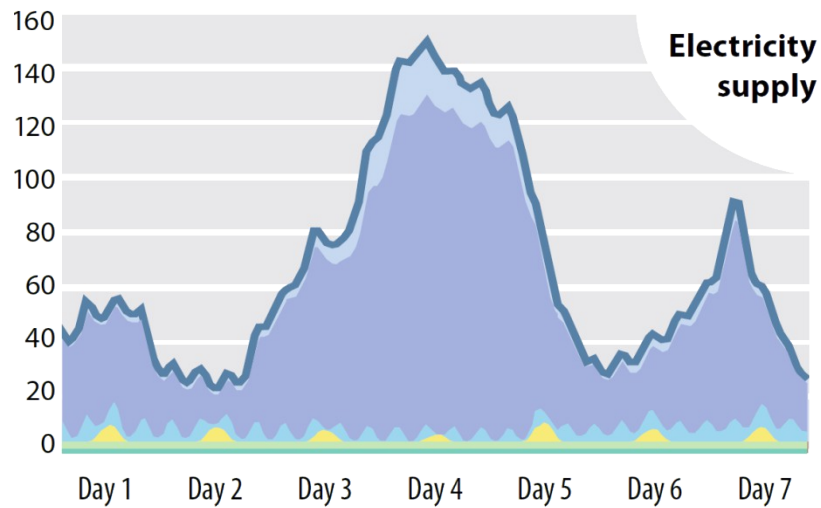
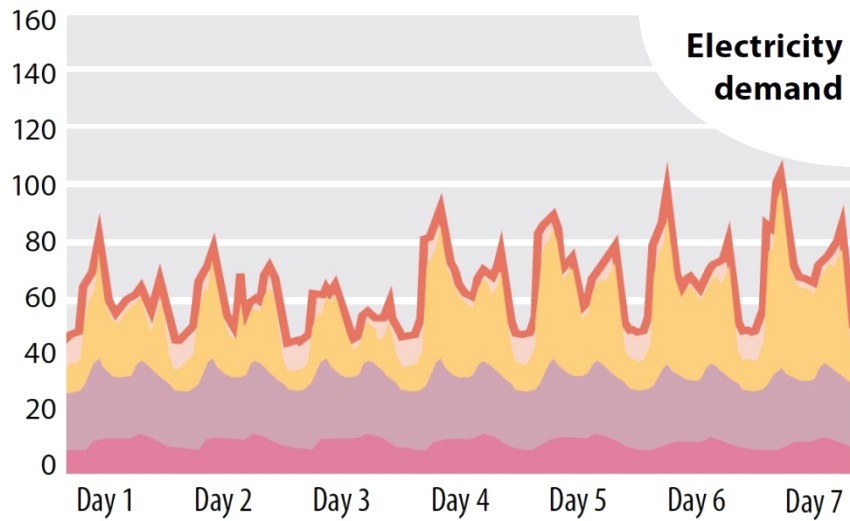
**2002 - 2011
87,648 hours**











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/tcm20>

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

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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



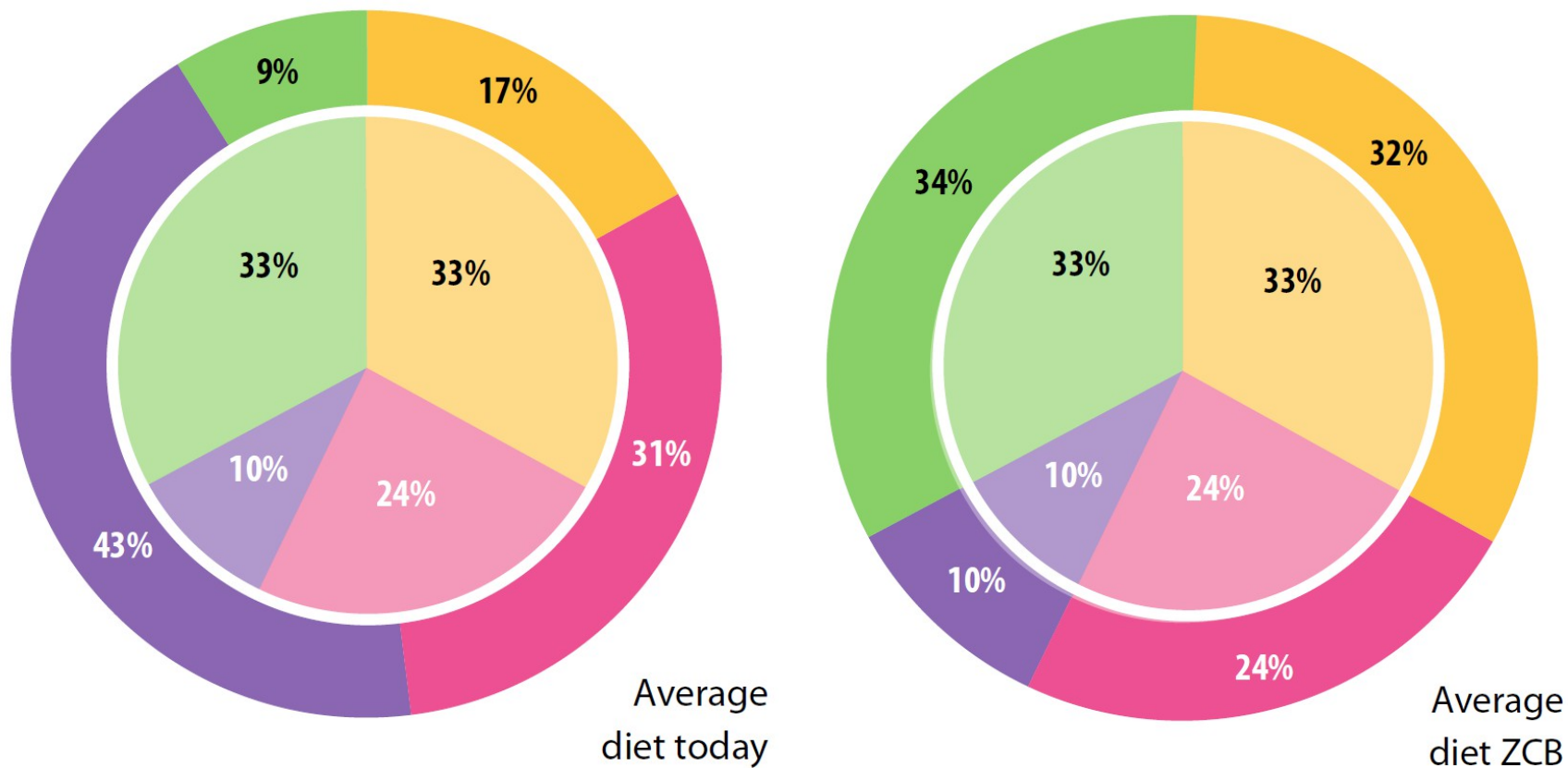
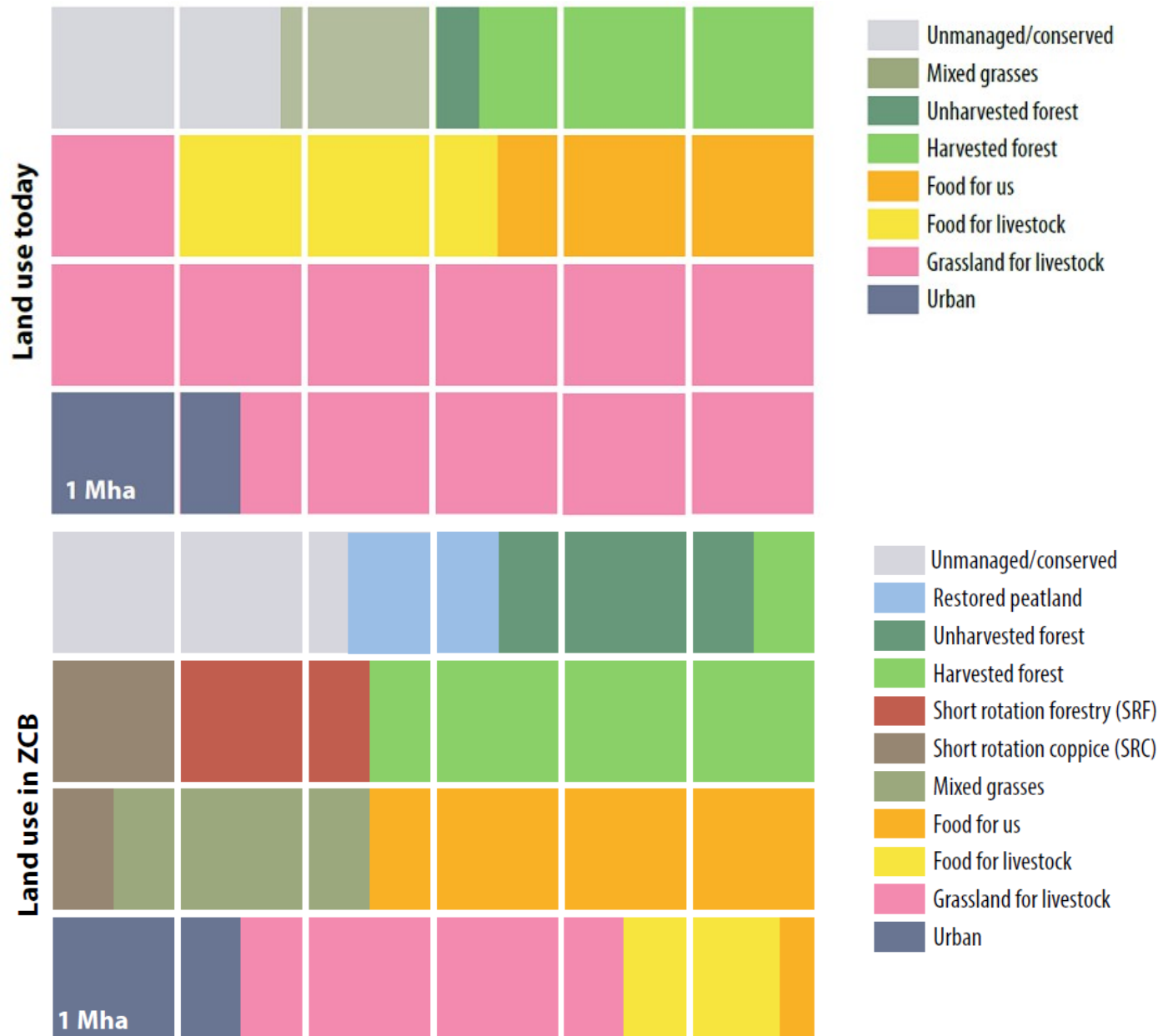
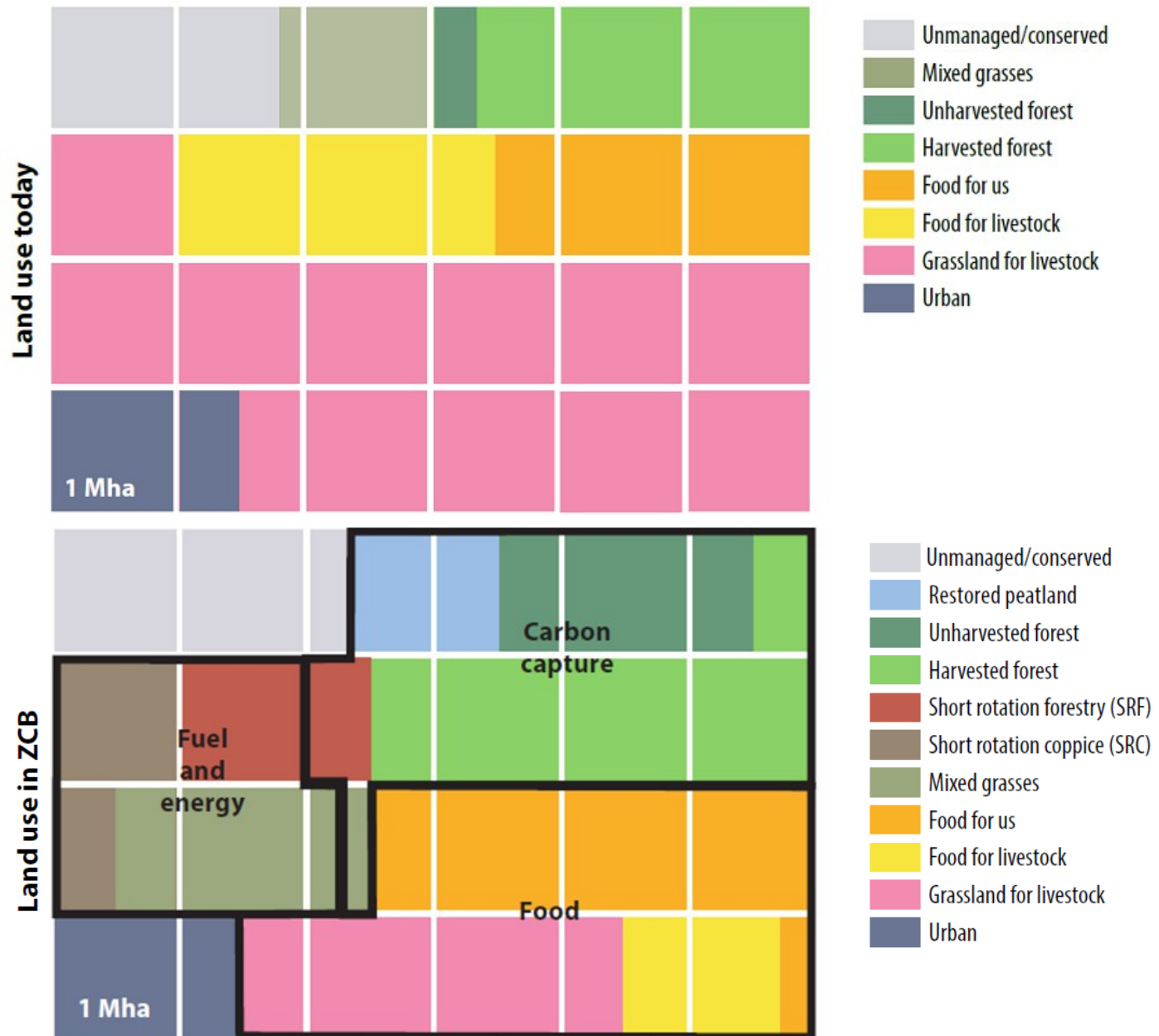


Figure 3.29: The Eatwell Plate. Government recommendations for a healthy balanced diet (FSA, 2007). Today's average diet and the average diet in our scenario are shown (outside circle) relative to the Eatwell Plate recommendations (central circle).







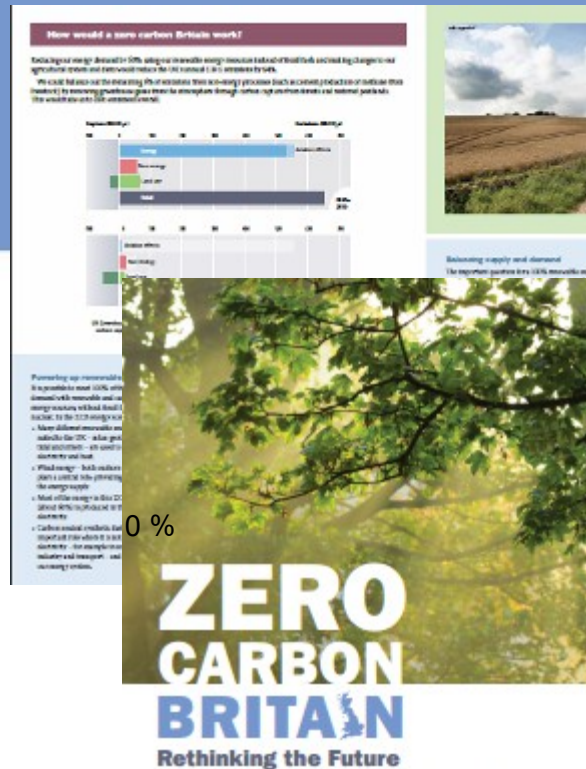
**ZERO
CARBON
BRITAIN**

Rethinking the Future

WHO'S GETTING READY FOR ZERO?

A report on the state of play of zero carbon modelling

www.zerocarbonbritain.org



rselves with 100% sustainably and to our children and

Future models a
the UK has risen
ry.

#JCEB @centse_alt

We already have the technology to power the UK with 100% renewable energy, to feed ourselves sustainably and to leave a safe and habitable climate for our children and future generations.

**ZERO
CARBON
BRITAIN**
Rethinking the Future

Report in short: a summary of key findings

Zero Carbon Britain: Realising the Future models a technically robust 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 2030, using only currently available technology.

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-track a 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 action towards a sustainable, zero-carbon future.

Zero Carbon Britain: Rethinking
www.zerocarbonbritain.org, or by

ZERO CARBON MAKING IT HAPPEN

at
ecology Eco Store.