Energy and waste

Peter Landshoff

Conclusions from 2030 Vision

- The energy efficiency of our large areas of existing housing must be improved by appropriate neighbourhood retrofit schemes

The benefits of addressing existing housing have a far greater pay-off than raising standards for new housing

- We must continue to exploit the region's renewables potential (mainly wind and solar).
- We must place more value on waste.

Our patterns of behaviour must change as increases in population place pressure on our natural resources

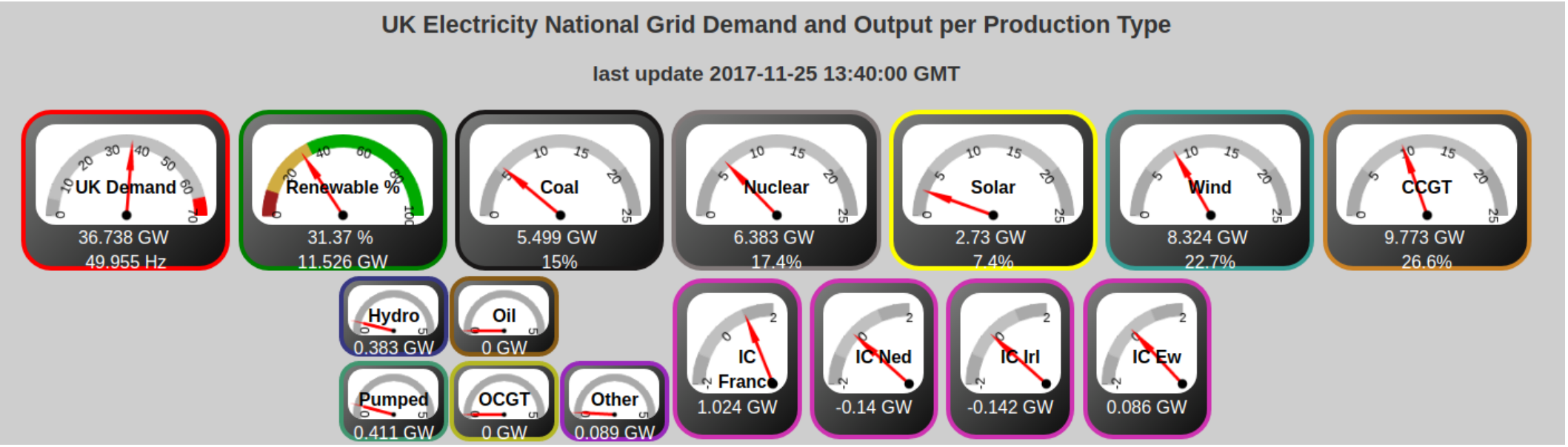
- By 2030 there will be a micro-nuclear power station under Parker's Piece

Nuclear

Small Modular Reactors

A Small Modular Reactor (SMR) programme represents a once in a lifetime opportunity for UK nuclear companies to design, manufacture and build next generation reactors to meet the UK's energy needs. Rolls-Royce is strongly placed to deliver the design and, together with a consortium of UK companies, the supply of almost all aspects of a new nuclear SMR plant, re-establishing the UK supply chain to a position of global recognition.

http://gridwatch.co.uk/



Renewable: wind + solar + hydroelectric + biomass
CCGT: gas turbine
Pumped: storage hydro
Other: mainly biomassl

Energy: what is the truth?

David MacKay: if we covered the windiest 20% of the country with turbines, or 5% of the land area with photovoltaic solar farms, the energy generated would only be what is needed for each of us to drive a car 50km.

http://www.inference.eng.cam.ac.uk/sustainable/book/tex/sewtha.pdf

Average demand is about 35GW. Total wind capacity is about 15GW. Its average load factor is less than 30%.

Offshore wind 5GW, with 4.5GW under construction (Crown Estate)

One day at 5pm in January 2015 peak demand was 53GW – wind provided 1%

Soham: 45,000 solar panels, up to 12 MW, 70 acres

Alice Thomson, The Times, 26.4.17

Subsidising power stations to burn American wood pellets that are doing more harm to the climate than the coal they replaced, according to a recent Chatham House report.

Why can’t people wear pullovers indoors?

Existing buildings are the main challenge for energy-saving – this is being addressed but too slowly.

Demolish and rebuild may seem wise, but involves a large – but uncertain – embodied carbon (Cambridge Architectural Research)

Is the UK future with shale gas?

Some research in Cambridge University

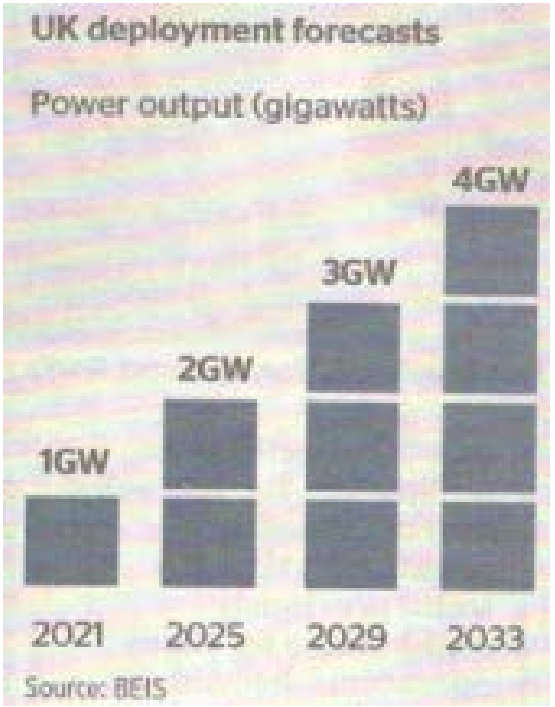
https://www.cam.ac.uk/subjects/solar-power

- Perovskite materials can recycle light particles – a finding which could lead to a new generation of affordable, high-performance solar cells.
- Scientists have developed a working laboratory demonstrator of a lithium-oxygen battery which has very high energy density, is more than 90% efficient, and, to date, can be recharged more than 2000 times
- Plants generate electrical currents as a consequence of photosynthesis and metabolic activity during the day and night.

… and much more

Power storage

Battery



The liquid air engine, invented by Cambridge firm Epicam, is to be trialled by the world's leading diesel engine manufacturer, Cummins.

The system is driven by wind and has an integrated energy storage and power regeneration system.

The energy is stored in the form of liquid air which is produced from a compact air liquefaction unit driven directly by the wind turbine. This enables the machine to store surplus energy under good wind conditions

For the past half century nuclear fusion power has always been 20 years away

https://eic.rsc.org/opinion/remembering-project-zeta/2021040.article

On the 25 January 1958, the press crowded into Hangar 7 of the Harwell nuclear research establishment, near Oxford, to hear news of a revolutionary scientific discovery. Nuclear physicists at Harwell had heated deuterium gas to ca 5 million °K inside a torus, code-named Project Zeta, in an attempt to recreate the nuclear fusion processes inside the Sun.

Waste

23% of renewable energy comes from energy from waste facilities - the equivalent to 726,000 tonnes of oil http://rethink.sita.co.uk

> Amey is proposing to develop a new waste treatment facility at its Waterbeach Waste Management Park in Cambridgeshire.
>
> The facility would use waste from households and businesses to create electricity, heat or a mix of both – generating enough electricity to power the equivalent of 45,000 homes.

Local company Entomics is transforming food waste into sustainable, renewable resources... using insects to produce

1) Protein Meal
2) Bio-Oil
3) Organic Fertiliser

Waste

23% of renewable energy comes from energy from waste facilities - the equivalent to 726,000 tonnes of oil http://rethink.sita.co.uk

> Amey is proposing to develop a new waste treatment facility at its Waterbeach Waste Management Park in Cambridgeshire.
>
> The facility would use waste from households and businesses to create electricity, heat or a mix of both – generating enough electricity to power the equivalent of 45,000 homes.

Local company Entomics is transforming food waste into sustainable, renewable resources... using insects to produce

1) Protein Meal 2) Bio-Oil 3) Organic Fertiliser

Recycling

Amey https://wasteservices.amey.co.uk/ uses a variety of technologies to recover usable materials

It separates plastics, cardboard, metals and paper (86,000 tonnes of material each year)

It converts garden waste to soil conditioner

Saves 200,000 tonnes per year from landfill

A Dutch company recover cellulose from used toilet paper, to add to tarmac

Discussion to be led by Barry Pearce :

- **Where do you disagree with what I have said?**
- **What have I omitted that is important?**
- **What should the local authorities and other local bodies do now to prepare for 2050?**