



Zero Carbon Britain 2030

by

Paul Allen

CAT

Low Carbon Societies Network Seminar

October 5, 2010

Centre for Alternative Technologies (CAT), Wales, UK

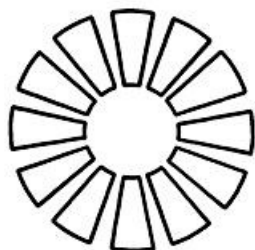
<http://lowcarbon-societies.eu/index.php?id=42>

ZERO **CARBON** **BRITAIN** **2030**



A NEW ENERGY STRATEGY

The second report of the
Zero Carbon Britain project



An Alternative Energy Strategy for the United Kingdom

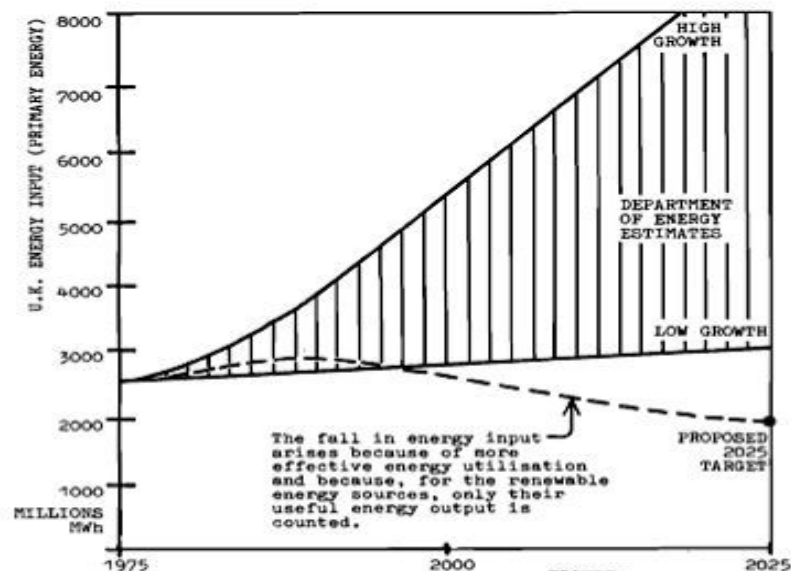


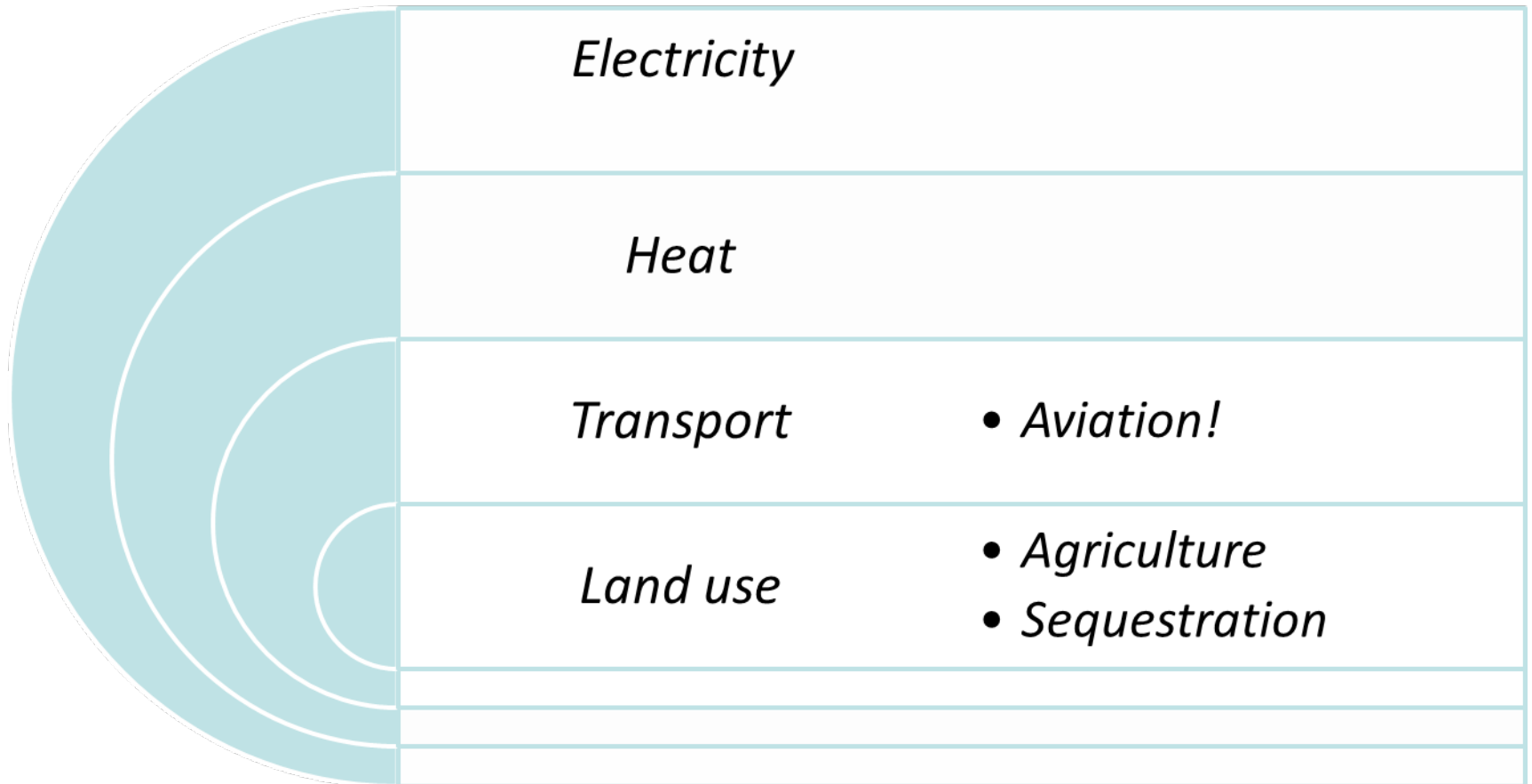
FIGURE 1

more efficient in their use of fuel but they involve the storage, handling and transportation of substantial quantities of plutonium, which is highly toxic and of military significance. Both types of reactor produce waste products which remain dangerous for very long periods of time. The Royal Commission on Environmental Pollution in its Sixth Report has drawn attention to the hazards of a large-scale nuclear power programme based on breeder reactors, mentioning the risks associated with accidents within reactors, the political risks involved in the so-called "plutonium economy" and the problems of the safe disposal of radioactive waste. On this last point the report recommends that there should be no commitment to such a programme until it has been demonstrated beyond reasonable doubt that a method exists to ensure the safe containment of long-lived, highly radioactive waste for the indefinite future.

Description of the scenario

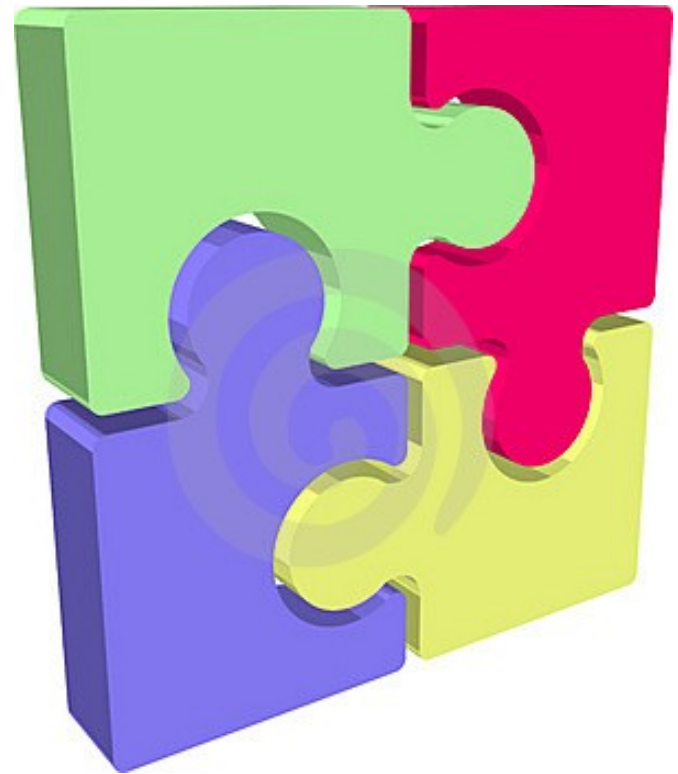
- We're all aware of big **21st century challenges**
- Lots of people are clearly doing **lots of great work**
- But are we on **target?**
- How can we **fit everything together in time???**
- A 20-year scenario to '**raise the debate!**'

The scope of the study

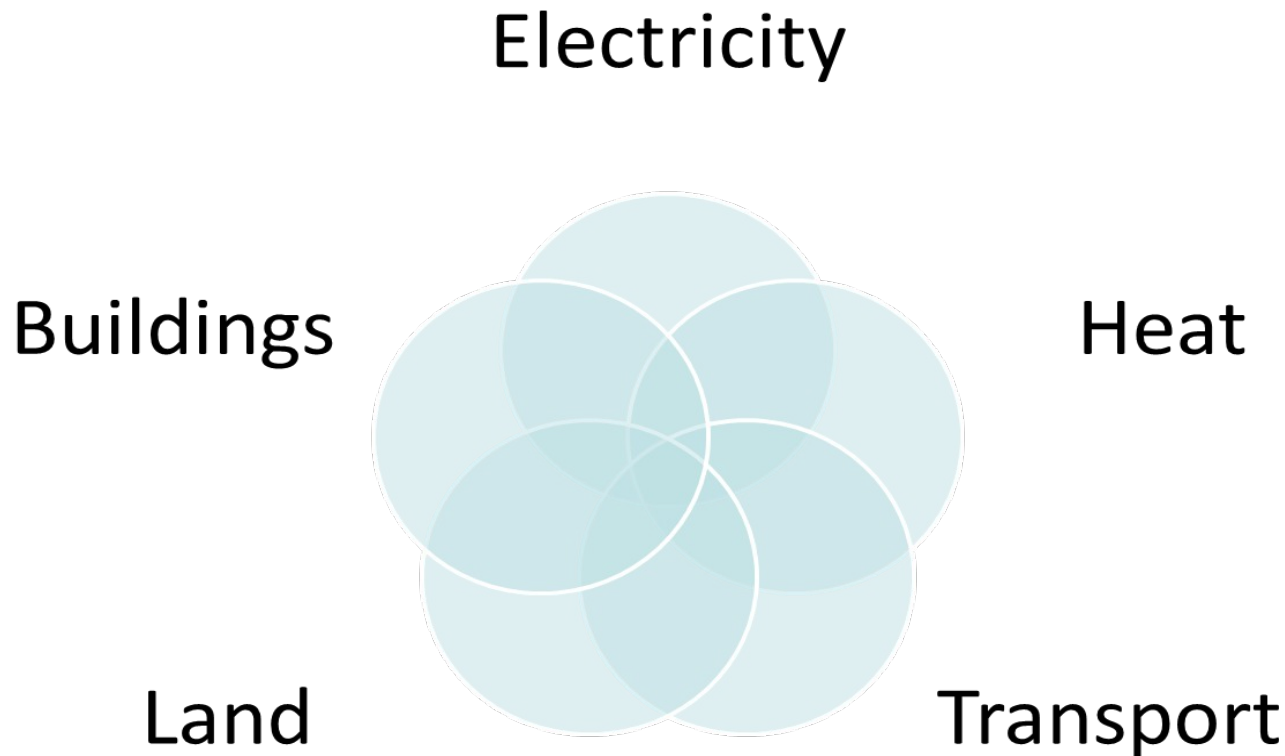


Integrating sectors & scales

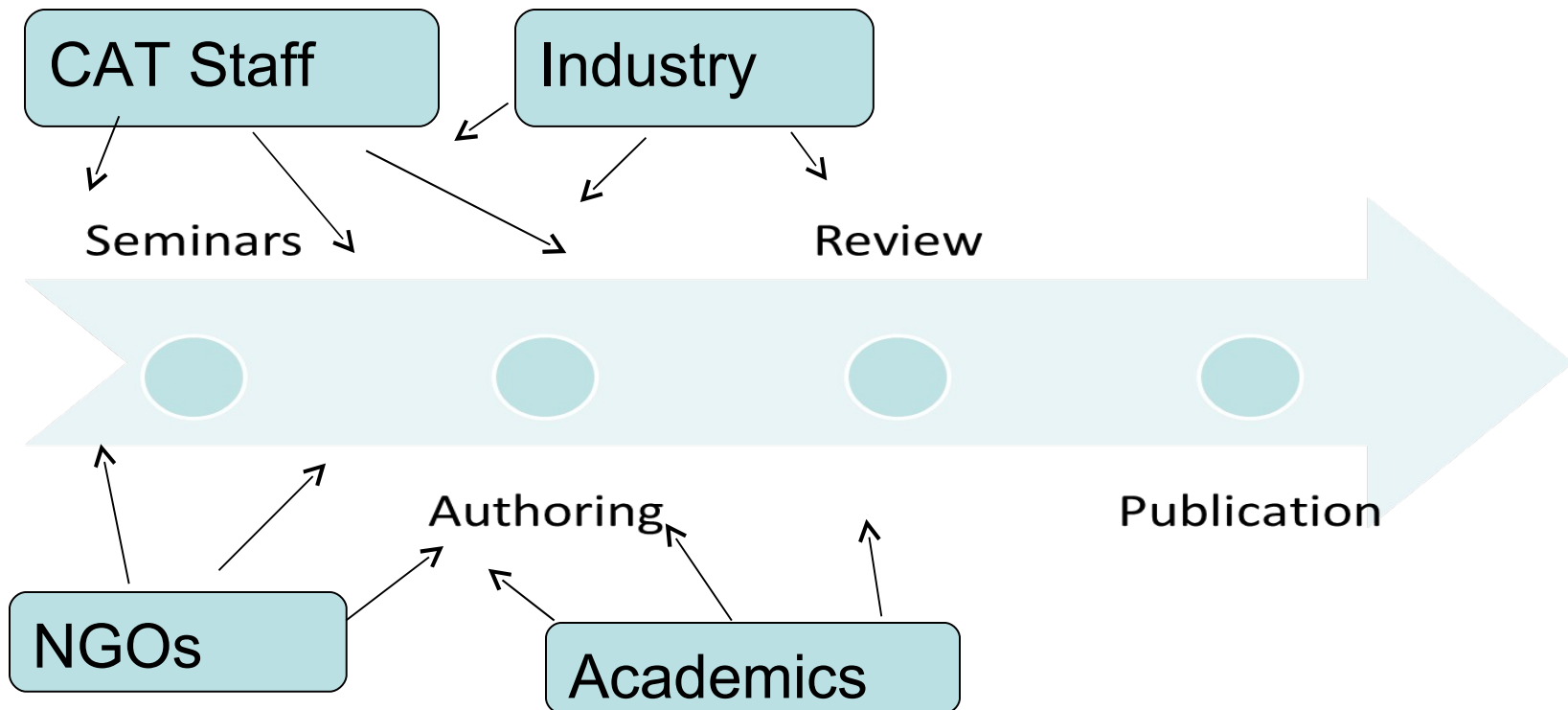
- Land-use, buildings transport, diet & industry
- Wind, wave, tidal, energy efficiency
- Domestic, community & national scales



Synergy in de-carbonising;



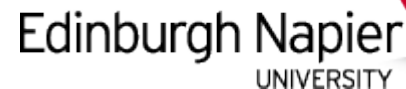
Our 18 month process ...



In collaboration with ...



Universities



The Open University



University of the
West of England



Anglia Ruskin
University

Industry

SUSTRACO

ARUP

BioRegional

riversimple



Research centres



publicinterestresearchcentre





Our wellbeing depends on:

- Climate Security
- International Security
- Energy Security
- Economic Security



‘The Scenario’

powerdown
powerup

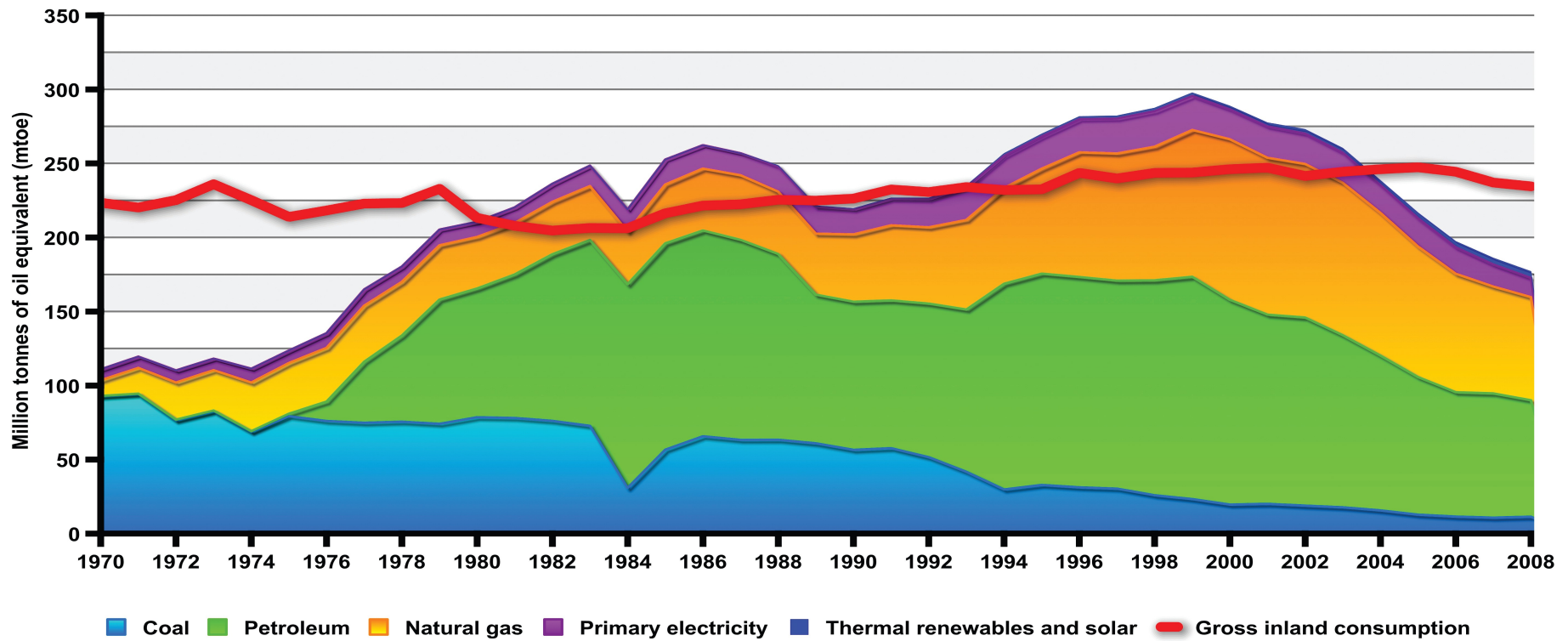
The diagram illustrates a transition from a 'powerdown' state to a 'powerup' state. The word 'powerdown' is written in orange, with an orange arrow pointing downwards from the 'p' to the word 'powerup' below it. The word 'powerup' is written in green, with a green arrow pointing upwards from the 'p' to the word 'powerdown' above it.

powerdown

- UK oil & gas supply lines
- More & more money leaves the UK economy as the cost of energy imports increases.



powerdown



powerdown

- Sector by Sector
 - Transport
 - Built environment
 - Food & Land-use
 - Industry
- Over 50% reduction in energy use in 20 years



Transport

- Change of **energy source** from fossil fuels
- **Electrification** of cars, trains & LGV's
- **Modal shift** - private car to public transport, walking and cycling
- Reduction in **passenger km**



Electric cars get a makeover

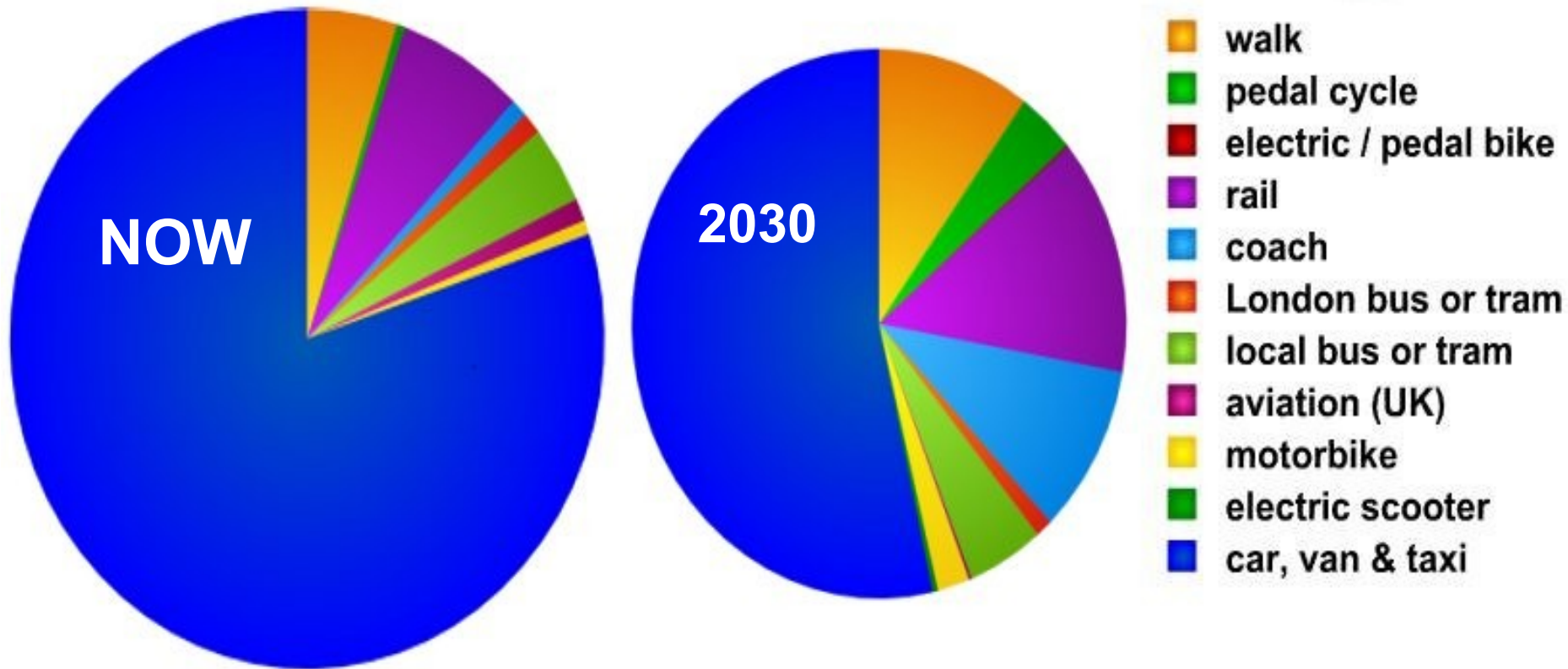


Transport

- **No** domestic aviation,
1/3 international on current
levels
- High speed **electric train**
network
- **Locally grown** biofuels &
hydrogen to power HGV's
and planes



Transport: modes (km)



Built-environment

- The design, construction, maintenance, refurbishment, management & operation of the country's building stock are all **crucial to reducing carbon emissions**
- Massive employment potentials

Built-environment

- Focus on fabric & EROEI of a building
- Embodied energy of materials & processes
- Natural materials in both new-build and retro-fit can reduce impacts **and** enable the building stock to lock away carbon



Hemp-lime render



Timber

Natural Materials

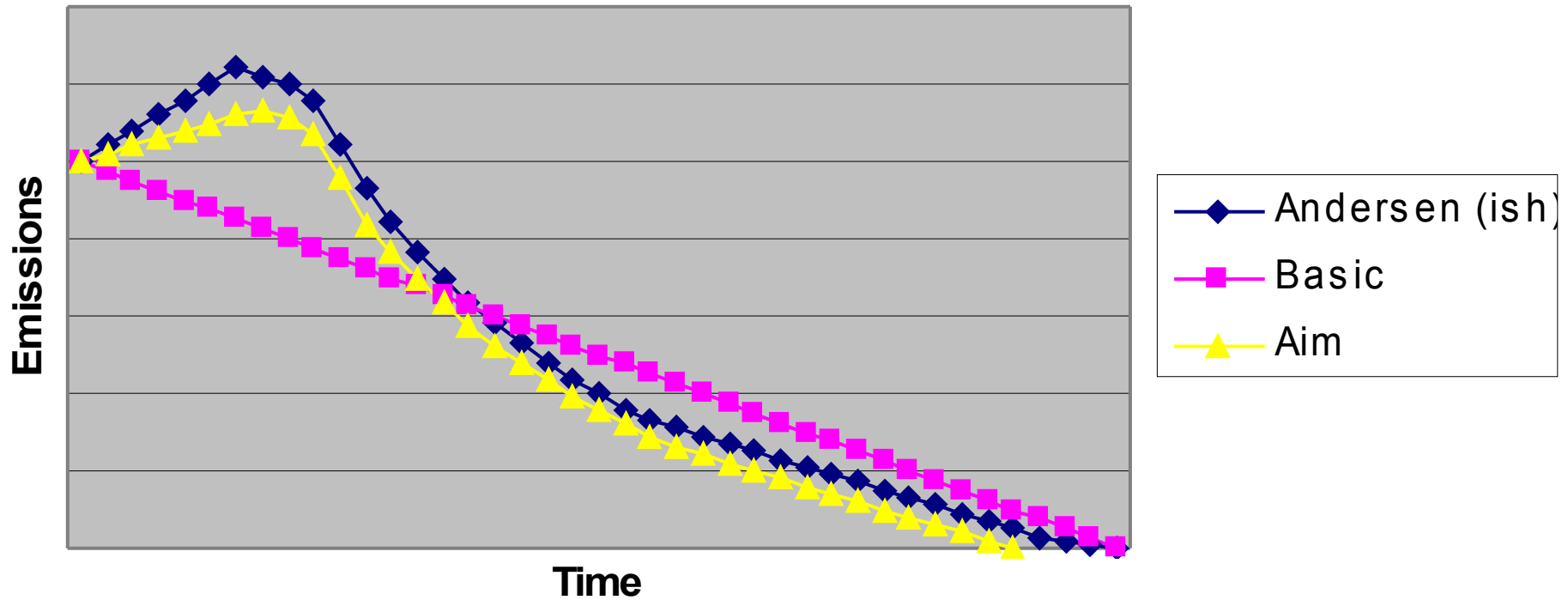


Sheep's wool



Rammed Earth Walls

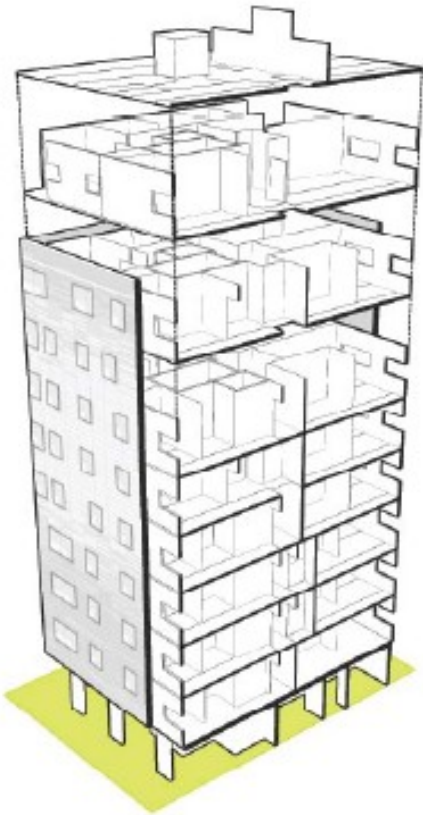
Alternative Decarbonisation



Zero carbon new-build

- “Net Zero Carbon” (construction & use)
- Up-skilling the industry
- Occupant education as core
- Building management systems

Timber-frame innovation



Honeycomb structure

Rotated plans

Load-bearing walls, floors
and cores

Tallest timber building in
the world

architects Waugh
Thistleton



Zero carbon retro-fit

- The largest **decrease in emissions** in the built environment will come from retro-fit
- **20 million homes in 20 years**
- **A Code for Sustainable Refurbishment;** improvements such as glazing, insulation, boilers & other efficiency measures.



- Identify UK ‘***strategic renewable asset***’
- The energy from current technologies **widely deployed** in non-sensitive locations

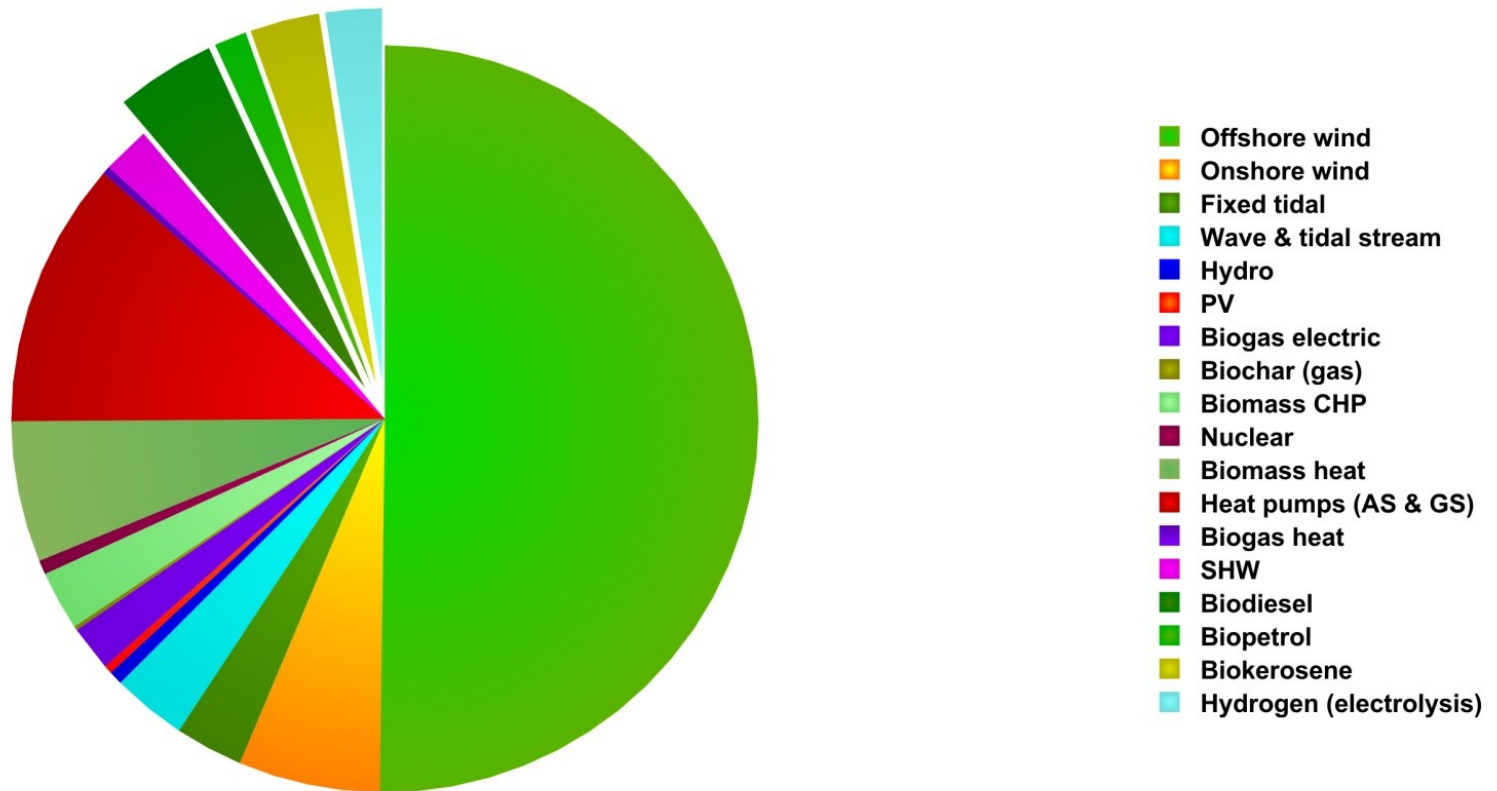




Estimate the income harvesting this renewable energy could **inject into** our economy!

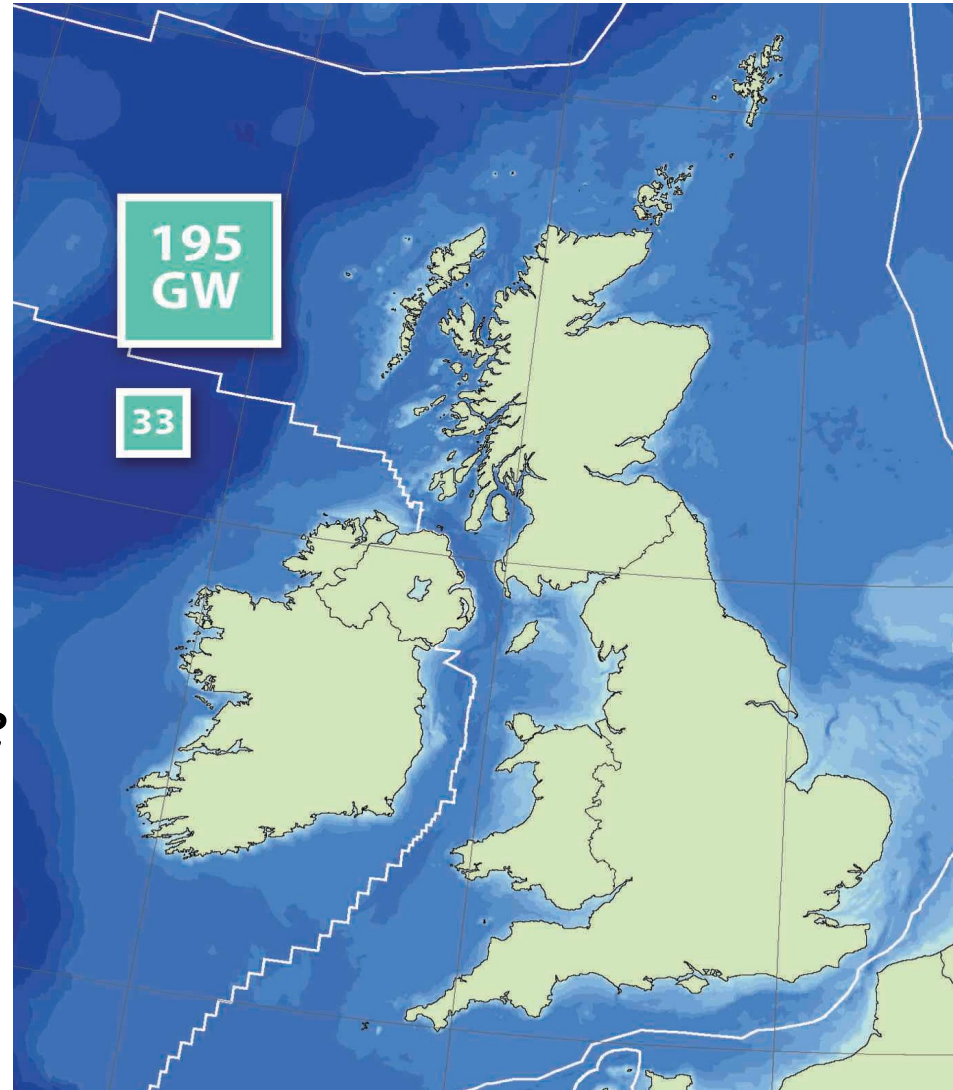


Electricity, Heat & Transport



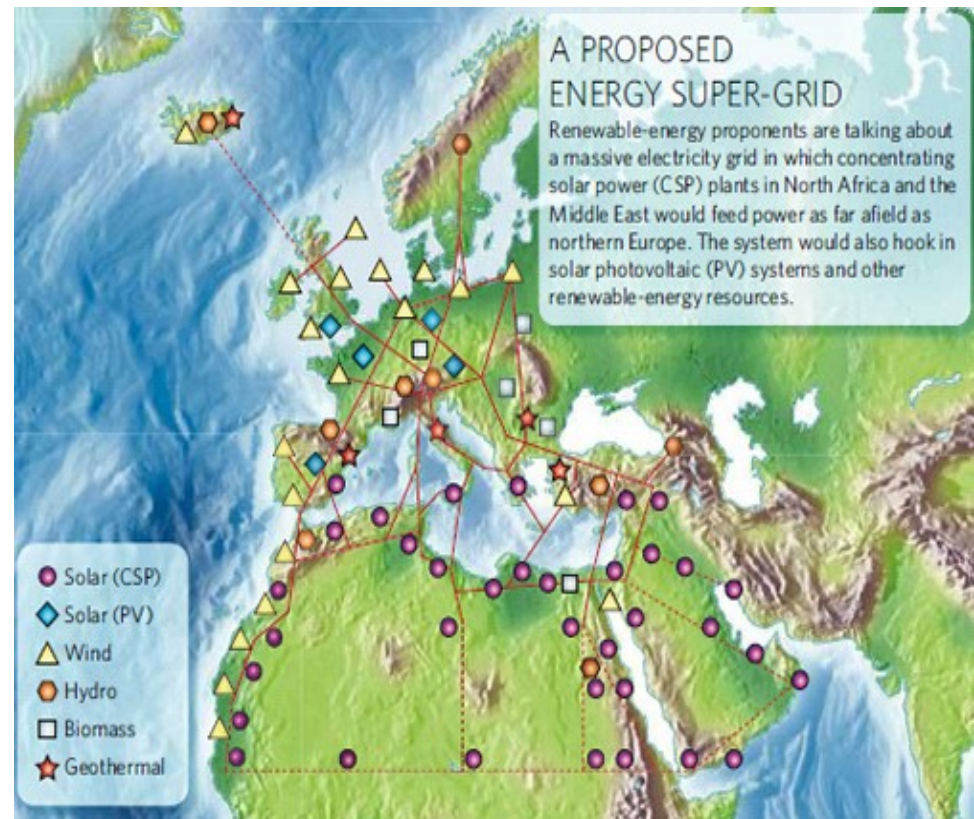


- Exports of up to 17% earning £7bn annually
- Built on UK-ERC '*Env. Sensitive Scenario*' data
- Comparable with '*Offshore Valuation Group*' findings



Variability managed by:

- Smart grids which control demand
- Limited use of UK biomass crops
- Thermal-mass of building stock
- EU Super-grid



EU Energy network

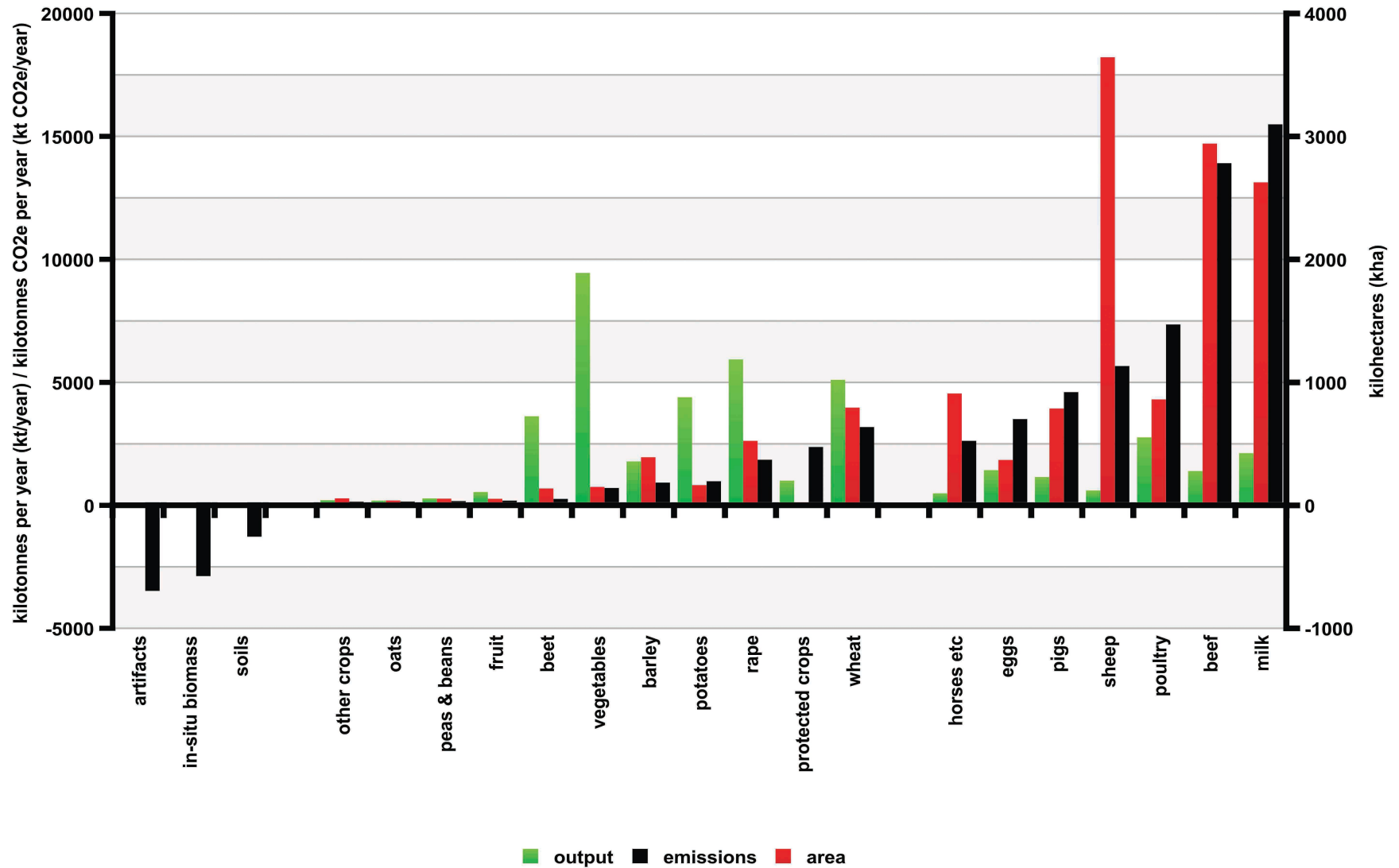
- High Voltage DC Grid
- Linking up the offshore wind-farms
- Also linking the winter wind to the summer sun



Land-use in the Scenario

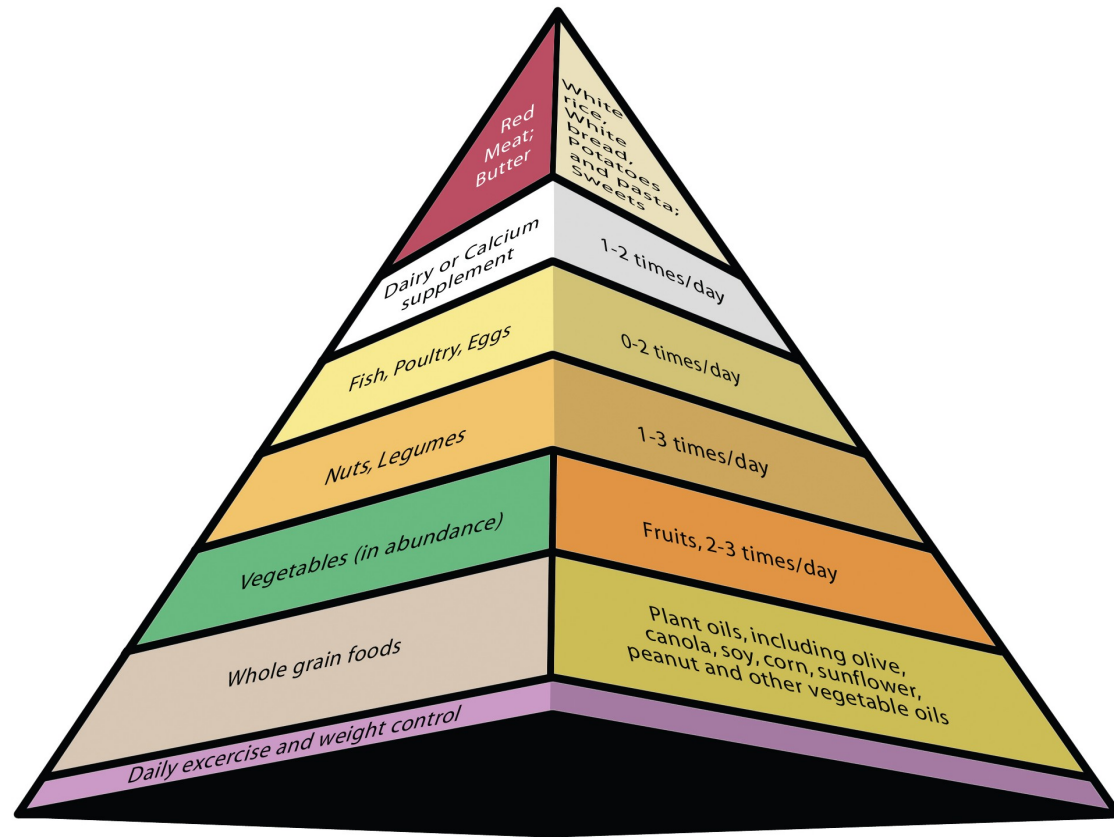
- Some emissions are hard to eliminate completely, and there would be residual emissions of about 10%
- These are balanced with land-based sequestration processes, giving net zero emissions.
- The mostly-electrical energy system still needs a certain amount of solid, liquid and gaseous fuels
- These are provided by dedicated biomass crops, converted into various usable fuels.

Current land-use yields and impacts



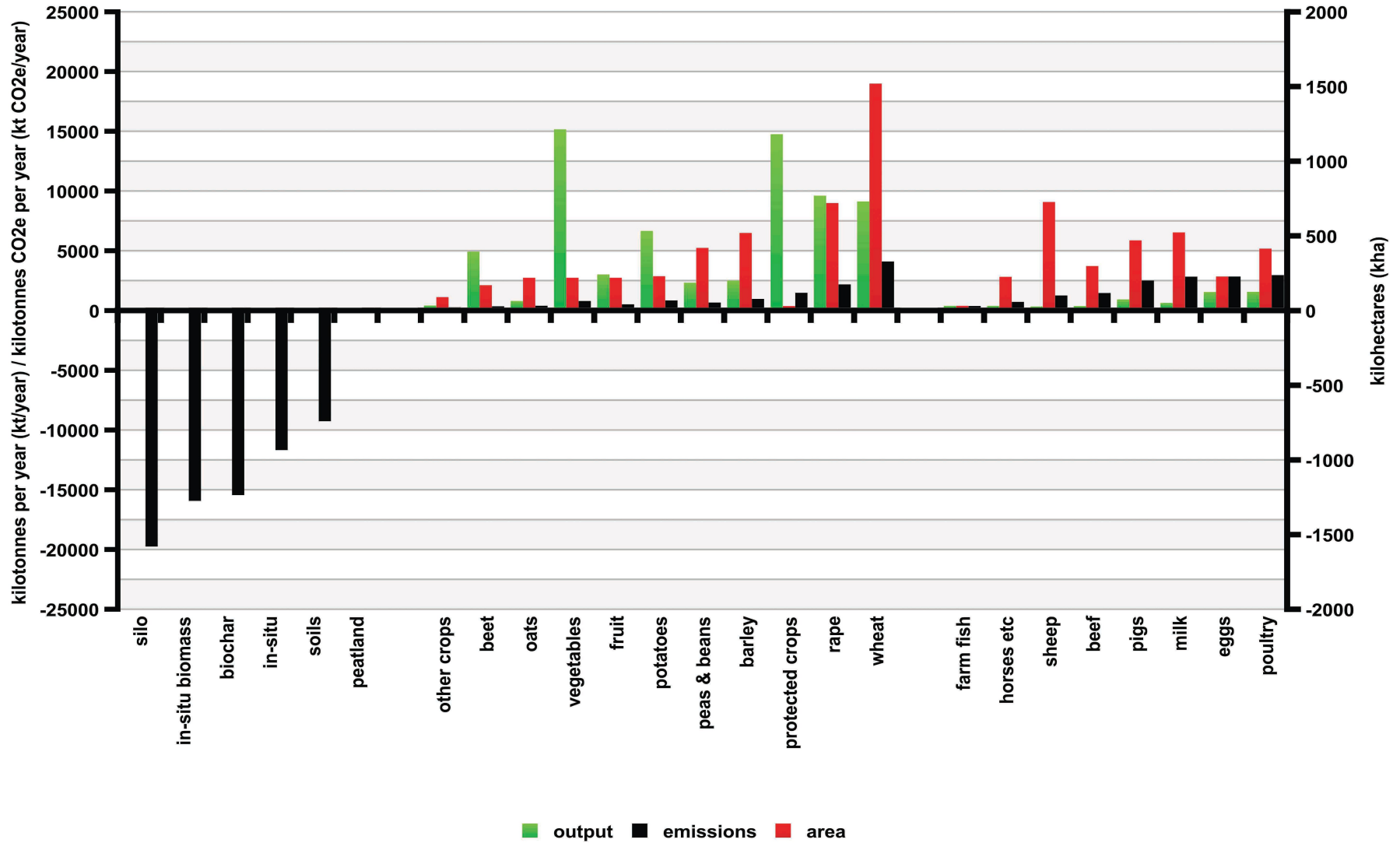
Food Quality

- There would be a lower level of livestock products, particularly red meat and dairy
- This mix closely matches the recommendations for a healthy diet

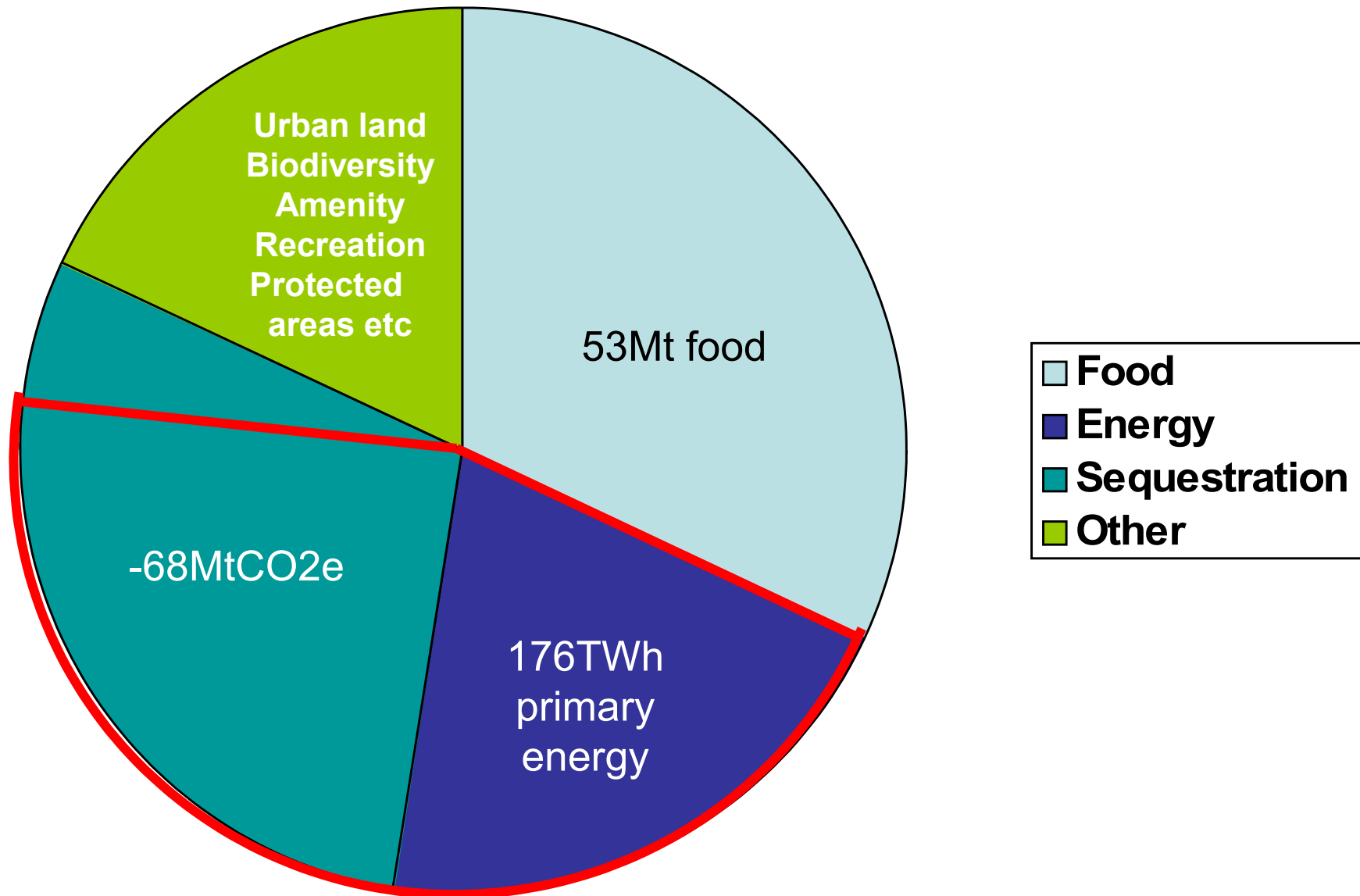


Meat 'n ten veg?

2030 land-use patterns



Re-thinking land-based assets

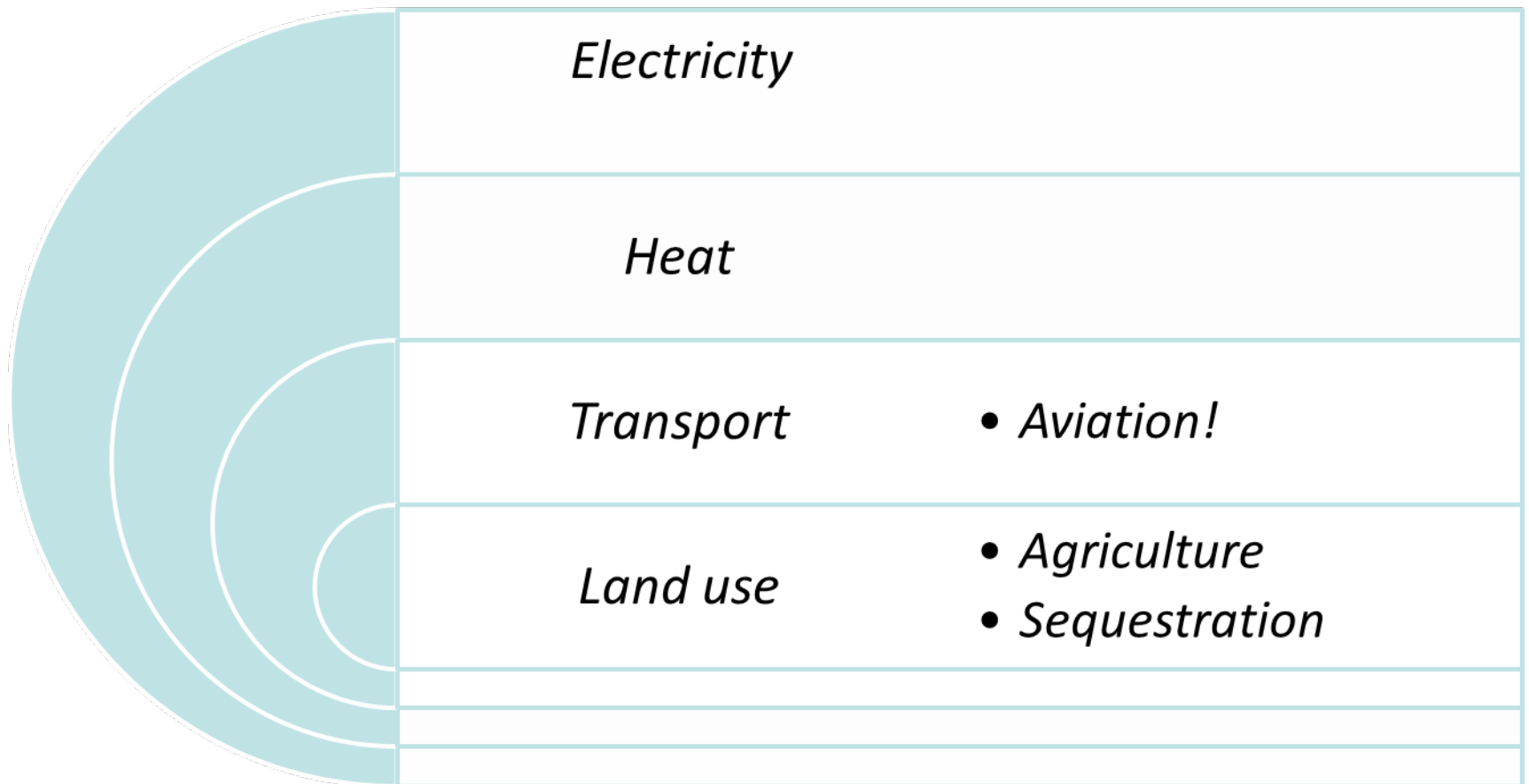


Some surprising benefits

- Food security
- Food quality
- Biodiversity
- Rural life and livelihoods



Is 100% RES Possible?



Needs a mix of policy options

- International Route-map is essential
- Personal Carbon Regulation
- Changes in taxation
- Support for innovation
- New business models: ESCO's
- Strategic 'stimulus' investments

What would be the costs?

- **These are not really costs!**
- War, fire, flood or epidemic are costs
- ZCB2030 offers an investment opportunity

What would be the costs?

- Electricity is a **secure premium product**
- Front-end loaded costs are **more certain** than other energy generation
- Returns are **greater** than investments
- Total margin depends on **carbon price**

What would be the costs?

- 50% of 'energy' in ZCB is from **195GW** of offshore wind with an output of 615TWh.
- A total investment of **£476bn** delivers a revenue of **£79bn** each year.
- So **£48bn** per year for 10 years could deliver **£79bn** revenue a year (for 20 years).
- Based on '**offshore valuation group**' findings

What would be the costs?

- Massive new **asset-base** for the UK
- Benefits for **rural areas** in particular
- **Re-skilling** to 'un-lock' these assets
- **Balance of payments** - 2030

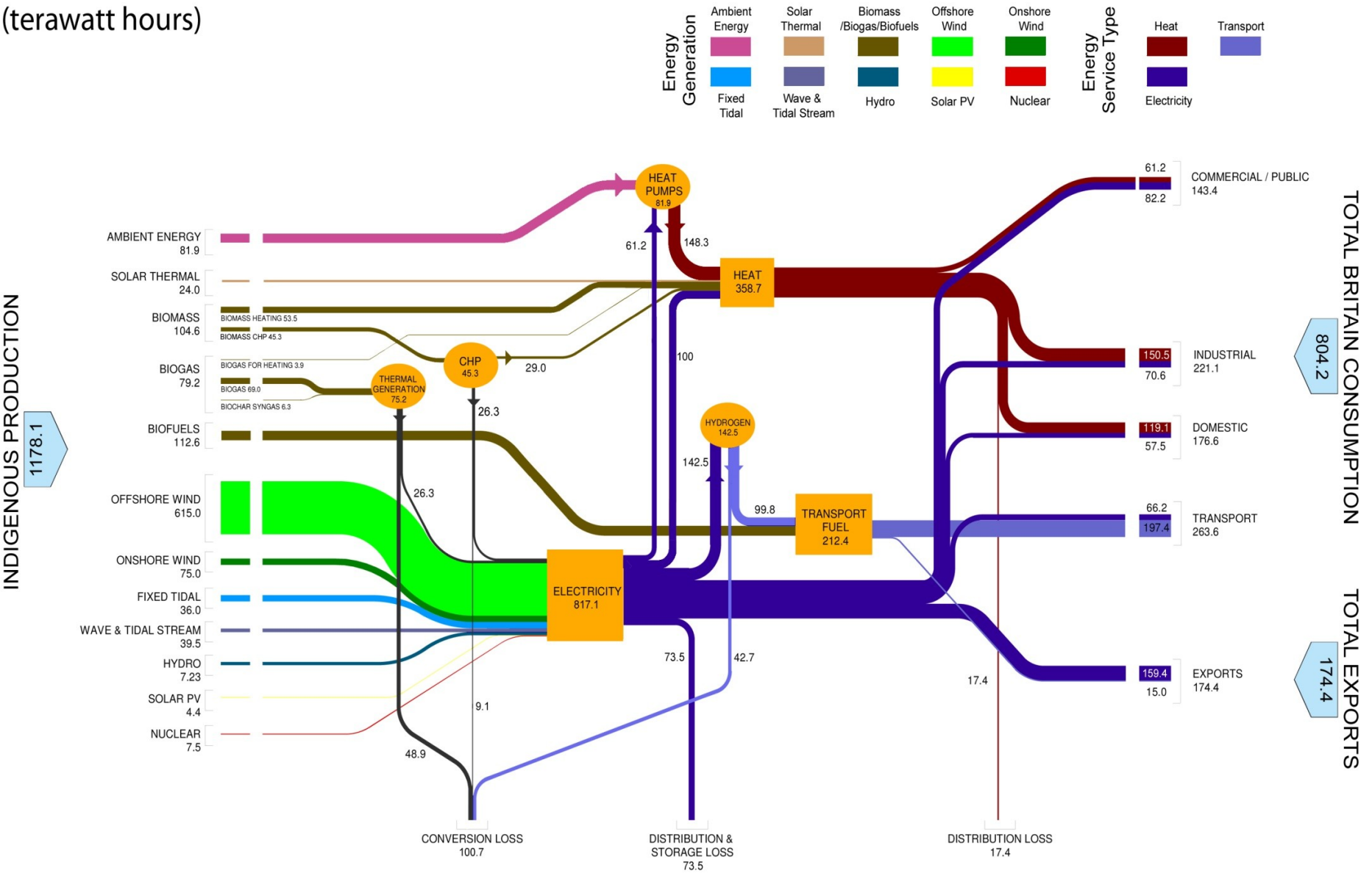
Where would the investment come from?

- Pension funds
- Local Authorities
- Individual & communities
- Charitable trusts
- Investment banks
- Energy Bonds



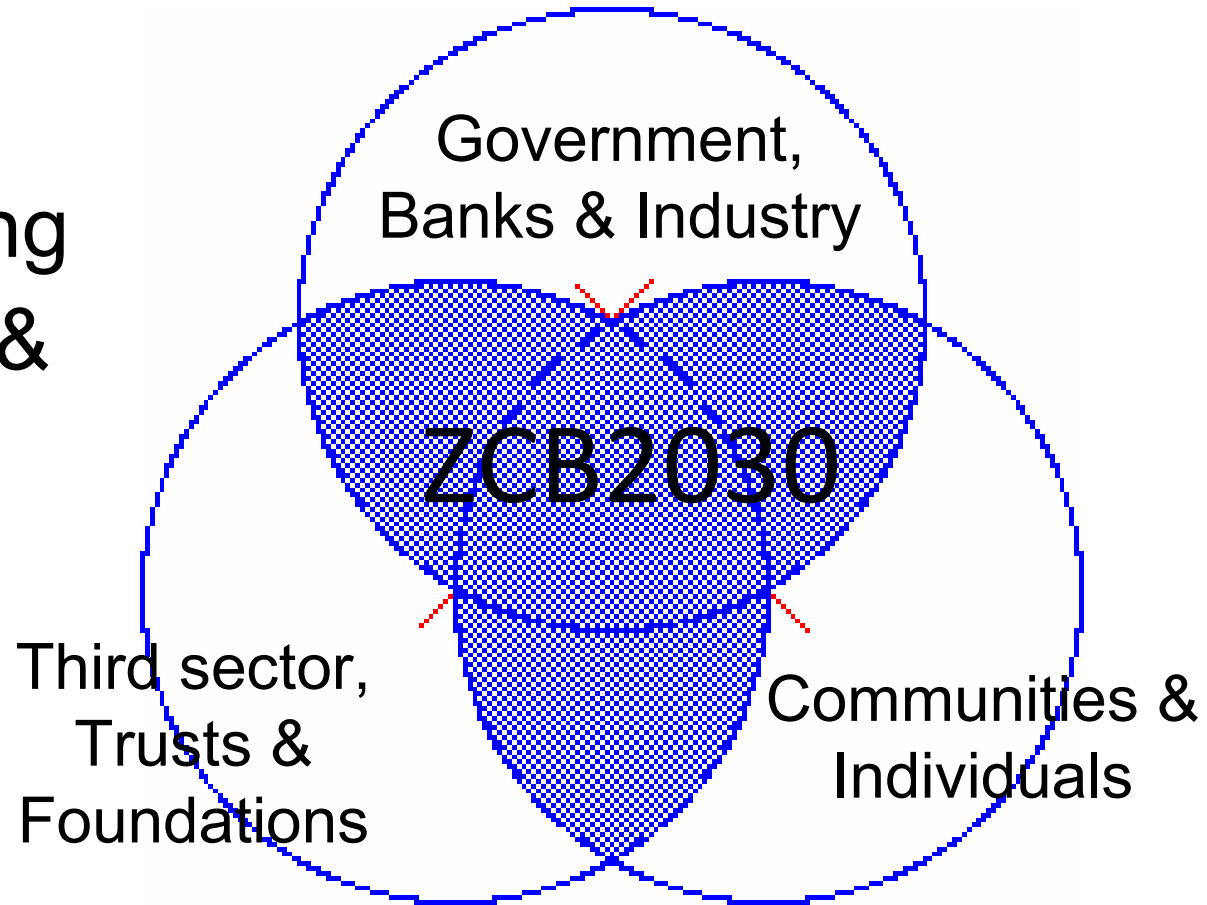
UK Potential Energy Flows 2030

(terawatt hours)



A new community of practice...

... between
forward-thinking
organisations &
first movers!



A sense of collective purpose



Communications

- The first fully integrated **positive vision** for the future.
- A rapidly decarbonised UK is both **aspirational and prosperous**.



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DEPARTMENT OF
ENERGY
& CLIMATE CHANGE

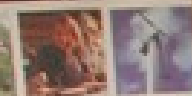


ZERO
BRITAIN
2030

ZERO
BRITAIN
2030

Canolfan y
Dechnoleg
Amgen

Offering practical solutions for
carbonates living since 1983



for Environment

www.cat.org.uk



Spring

100%
Renewable

Energy

Energy

Energy

Energy

Energy

Energy

Energy

Vision of zero carbon Britain in just 20 years

Juliette Jowit

It's 2030, only 20 years from now: you have driven to work, there is a roast in the oven for dinner and you are considering taking your partner to India to visit family later in the year. So far, so normal, but this is also a vision of a zero-carbon Britain, where not a single gram of the greenhouse gas blamed for global warming and climate change is emitted to power our lives.

Some of the changes are invisible, many more are obvious. Cars are electric, and many drivers borrow from car clubs or lease rather than own them. Airlines no longer fly short distances and long-haul trips are a rare treat.

Workers from traditional heavy-energy industries such as steel or cement need to retrain to work on insulating millions of buildings or go back on the land. Dinner may be a roast, but it is poultry or pork because rearing lamb or beef would take up too much land and emit too many greenhouse gases. Mangoes and bananas are a luxury, as food imports have been halved. The landscape of Britain looks different: instead of green cattle pastures there are millions more acres devoted to vegetables and grain, and trees for biofuel and buildings.

This picture of Zero Carbon Britain in

Nations intergovernmental panel on climate change.

It claims that in just two decades, the country can eliminate greenhouse gas emissions equivalent to 637m tonnes of carbon dioxide.

Nine-tenths of this would be achieved by ending wasteful uses of energy, increasing renewable electricity and heating, and transforming land use and farming. The remaining tenth, or 67m tonnes, would be offset by capturing the equivalent emissions from the atmosphere by growing willow, ash, pine, oak and other trees on land freed up by the near-abolition of animal grazing.

Despite setting a more ambitious timetable than demanded of Britain, the pace and scale of the transition are "entirely possible", said Viki Johnson of the New Economics Foundation, one of the report's authors. "The solutions exist - what has been missing to date is the political will to implement them."

The blueprint envisages mass insulation of homes and offices, with smaller, easier-to-heat rooms; electric or biofuel vehicles; much less flying and driving and more public transport; generating a lot more renewable electricity using a range of clean sources, especially offshore wind, but no nuclear power; and a "revolution" in diets to cut out a huge source of meth-

Mangoes, as well as bananas, could be a luxury 20 years from now if food imports halve in a zero-carbon Britain



637 Million tonnes of carbon dioxide can be eliminated in two decades, says the Centre for Alternative Technology



Energy plans 'could create thousands of jobs in Wales'

Thousands of new jobs could be created in Wales to help cut greenhouse gas emissions to zero, it is claimed.

A report by the Centre for Alternative Technology (CAT) says young people can be trained and industry boosted by its plan to eliminate emissions by 2030.

CAT, based in Machynlleth in Powys, is due to launch its report, *zerocarbonbritain2030*, at the Senedd.

The Welsh Assembly Government has welcomed the report, which suggests greater use of Wales' coastal energy.

The report is a UK-wide strategy to eliminate emissions for all greenhouse gases and across all sectors in the UK.



The report calls for every cavity wall and loft in the UK to be insulated

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All the latest from the Senedd and Westminster

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21 June 10 | Wales
- ▶ [Eco-centre's UK zero carbon plan](#)
10 April 10 | Mid

Renewables could bring jobs bonanza

Jun 24 2010 Daily Post

THOUSANDS of new jobs could be created in Wales under moves to slash greenhouse gas emissions to zero.

A new report from the Centre for Alternative Technology in Machynlleth says the new jobs can be generated by stepping up the use of renewable power.

Research work from academics and experts at Aberystwyth and Cardiff universities is used in the report to map out a path for a zero carbon transition by 2030.

The report, launched yesterday, says that for the first time a comprehensive energy strategy has been produced that could reduce emissions to zero for all greenhouse gases and across all sectors.

Paul Allen, CAT director, said the report shows how the right mix of wind power, hydro, solar, biomass, together with an "intelligent grid" to manage demand, could meet the country's energy needs without the present reliance on oil and gas.

He said the report aims to integrate thinking across a range of sectors and identify potential ways to reduce energy demand as well as increasing the use of renewable energy sources to meet all energy demand by 2030 without the requirement for nuclear power.

"Wales enjoys abundant renewable resources, and by moving towards a zero carbon Wales we can create thousands of new jobs, enjoy greater energy





A move from oil and gas to renewable energy could revitalise manufacturing and create thousands of Welsh jobs, says the [Centre for Alternative Technology](#)

How UK's carbon emissions can be cut to zero in 20 years

GREEN STUDY FORECASTS THOUSANDS OF NEW JOBS

SALLY WILLIAMS
sallywilliams@walesonline.co.uk

NET greenhouse gas emissions in Britain can be cut to zero by 2030, creating thousands of jobs in Wales, a new study by green pioneers claims.

A new report, *ZerocarbonBritain2030*, by the Machynlleth-based [Centre for Alternative Technology](#) (CAT) with research from Cardiff and Aberystwyth Universities, highlights an ambitious path to a 90% emissions reduction by 2030.

This compares to the UK Government's target of a smaller 80% emissions reduction by 2050 – twice the timescale of the CAT plan.

Director of CAT Paul Allen said it was the first time a comprehensive energy strategy had been produced that could reduce emissions to zero, for all greenhouse gases and across all sectors.

"Wales enjoys abundant re-

newable resources," he said.

"By moving towards a zero carbon Wales, we can create thousands of new jobs, enjoy greater energy security and a more sustainable, dynamic and resilient Welsh economy."

ZerocarbonBritain2030 shows how the right mix of wind power, hydro, solar, biomass, plus an intelligent grid to manage demand, can keep the lights on and supply the energy the country needs, with major win-wins across the economy.

"We propose a model that uses both an emissions cap and trade system and a carbon tax."

He said the cap and trade element ensures that Wales and the rest of Britain maintain emissions at a safe level.

"Setting a price on carbon and implementing a carbon tax makes choosing lower emissions products more economically attractive," he said.

He said oil and gas in the North Sea was running out, meaning huge price hikes in fuel prices in future, plunging more people into fuel poverty.

"The report shows *ZerocarbonBritain2030* is achievable and that we can power down by 57% through energy efficiency and saving measures and power up our renewables to 100% to meet the reduced energy demand," he said.

"Britain can produce its own food, fuel and heat houses, reducing imports."

Residual emissions – 10% of current totals – will be balanced by carbon sequestration through agriculture and building materials, bringing Britain's net emissions to zero.

He said there were a lot of economic gains, as well as the obvious environmental ones.

"The move to renewables could revitalise manufacturing in the UK," he said.

Cut in livestock numbers urged in zero carbon goal

By TARA GREAVES

Environment correspondent

Britain could cut greenhouse gas emissions to zero in 20 years, creating new jobs in the process, if a range of controversial measures are introduced - including a call for an 80pc reduction in livestock numbers.

A new report, published today, which features input from 13 universities and 12 research bodies, including the University of East Anglia, urges the new government to break this country's "fossil fuel addiction".

Switching from petrol or diesel-powered vehicles and cutting the number of short-haul flights are key policies together with cutting livestock numbers, which generates 82pc of greenhouse gases in the agricultural sector.

But Brian Pinnerty, regional spokesman for the National Farmers' Union (NFU), said while the organisation supported the view that farming had a part to play in carbon reduction, it took exception to the assumption that livestock production should reduce by more than 80pc.

"Simply arguing for a reduction in meat production and consumption fails to take into account the complex interactions within the food and farming system, and the fact that much of our agricultural land is unsuitable for arable and vegetable crops," he said.

"British livestock production is based on grassland which stores more carbon than any other land use while at the same time producing some of the most breathtaking landscapes we all enjoy. This is particularly relevant in East Anglia. Next week we're launching a new report on farming in the Broads, beside grazing land which was due to be ploughed up for arable farming in the 1980s, but which environmental



Picture:
EDP LIBRARY

GAS MAKERS:
A call has been made for numbers of livestock, like these cows grazing on a hillside near the village of Syleham, to be cut back to reduce greenhouse gas levels.

EMISSIONS REDUCTION

How will it be done?

Transport: A 63pc reduction in energy use for transport could be achieved by:

- A switch from petrol/diesel vehicles to electric/battery vehicles.
- Rail and bus services replacing domestic and short-haul flights.
- A two-thirds reduction in long-haul aviation and using kerosene fuel produced from coppicing in the UK.

Buildings: A 50pc reduction in heat and electricity demand could be achieved by:

- Insulation of all of Britain's un-insulated cavity walls and lofts.
- Using natural construction materials such as wood and straw.

Land Use: Britain can grow most of its own food while still producing biomass for heating, electricity and transport fuel.

- Land can be used to mop up residual emissions through sequestration.
- An 80pc reduction in livestock products that generate 82pc of greenhouse gases in the agricultural sector.

Alternative Technology (Cat), based in Wales, is said to be the first time an energy strategy has been produced that could reduce emissions to zero for all greenhouse gases and across all sectors.

Paul Allen, from Cat, said: "Zero Carbon Britain 2030 shows how with

the right mix of wind power, hydro, solar, biomass - plus an intelligent grid to manage demand - we can 'keep the lights on' and supply the energy the country needs, with major win-wins across the economy."

The report aims to identify potential for 'powering down' through reducing demand and 'powering up' renewables to 100pc by 2030 - with no requirement for nuclear energy.

Marcus Armes, from the Low Carbon Innovation Centre, based at the UEA, said: "The joint aims of reducing greenhouse gas emissions and creating greater energy security are to be welcomed, and certainly this report gives us some helpful pointers as to how to achieve these crucial goals. However, the good intentions go along with some political leaps of faith and drastic lifestyle changes which suggest it would be very difficult to realise the report's desired outcomes."

■ **The full report is available to download at www.zerocarbonbritain.com**

Eastern Daily Press

Lifestyle changes could end carbon emissions

Britain could eliminate all damaging carbon emissions within two decades without building any more nuclear power stations, a report claimed yesterday.

But there would have to be huge changes in lifestyle with people eating much less meat, switching to electric cars and taking no short-haul flights.

The Welsh-based Centre for Alternative Technology (CAT) Zero Carbon Britain 2030 report is sure to stoke up the controversy over global warming.

It will be opposed by farmers, supporters of nuclear power and those sceptical about climate change.

The report says the nation could be "zero-carbon" by 2030, while still keeping the lights on and not relying on nuclear power, including new plants at Hinkley Point in



Andrew Simms says the BP fiasco underlines the importance of breaking addiction to fossil fuels

Somerset and Oldbury in South Gloucestershire.

Switching to electric vehicles would generate than 50 per cent less carbon dioxide than petrol or diesel cars, the report says.

Energy demand in buildings could also be halved, through steps including improving insulation and cutting draughts, while new homes should be made from natural materials such as wood and straw.

The study suggests more than half Britain's electricity in 2030 could come from off-shore wind, while domestic air flights should be replaced by rail or bus travel.

Better town planning would boost opportunities to use public transport, as well as cycling and walking. Live-stock production would be massively reduced, with a focus on quality, freeing up land

needed for biofuels.

Paul Allen of CAT said: "Zero Carbon Britain 2030 shows how with the right mix of wind power, hydro, solar, biomass – plus an intelligent grid to manage demand – we can supply the energy the country needs."

Andrew Simms of thinktank the New Economics Foundation said: "We have the lifetime of this Parliament to break Britain's fossil fuel addiction. The BP fiasco underlines how important it is we act now.

"If we do, we can enjoy greater energy security and a more sustainable, dynamic and resilient economy.

"If we don't, we will lurch from one energy and environmental crisis to another on a downward spiral."

NATIONAL & WORLD **PAGE 16**

'UK can be zero-carbon by 2030'

A MASSIVE expansion in offshore wind, a switch to electric vehicles and steps to halve household energy demand could help the UK cut emissions to zero by 2030, a report claimed today.

The report from the Centre for Alternative Technology said the country could be "zero-carbon" by the end of the next decade, while still keeping the lights on and not relying on nuclear power.

The study said en-

Cuts we should be talking about

A NEW report published by the Centre for Alternative Technology today (June 16) including input from 13 universities, 12 research bodies and eight key industry players, highlights a path for a zero carbon transition by 2030. For the first time, comprehensive energy strategy has been produced that could reduce emissions to zero for all greenhouse gases and across all sectors.

Paul Allen, from CAT, said: "Zero-Carbon Britain 2030 shows how the right mix of wind power, hydro, solar, biomass, plus an intelligent grid to manage demand, can 'keep the lights on' and supply the energy the country needs - with major benefits across the economy."

The report aims to integrate

NATIONAL

Zero emissions a possibility

A MASSIVE expansion in offshore wind, a switch to electric vehicles and steps to halve household energy demand could help the UK cut emissions to zero by 2030, a report claimed today.

The report from the Centre for Alternative Technology said the country could be "zero-carbon" by the end of the next decade, while still keeping the lights on and not relying on nuclear power.

National briefs

Energy savers

A MASSIVE expansion in offshore wind, a switch to electric vehicles and steps to halve household energy demand could help the UK cut emissions to zero by 2030, a report claimed today. The report from the Centre for Alternative Technology said the country could be "zero-carbon" by the end of the next decade, while still keeping the lights on and not relying on nuclear power.



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Aviation
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Zero Carbon by 2030: Action for the Climate Emergency

Start: 30 Oct 2010,

Where: Friends House, Euston, London



Saturday 30th October

Friends House, Euston Road, London

1.00 pm to 7.00 pm Climate Forum

7.00 pm to 9.00 pm Climate Concert

Zero Carbon by 2030. We need to reach this goal and we can reach this goal. But to get there we will need a radical programme of climate action for the UK – a positive vision with real solutions. Join us in challenging the new government to



Global Climate Campaign



Global Day of
Action
4th December
2010



Sceptic disinformation

A rising tide of climate denial
Hall of shame
Take action

Latest climate change news

- Yes, we broke the law as climate change activists. And this is why | Dan Glass
- Nine Plane Stupid activists fined for Aberdeen airport stunt
- Poorer nations hit with 'exorbitant' consultancy fees for carbon offset projects

Free to download from
www.cat.org.uk

ZERO
CARBON
BRITAIN
2030

A NEW ENERGY STRATEGY
The second report of the
Zero Carbon Britain project

