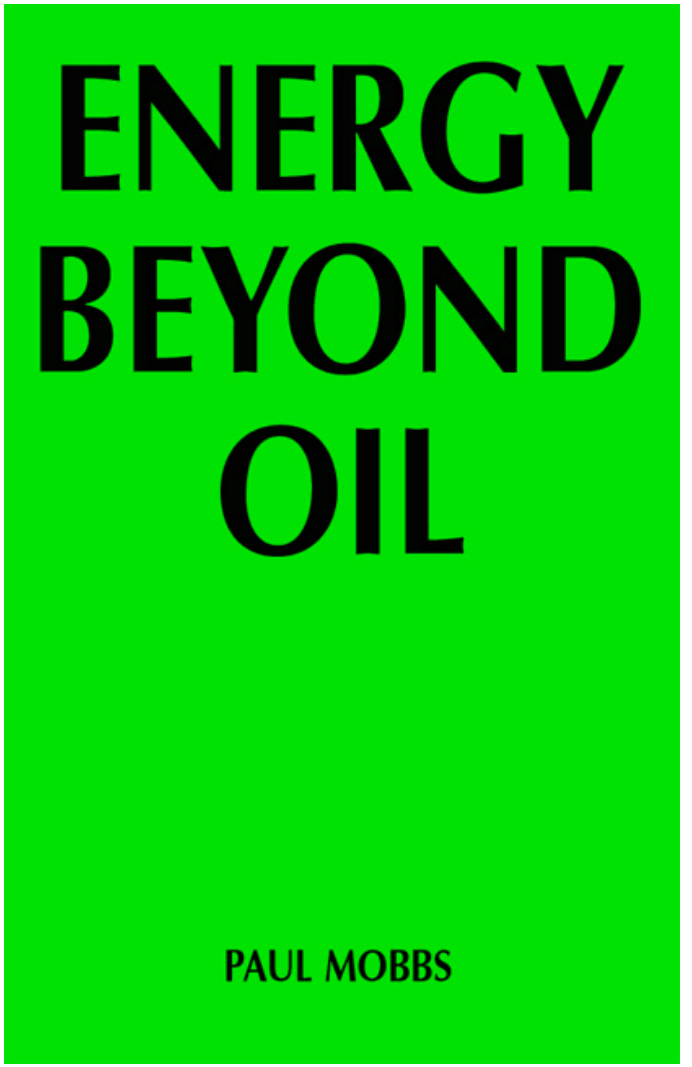
Energy Beyond Oil



Rude Awakening Tour
Bodmin,
July 2008

http://www.fraw.org.uk/ebo/

An illustration of the problem...

Source:
NASA

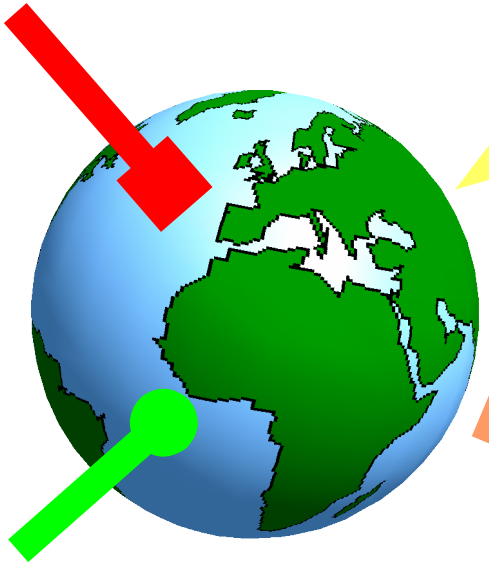
An illustration of the problem...

Source:
NASA

Global Energy Inputs

Solar input,
5,400,000EJ
per year

Climate cycles
(wind/currents)
2,500,000EJ (46%)



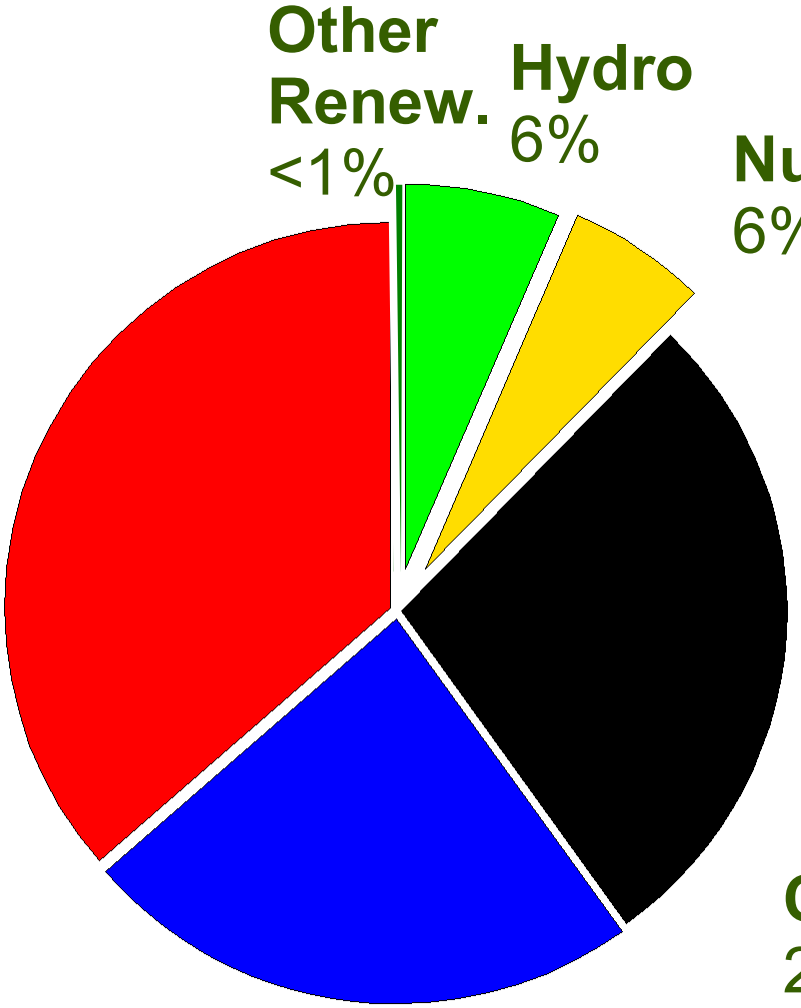
Moon's gravity
(creates tides)
94EJ per year

Reflected to space,
1,600,000EJ (30%)

Hydrological cycle
(evaporating water)
1,300,000EJ (24%)

Source:
Open University

Globally Traded Energy, 2005

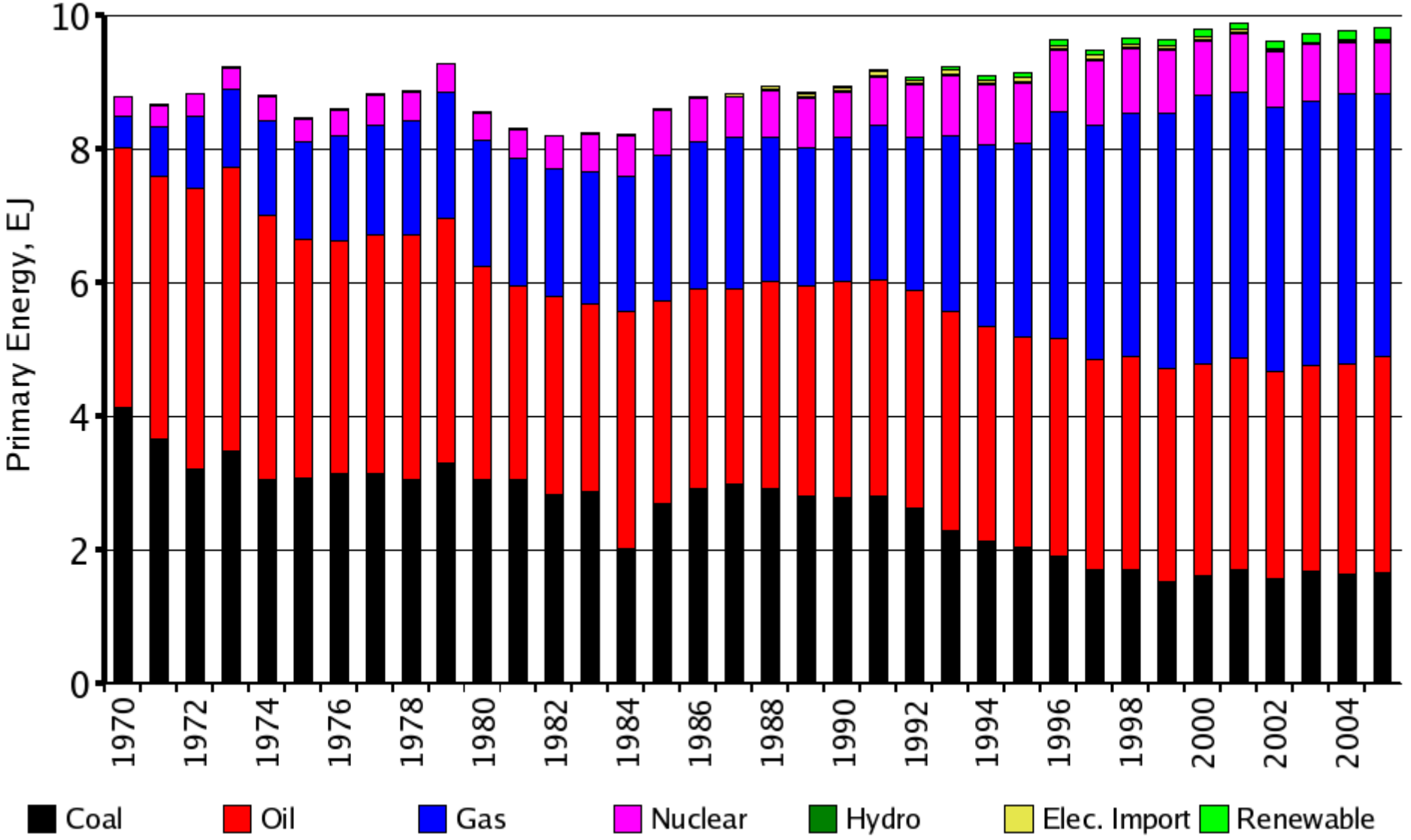


Consumption:	EJ
Oil	161
Natural Gas	104
Coal	123
Nuclear	26
Hydro	28
Total	**442**

88% fossil fuels!

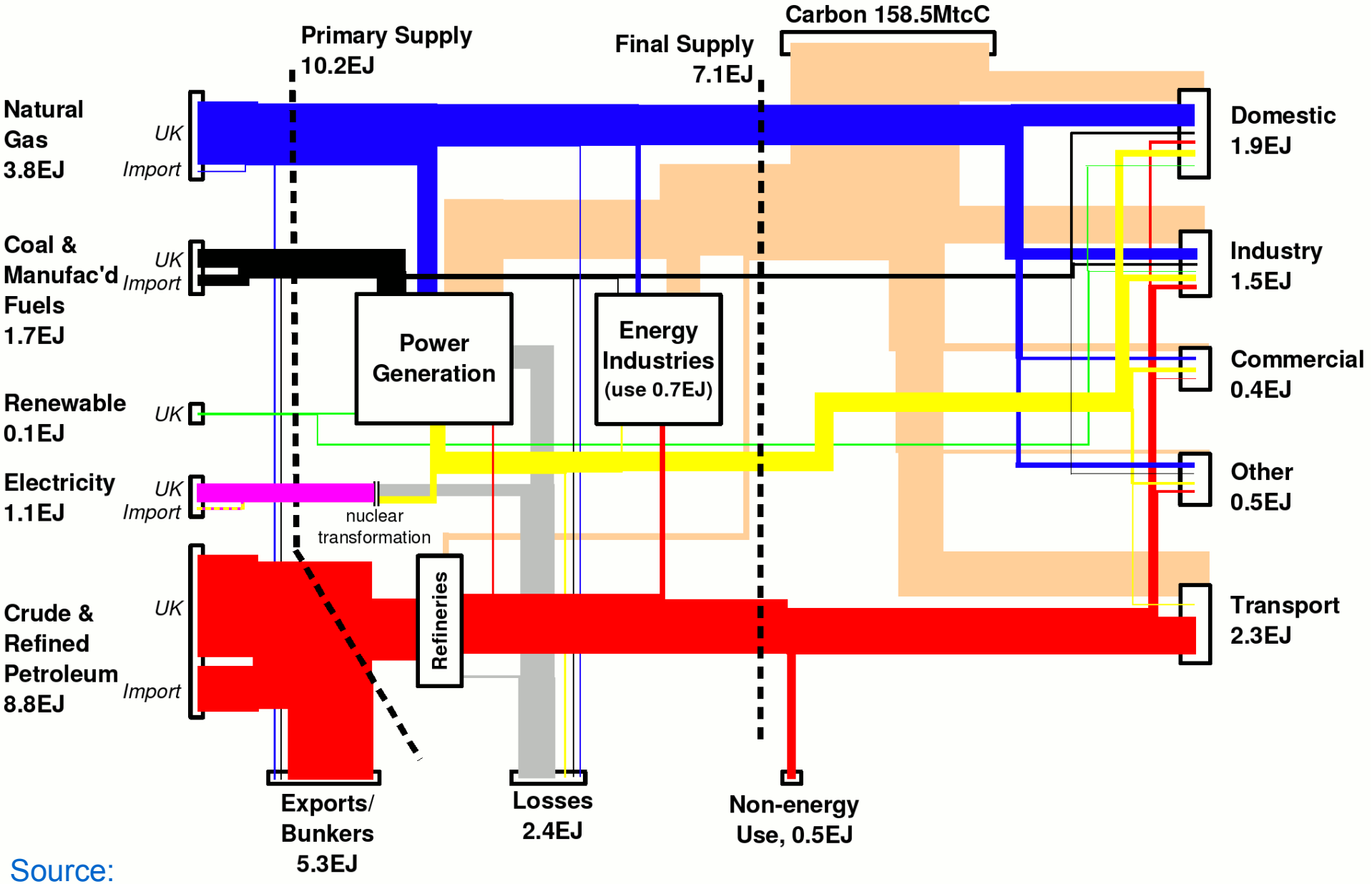
Source:
BP

UK Primary Energy Supply, 1970-2005



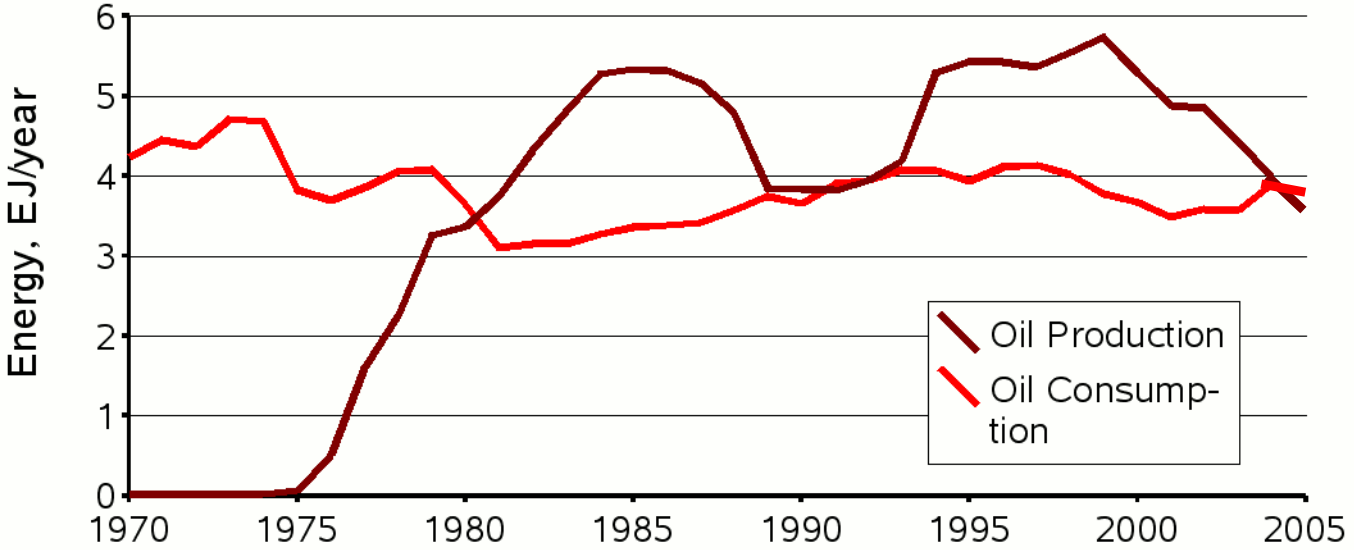
Source:
Digest of UK Energy Statistics 2006, DTI

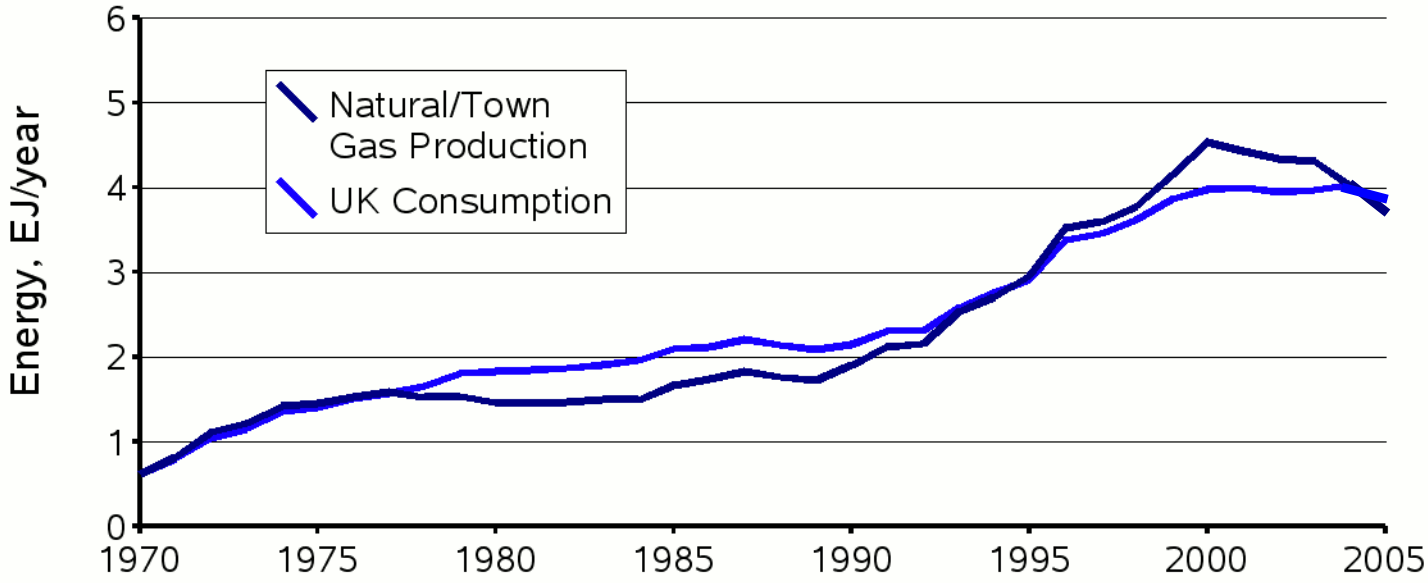
UK Energy and Carbon Flowchart, 2004



Source:
Compiled from Digest of UK Energy Statistics (2005) data

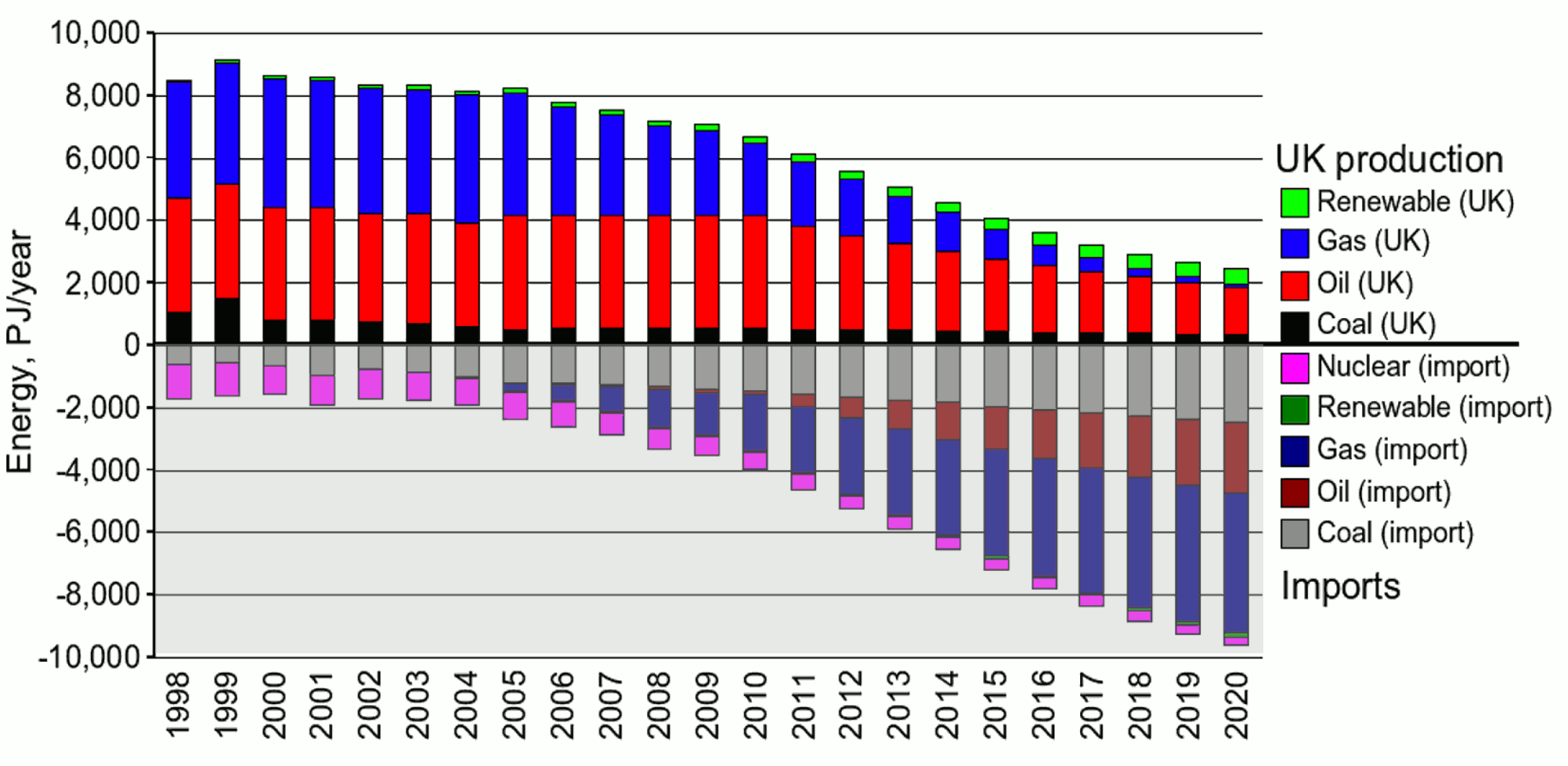
UK Oil and Gas Production, 1970 to 2005





Source:
Digest of UK Energy Statistics 2005, DTI

Change in Imports

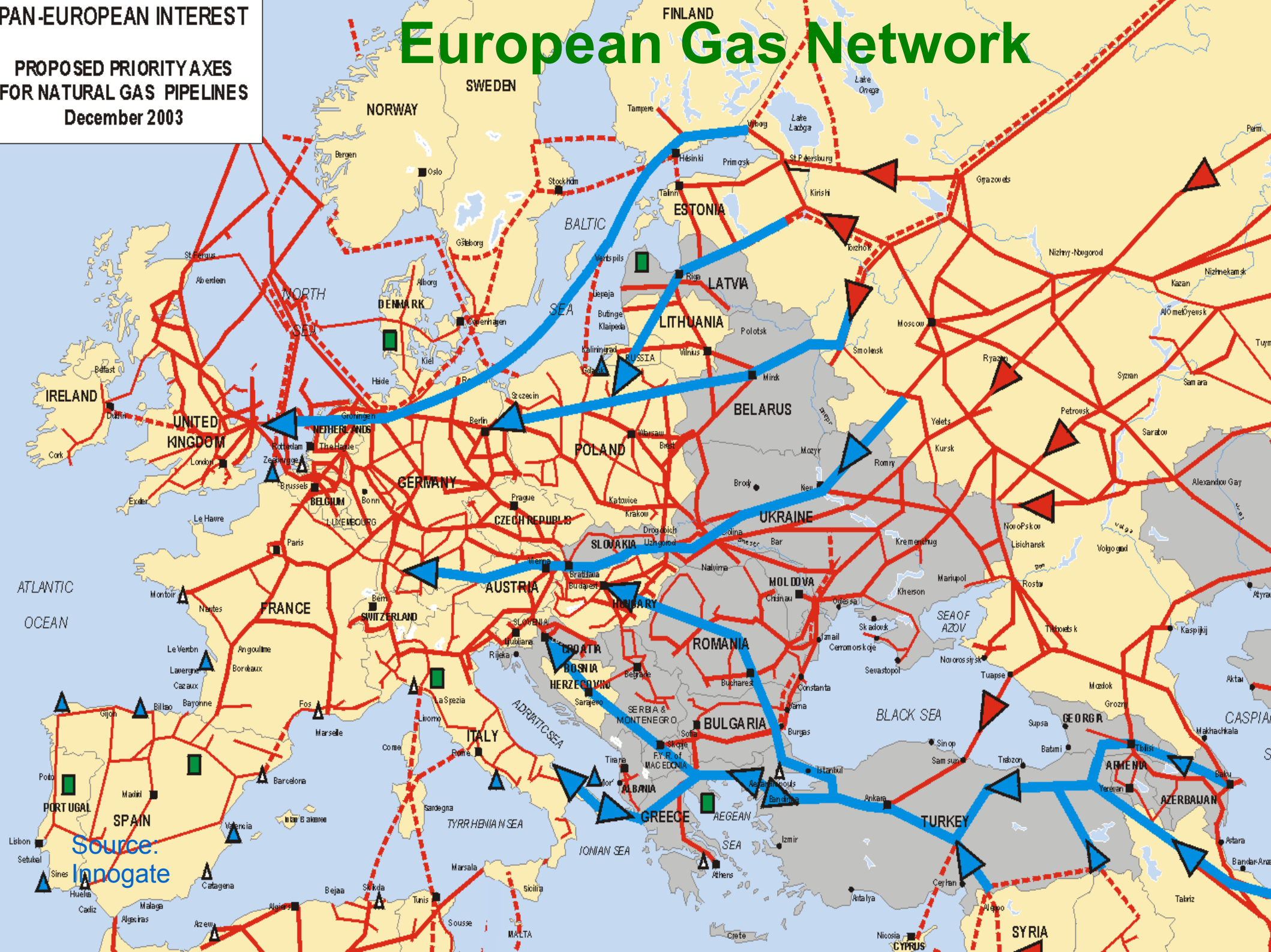


Source:
UK Joint Energy Security of Supply (JESS) Committee

European Gas Network

PAN-EUROPEAN INTEREST

PROPOSED PRIORITY AXES
FOR NATURAL GAS PIPELINES
December 2003



What's Renewable?

Wave

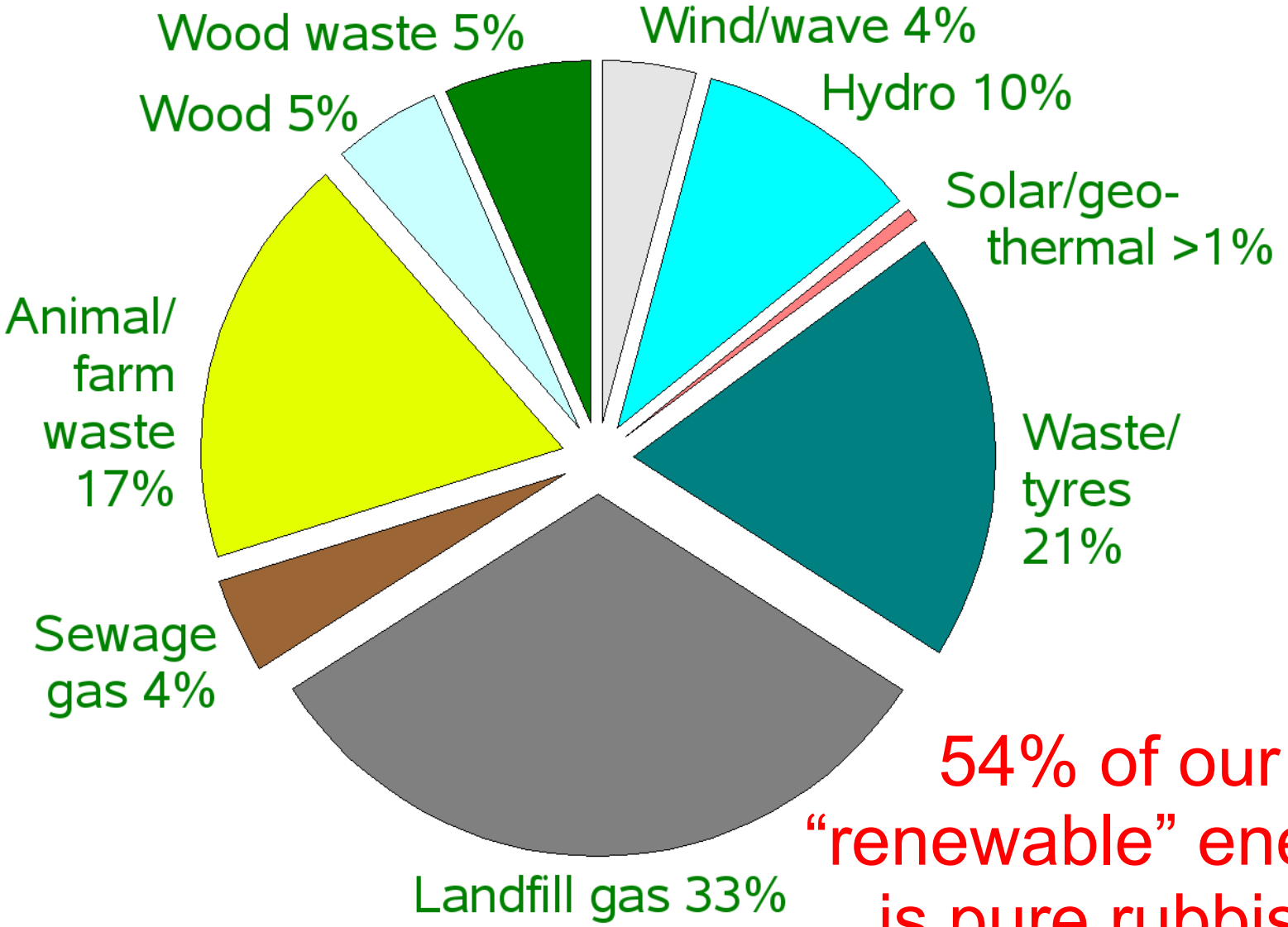
Wind

Hydro

Solar PV

Thermal solar

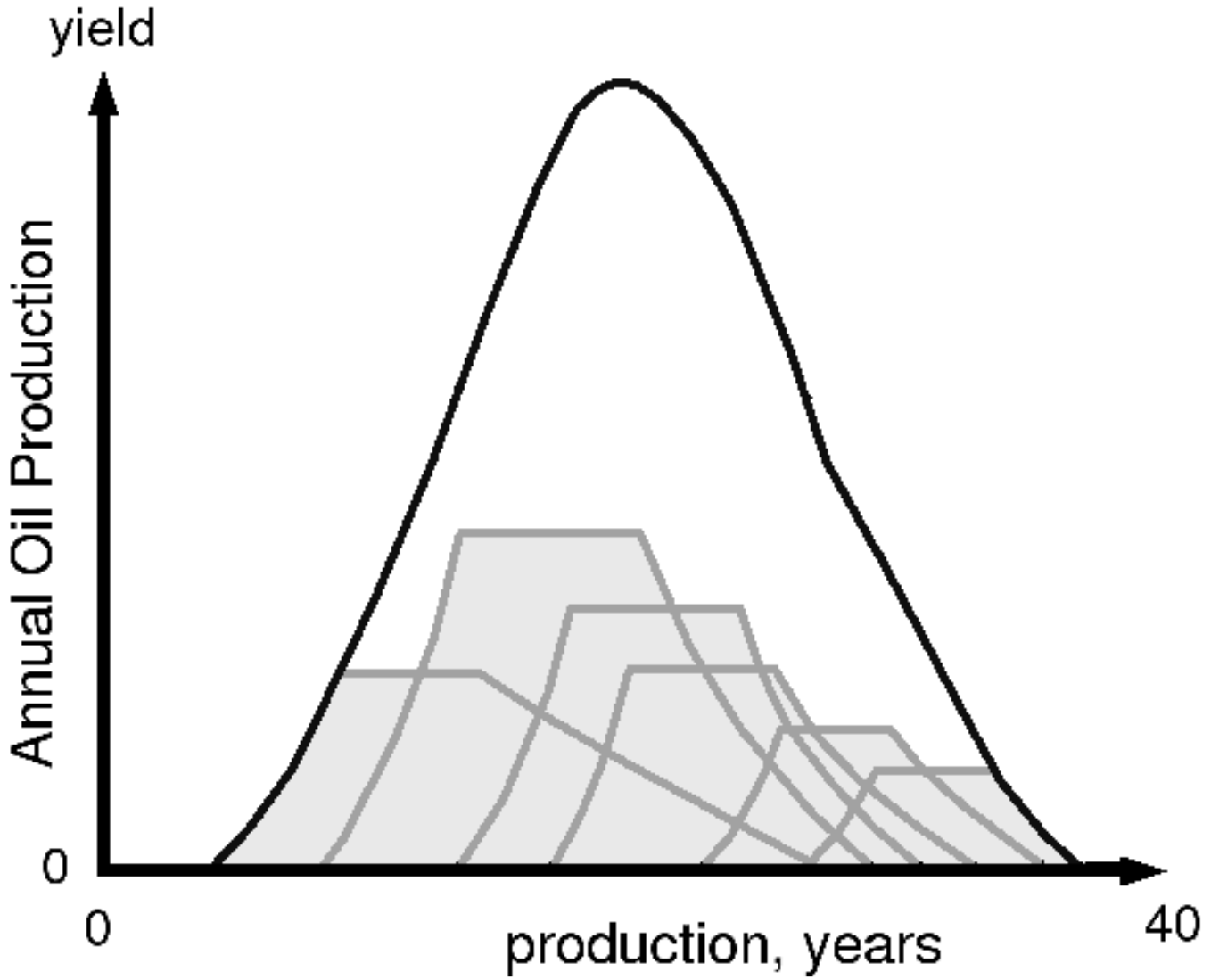
UK “Renewable” Energy, 2005



54% of our “renewable” energy is pure rubbish!

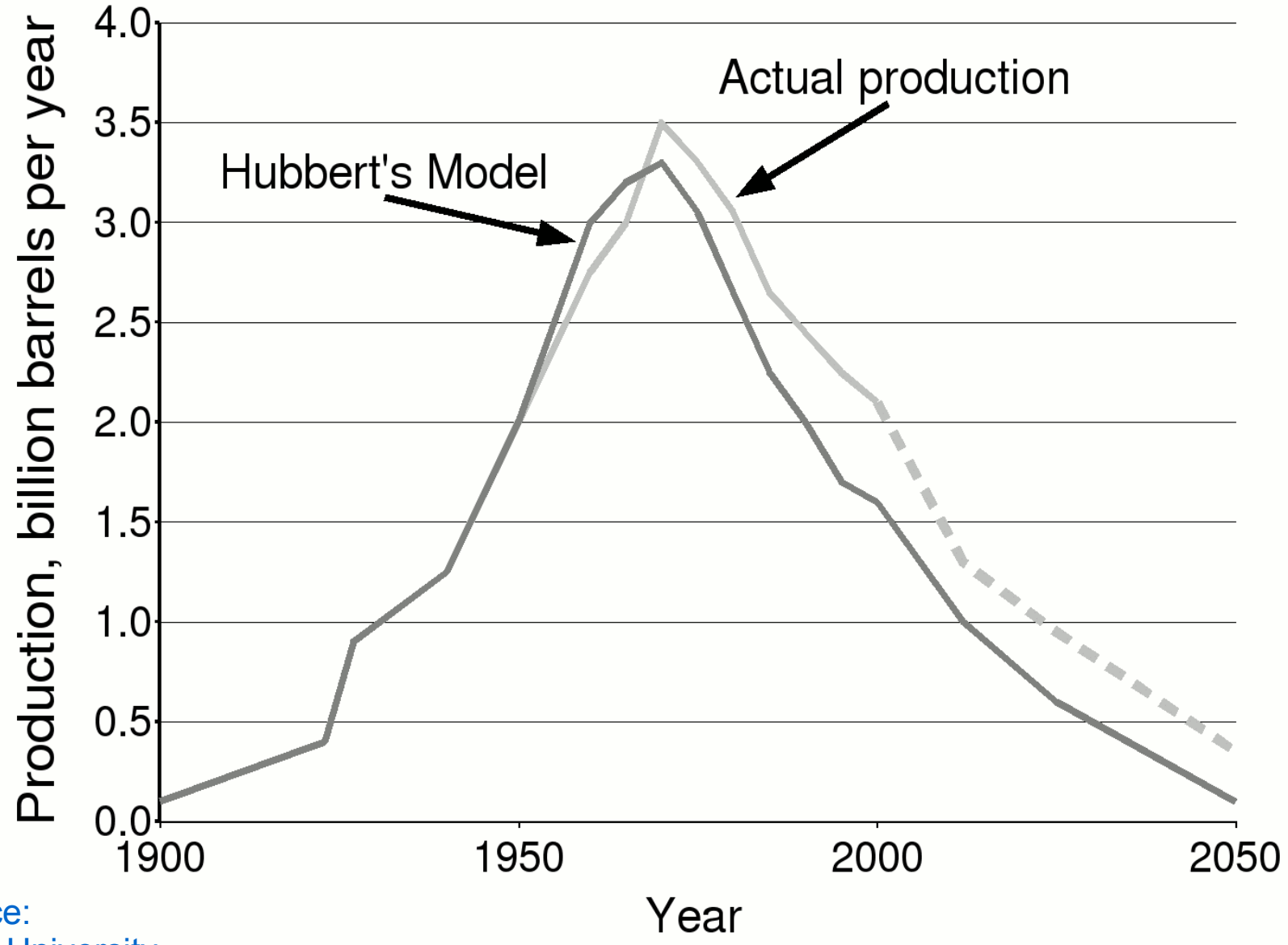
Source:
Digest of UK Energy Statistics 2006, DTI

Conventional Oil Production



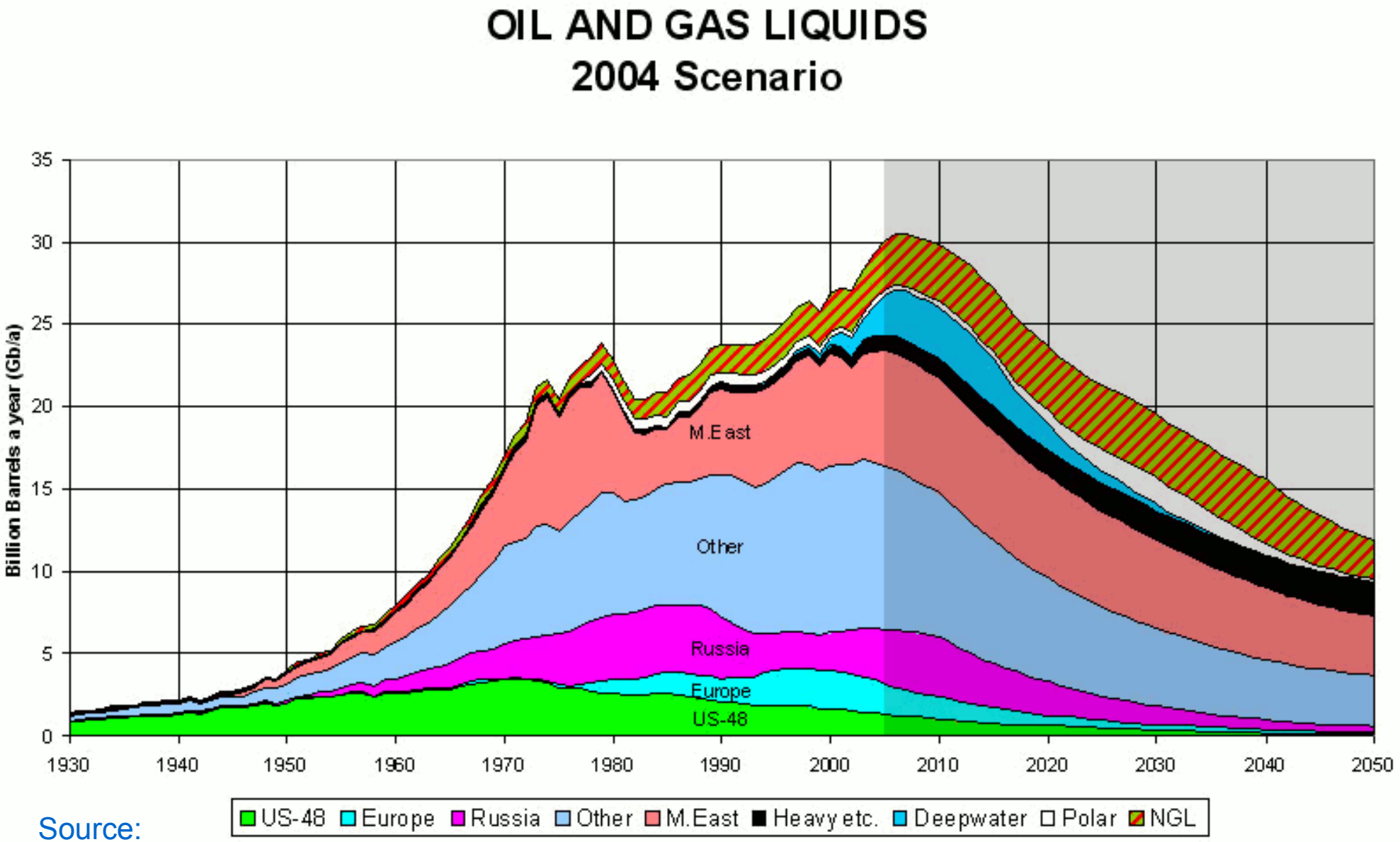
Source:
Campbell & Laherrere 1998

Hubbert's Peak



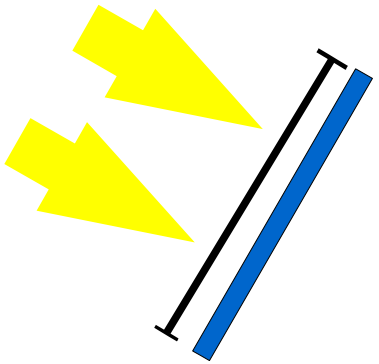
Source:
Open University

The Global Peak



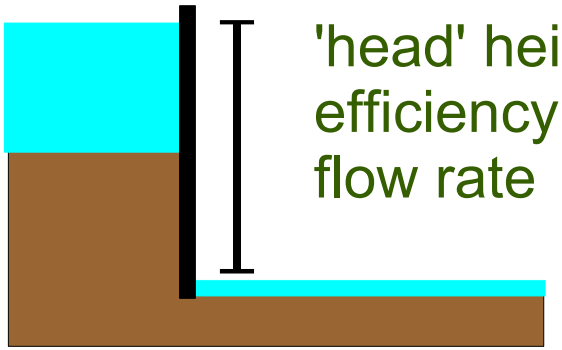
Source:
ASPO

Flux: The Limitation on Energy



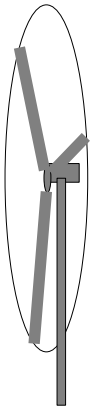
surface area x
efficiency x
insolation

solar thermal/
solar PV
flux = sunlight



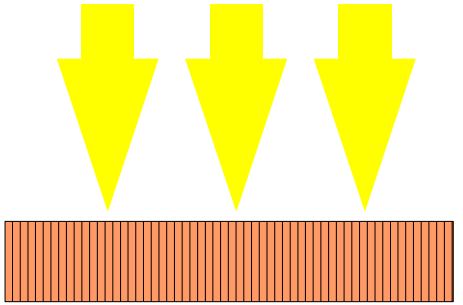
'head' height x
efficiency x
flow rate

hydro/
tidal impounds
flux = water flow



swept area x
efficiency x
flow rate x
density

wind/
tidal stream
flux = wind/water flow



crop yield
x
efficiency
x
area/year

biomass
flux = crop yield/area

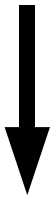
Biomass

Solar radiation, 36,000GJ/ha/year — 100%

Absorbed by plant, 1,836GJ/ha/year — 5%

Biomass produced, 230GJ/ha/year — 0.6%

combustion-based power generation



Power output, 70GJ/ha/year — 0.2%

Source: OU

A. Net energy produced from one hectare (2.5 acres) of intensively produced short rotation coppice, less power generation losses ≡ 5MWh/year

B. UK power generation in 2003 ≡ 400,000,000MWh

C. UK land area ≡ 24,290,000 hectares

Number of UK's required to provide just the UK's electrical power (one-fifth of total energy consumption) from biomass ([B / A] / C): **3.3**

The Simple Solution...

Why n  t

HAVE LESS?

The Likely Future

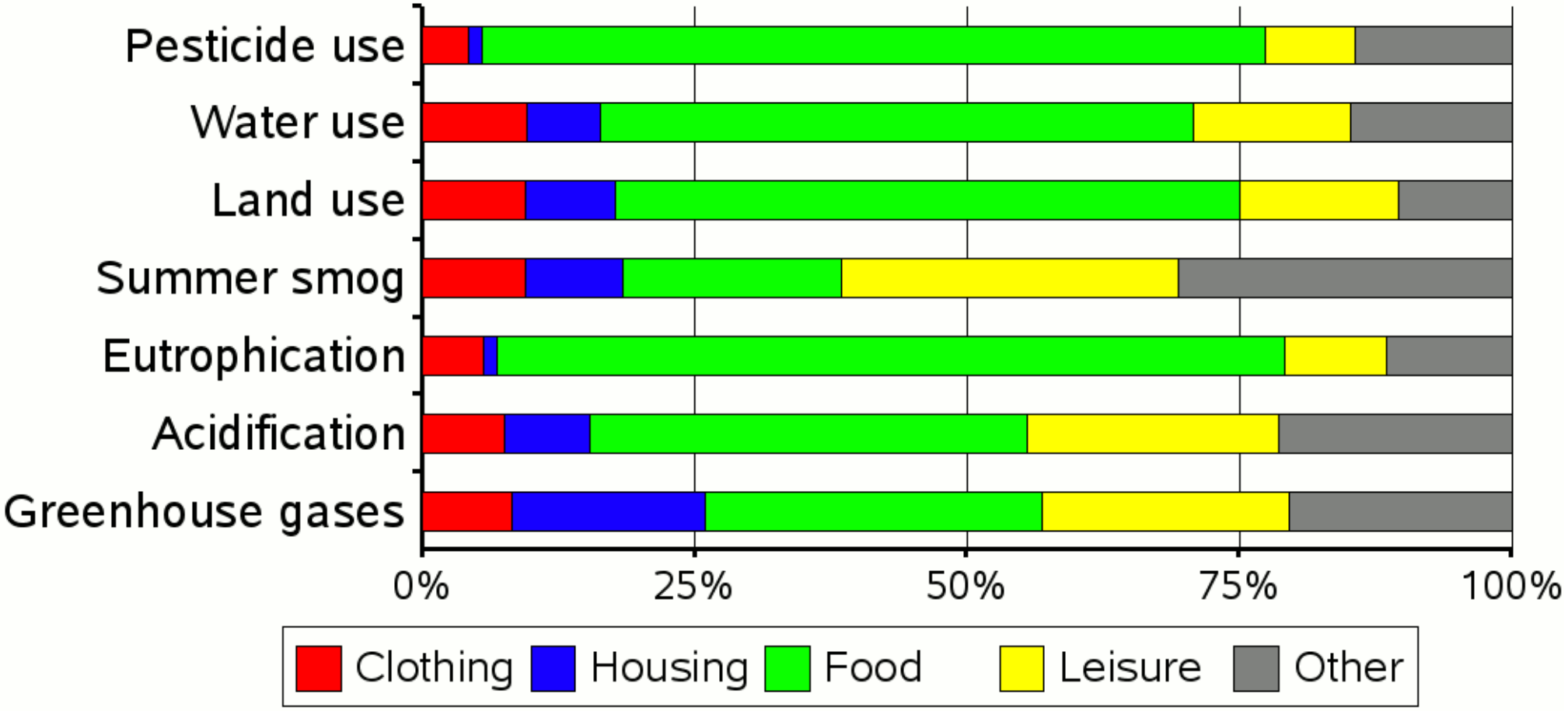
We don't need to produce more energy, we need to use less!

- Petroleum will become very expensive within 10 years and will be in short supply within 20.
- Gas will become expensive. Just as more people are switching to gas, this too will begin to run short around 2030.
- Coal creates problems because of climate change, and nuclear has problems because the uranium won't last long.
- Renewables can't fill the gap – wind needs back-up/storage, biomass needs massive land area that it would affect agriculture, and other options have a low power density.

In short, renewables might supply 30% to 40% of the UK's current energy use. That means cutting use by 60% to 70% over 60 to 70 years.

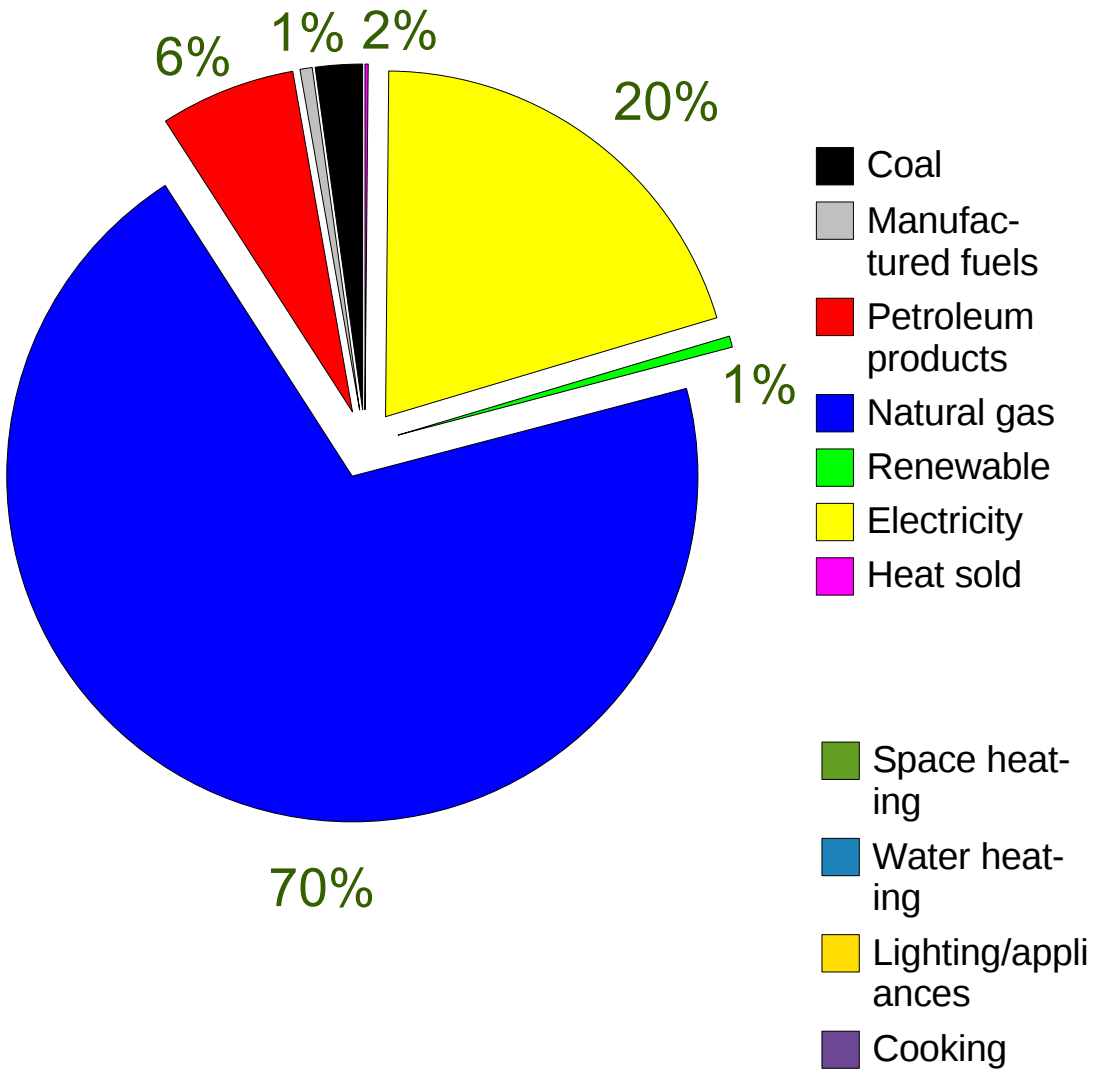
The Impacts of Consumption

Dutch consumption provides a good analogy for the UK:

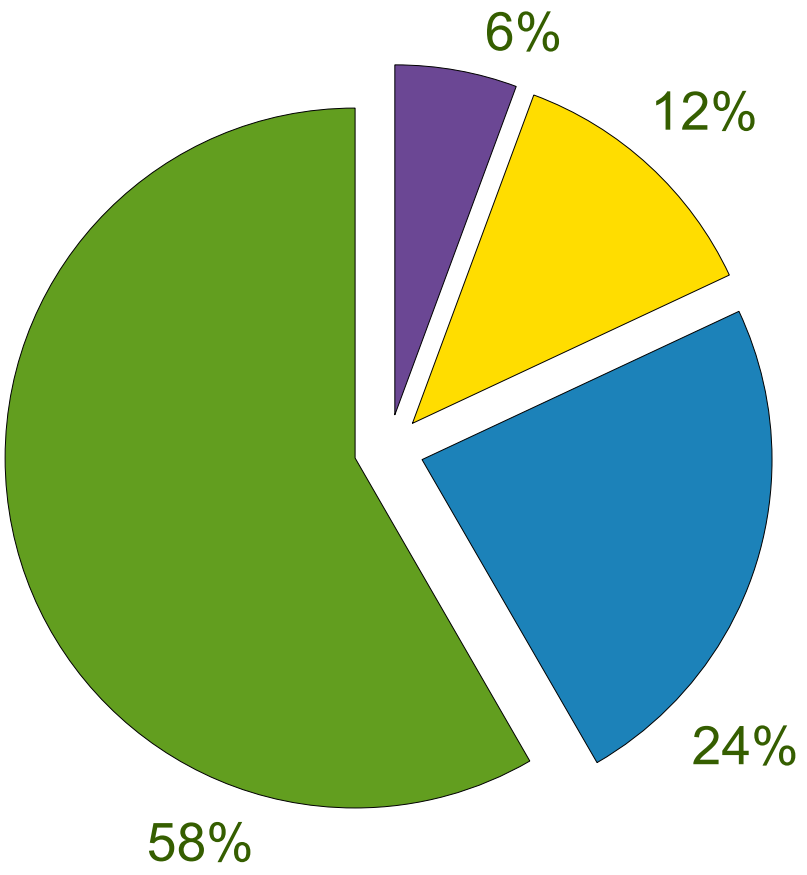


Source: Share of Consumption Environmental Load from Dutch Private Consumption, Nijdam et. al., Journal of Industrial Ecology 9(1-2), 2005

Domestic Energy Use



So, if standby devices use 10% of your lighting/ appliance consumption, that's 10% of 12% = 1.2%! (not a lot compared to the space heating load)



Source:
DTI

Some Quick Ideas...

- **Get out of debt!**
- Cutting energy use – 50% of domestic consumption is space heating, and 25% water heating (low energy light bulbs won't solve the problem – *only saves about 4.5%!*).
- Energy reduction becomes more difficult to achieve the more you cut, so it's actually easier to look at on-site energy production (micro-generation) to offset consumption.
- Solar systems can reduce hot water demand by 50%, but for larger savings you'll need to do some major engineering on the house and install a solar roof and heat store – note that a thermal system is more productive (and cheaper) than PV
- You need to tackle your use of commodities – the easiest way of doing this is gardening to produce food, and developing local networks to supply other goods from within the area.
- You need to set yourself up to travel less within 10 to 15 years.

Finally, read the book!

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