

Farnham U3A

Sustainable Energy

How to make policies work for people
The challenges of funding, taxing and changing behaviour

Stewart Edge October 2021

Updated Nov 2021 to include Government Net Zero Reports
(updates in red)

THE CHALLENGE

Fund and Regulate for...

- Building technologies that exist
- Researching to find improvements / new technologies
- Modifying personal behaviours (/ expectations)
- Without wrecking the economy
- With what effects on (whose) lifestyle?

CONTENTS

- IDENTIFIED CAPITAL FUNDING REQUIREMENTS NEEDED
- GOVERNMENT FUNDING SO FAR / COMMITTED
- ELECTRICITY PRICES
- SITUATION IN MAJOR SECTORS
 - ELECTRICITY SUPPLY
 - ELECTRICITY NETWORK
 - BUILDINGS
 - SURFACE TRANSPORT
 - OTHER
- SUMMARY and COMMENTS

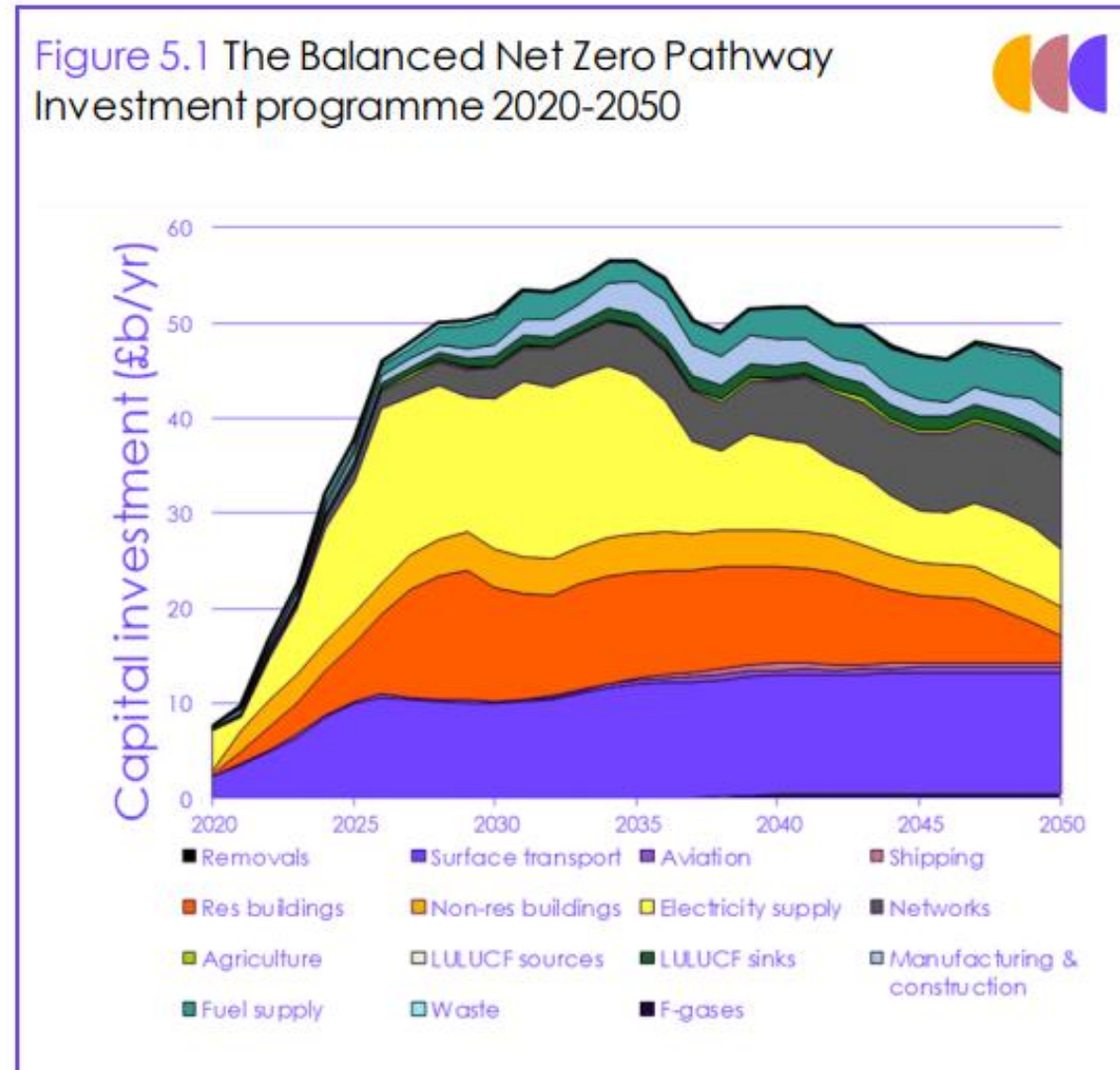
6th Carbon Budget Summary

- Report very positive about feasibility - economic and technical - of Net Zero by 2050
 - IF significant policy steps taken without delay
- Message given out is that this is economically manageable
 - Net additional costs of less than 1% of GDP
 - Early costs produce benefits later on as cost of fossil fuels eliminated
 - Lower net costs than estimated in earlier reports
- + Potential benefits from UK taking lead in low carbon industry

Summary of UK Capital Funding Requirements – per 6th Carbon Budget

- Totals Additional £50B per year (£10B now)broadly up to 2050
 - Cf recent 'UK economy-wide capital formulation' just under £400M
 - UK GDP £2000B per year
 - National Debt £2200B
 - COVID borrowings more than £300B
 - HS-2 £100B
 - Crossrail £20B
- 6th Carbon Budget implies some 20 - 25% public funding, rest private

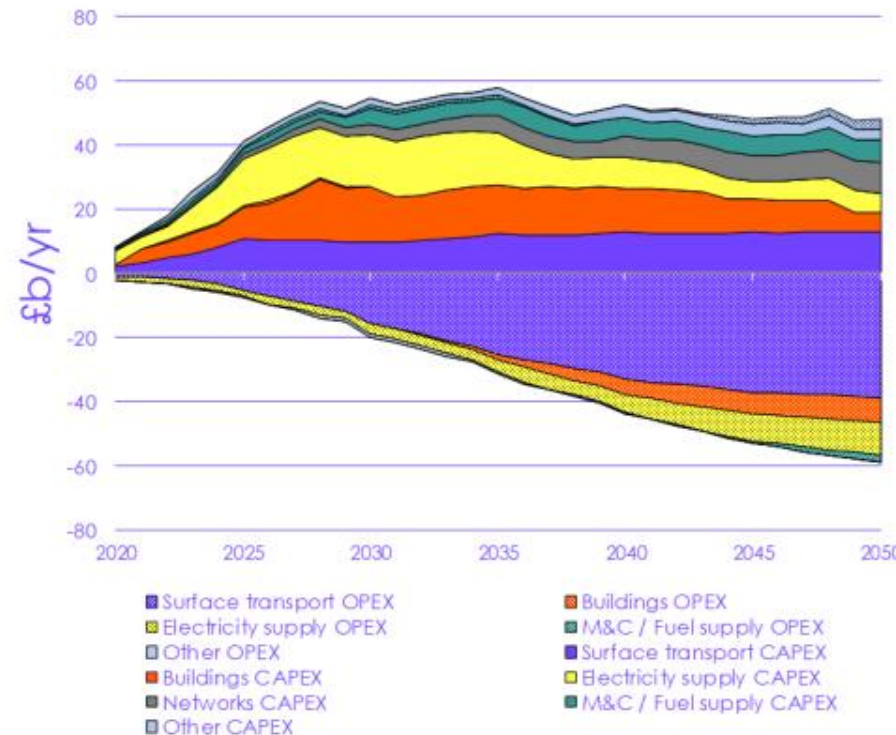
UK Capital Funding Requirements – per 6th Carbon Budget



UK Net Benefits – per 6th Carbon Budget

- Capital Costs and Operating Costs/benefits - differences from non-Carbon base case.

Figure 5.3 Capital and investment costs and operating cost savings in the Balanced Net Zero Pathway



Capital Funding Required by Sector (Additional to previous long-run)

Totals 2020- 2030

£Bn

• Electricity Supply	124	
• Electricity Network	16	??cf £40B 20-26 per OFGEM
• Buildings	111	
• Surface Transport	87	
• Other	36	

TOTAL

374

Government Funding - Plan

- 6th Carbon Budget suggested ADDITIONAL £4B - £7B needed from Exchequer annually above existing approx. £4B
- Government Response to 6th Carbon Budget & need for £374B total over 10 yrs
 - Nov 2020 '10 Point Plan'
 - Total over 10 years - £12B government + 3 times Private = £50B !
 - Or is it £20B / £80B total?
 - Dec 2020 Spending Review identified no increase: (about £4B / year government spending)
 - Treasury 'Net Zero Report' Oct 2021
 - Total commitments over 10 years - £26B government + Private £90B Total £116B (compared with £374B above)
 - Most of increase (£12B in 10 point plan to £26B in Net Zero reports) seems to be £12B for 'Local Transport Systems' ...? How green?
 - (Compare this with Labour Conference £30B per year)
- ➔ Identified govt investment very unclear and insufficient
 - ➔ Net Zero Report Oct 2021 increased Government commitments (Although still only 30% of 6th Carbon Budget, it can reasonably be argued that it is reasonable that much of the budget to 2030 is not yet be committed)

Context

- Average Govt net Capital Expenditure over last 5 years is £40B/ yr

Warning

- Lack of government plan means this presentation will be
 - Not as well grounded in facts as I'd like
 - Include significant uncertainty ..
 - Government Net Zero Reports Oct 2021 filled in some gaps. Lord Deben (Climate Change Committee Chairman) said that these were in line with 6th Carbon Budget except in area of Land Use / Agriculture where more was needed.
 - My view is that this is over-generous – there is a particular gap in the lack of early action on Buildings ('Insulate Britain' demands are well-focussed)
- The presentation will need updating in coming months as we look in detail at different sectors
 - Updates for Oct 2021 Net Zero Strategy and Treasury Net Zero Report in Red

Electricity Supply – Current Consumer Prices

Breakdown (Apr 2021 per OFGEM)	%	‘£/yr Avg’
• Wholesale costs – ie of actual electricity	29	203
• Network costs – ie of distribution / grid	23	161
• Environmental /Social – ie government mandated additions to cover renewable subsidies, energy efficiency schemes and help for vulnerable	25	175*
• Suppliers costs and profits	16	112
• VAT	5	35
• Other	2	14
TOTAL	100	700

* £175 / yr average per domestic household is approx. £9Bn / yr on total electricity costs

Electricity Supply – Future Consumer Prices

- What is the Strategy for Electricity Pricing? which is basic for
 - Economics of switching from gas to electricity for heating
 - Economics of electric cars
 - 6th CB shows considerable running cost savings vs fossil fuel (including duty)
 - Is policy to retain these savings (and encourage further car ownership!)?
- Existing environmental / social levies make up 25% of electricity prices
 - 6th Carbon Budget suggests another 15% addition likely for these by 2030 (then reducing) for
 - Future feed-in tariffs: nuclear / CCS / hydrogen?
 - +? Future of energy efficiency scheme funding (insulation etc)
 - + ? Future of support for vulnerable (warm homes)?
- UK electricity prices about average in Europe

Electricity Supply

- Significant change over last decade
 - Coal virtually eliminated
 - Wind / solar now significant
 - (Gas also increased)
- Levers for change have been
 - Levy on coal power generation
 - Subsidies for wind / solar
 - High 'feed-in' tariffs available for wind & solar power
 - Paid for by levy on consumer bills:

Electricity Supply – increasing future supply

- £124B cumulative investment 2020 to 2030
- Net Zero Power generation anticipated (in 6thCB) to be 75%-90% wind / solar with 10% - 25% nuclear and/or fossil+CCS
- **Off shore Wind – 40GW by 2030**
 - Capital costs have fallen from £5B / GW
 - Off shore wind 'strike' prices fell to £40/MWh in 2019 contracts (cf £50 MW/h from gas)
 - Subsidies no longer needed for turbines, but likely need for some(small) government support
 - Port infrastructure for servicing off shore activity **£380M in Net Zero Reports (incl floating off-shore, Infrastructure)**
- **Government Framework - 1**
 - Auction 'options' to set up on sea bed: developers pay until
 - Latest 8GW has produced £879M per year until planning permission confirmed
- **Government Framework – 2**
 - 'Contracts for Difference' auctioned/ negotiated
 - Establish feed in tariffs for 15 year period – effectively fixed prices to producer

Electricity Supply – increasing future supply

- On shore Wind / Solar / Tidal
 - (13 Sep) New Gov't subsidy fund o support
 - £10M for on shore wind / solar (first since 2015)
 - (£24M for floating off-shore ...see above)
 - £31M for tidal etc
- Nuclear
 - Ongoing debate about large nuclear : Decision by end of Parliament (Late!!)
 - Hinckley Point £90 / MWh fixed price; £18/per yr onto ave bill
 - Sizewell C ?.....£20B 'Regulated Asset Base' funding model; Chinese funding issue
 - New nuclear opportunities
 - Small nuclear£210M Gov't funding to Rolls Royce led consortium for 16 plants
- Gas with Carbon Capture Storage (CCS)
 - £1B govt fund for CCS announced
 - Private ????? 50+ projects round the world...
- 6th CB implies Government costs on these could peak at £9B / year, funded by new levies of over £100 / yr on electricity bills

ELECTRICITY NETWORKS

- Currently £161 per household per year
- 'Market' comprises primarily National Grid (privately owned since....)
and ? In Scotland
- OfGem regulate network 'market'
- Will fall to £151increasing back to £161 by 2026

Electricity Networks - Structure

- National Grid – privately owned since 1990
 - In Scotlandby Scottish Power
- OFGEM regulate network ‘market’ it seems of investment and prices
 - Dec 2020 agreed £40B (total) spending between 2021 and 2026 by providers
 -and a price they could charge
 - Results in specific network charge component of electricity cost to consumers
 - Currently Avge £169 per household: will drop slightly then back to £169 by 2026
 - £450M to be funded BY Ofgem (oil and gas) for ‘green innovation’
- National Grid at present primarily responsible for ensuring security of supply
 - But, recognising ‘Conflict of Interest’ new independent ‘System Controller’ announced in July to steer future electricity security & balancing issues
 - (? Present system seems to allow for independent attempt by AQUIND to build cross channel interconnector?)

Surface Transport

- £87B Cumulative Investment by 2030 (LOWER operational costs in future)
 - Electric cars, buses, charging infrastructure
 - 6th CB sees this area as largely funded by private sector
- Government support identified.... £8B? total over 10 years
 - Subsidies to Manufacturers in UK ??£0.5B + in 10 pt plan
 - Subsidies for purchase of electric vehicles £0.2B ?/ year
(....reducing?? Sufficient?)
 - Subsidies for charging infrastructure £1.3B in 10 pt plan
 - Buses £5B (in 10pt plan)
 - HGV's - hydrogen £.02B 1 yr (in 10 pt plan)

Surface Transport in Net Zero Report

- Government support identified.....£20B before 2030 or earlier
 - Local transport systems (in current Parliament) £12B ? All counts as 'green'?
 - Subsidies to Manufacturers in UK £1B
 - Subsidies for purchase of electric vehicles
 - + Subsidies for charging infrastructure £2.5B?
 - Buses £3B
 - Cycling £2B
 - HGV's - hydrogen £.02B 1 yr

Difficult to identify amounts clearly.....£12B in local transport systems significant – and primary cause of increase in this area

Buildings

- £111B Capex 2020 to 2030and NO net Operating cost savings
Insulation and draughtproofing + change from gas to heat pumps (?hydrogen)
£4B only identified
- Government Support needed (*6th CB suggests 1/3rd from govt for year 2030)
 - For public sector buildings *£1B / yr committed £1.426B in
 - For social homes / low income *£1B / yr not committed £1,760B in
 - Heat Networks £122M £338M
 - For owners/landlords (+ 'other *£4B / yr)
 - Previous renewable heat scheme £1B / yrending
 -abandoned Green Homes Grant £2B/ yrabandoned **£510M
- (** £450M over 3 yrs heat pump subsidy + £60M research)
only 30,000 a year vs 600,000 needed
- Funds in part from Levies on Electricity prices (Previous Renewable Heat scheme, low income support Future?) AND general taxation (Other)
- Private (eg homeowners) funding: will depend on practical feasibility and economics (as well as availability of grants)
- Regulation of new buildings missing Silent in new buildings !!

Net Zero Reports identify very slow progress – even on insulation; Reason much to do with hedging bets on use of hydrogen (for which it identifies decision by 2026 only)

Other Private & Public

Potential Private / Support

- Manufacturing £2-£3B /yr Gov't to support because of higher costs versus competitors of eg power bills, hydrogen/CCS conversion ..including new steel / cement
£315M Industrial Energy Transformation Fund
- Carbon Capture / Storage £1B Gov't 'CCS Infrastructure Fund' : 4 industrial clusters in UK £1B included
 - BP projects Teesside and Hull
- Green hydrogen Initial pilots...May 21 a specific £60M Gov't £140M incl £100M electrolytic H2
 - (Note also private £1B hydrogen investment fund set up by Bamford (JCB son; £750 Private Ellesmere Port project)
- Land Use / Agriculture £1B/yr Gov't / private Brexit Agriculture policy critical eg For tree planting / environmental Fertiliser alternatives? £836M in + £300M food waste collection
- Sustainable Aviation Fuels £180M budgeted
- Bioenergy
- CO2 removals (from air) Initial pilots £100M £100M In
- General Innovation £1.6B innovation fund
Finance: green bank / bonds. £12B UK Infrastructure Bank (? Private? How fits with specifics above?)
Training

SUMMARY AND COMMENTS (1)

- Electricity Supply
 - Significant government control over (private) investments and pricing/funding
 - Primary source of funds private, with significant levies on (future) prices
 - Electricity pricing issue is vital as key driver of change in other areas
- Surface Transport
 - Pace of government support correct?
 - Questions over subsidies for manufacturers and charging infrastructure
- Buildings
 - Significant failings of funding support/ regulation for the necessary changes
 - Remain after Net Zero Reports
 - Unclear where money will come from (levies or taxation)

SUMMARY AND COMMENTS (2)

- How best to manage Government grants / loans for new technology areas?
 - New nuclear, CCS & Co2 removals from air, hydrogen
- How best to replace Fuel duty (£28B) Vehicle excise duty (£7B)?
- Carbon taxes
 - Alternative methods of taxation to raise funds and manage market pressures
 - (fuel tax) (VAT)
 - Air (frequent flyer?)
 - Emissions tax on some industries
 - Cap and trade schemes (including allowance budgets and trading)
 - Carbon border taxes (eg EU on steel, aluminium, cement, fertilisers, electricity from 2023)

SUMMARY AND COMMENTS (3)

- Low Carbon Technologies are Capital Intensive, giving more power to Capital.....is more government ownership needed to protect taxpayer & electricity bill-payer in long run?; and to ensure security?
 - Labour's £30B / year
 - Ref. Piketty's observation re reduction of share of public assets as % of all assets
- Does adequate transparency exist in processes and decisions for handing out public money?
- How to protect inevitable losers during changes
 - Fuel poverty, job losses

APPENDIX – TREASURY NET ZERO REPORT

- Encouragement for ‘green finance’
 - Green Technical Advisory Group
 - Task Force on Climate related Financial Disclosures
- Trade: No clear message from report on carbon leakage / carbon border taxes.
 - An EU carbon border tax is due 2026
 - Emission Trading Schemes also play a part
 - Clear on need for international cooperation (Cop26
- Domestic (household) exposures
 - Costs speculative.....issues considered but no conclusions

APPENDIX – TREASURY NET ZERO REPORT (cont'd)

- How to control transition
 - Carbon pricing seen in theory to be 'best'used for UK Power Generation
 - Emission Trading Schemes used in UK / EU on large emitters covering 1/3 of emissions
 - Need to reduce price incentive for domestic gas price use over electricity (Govt will launch a review to take decisions in 2022)
 - Role for regulation / labelling
 - How to decide where public expenditure helpful and how to manage it
 - Investment management issues
- Fiscal implications
 - Major issue is how to replace tax and fuel duty on petrol & diesel vehicles (£35B/yr)
 - Assesses issues (including financing of investment) without drawing conclusions