A Fairer, Greener Future: A Discussion about Labour Party Climate Policies.

Introduction

Labour's electoral prospects have improved as it has become increasingly clear that it still prioritises Climate Change and possesses polices which respond to people's Climate concerns. The Conservative government has failed to take urgent action, bowing to fossil fuel corporate interests even though Climate Crisis scope and magnitude grows exponentially, overtaking measures intended to counteract it. Few truly appreciated the pace at which Climate Change would bring violent storms, floods, heat-waves, droughts, downpours and wildfires. Fifteen thousand died from heat stress alone in Europe during 2022. 30 degree Celsius and sub-zero temperatures, rarely experienced beforehand in the UK, hit the population along with flooding, high winds and serious storms. Wildfires destroy woodland carbon stores. Drought depletes cooling waters that once guaranteed safe, continuous, nuclear energy generation. Production now episodically halts to allow plants to cool down. As national economies recovered from the Covoid-19 pandemic energy demand grew and emissions rose. War began in mainland Europe, increasing the vulnerability of nuclear plants to deliberate or accidental damage. Energy supply has been weaponised; national energy security put at risk. Energy prices rise, putting fossil-fuelled heating costs beyond the reach of too many vulnerable individuals and families. Rising sea levels and extreme heat demonstrate that battles to combat Climate Change are being lost. Communities will increasingly need relocation; cities, resilience measures.

As climate change accelerates, undermining transformative strategies, decarbonisation needs to gear-up. Ever changing scenarios – pandemic, war, and drought have rapidly evolved so that Labour's Climate Policy Portfolio needs built-in flexibility, speed, security and safe sustainability if it is to stay ahead of the game and deliver its climate promises to an anxious, expectant electorate. We need to increase the amount of indigenous green domestic energy coming on stream far faster than we anticipated pre-war to stop nations reaching for their carbon-emitting fossil fuel security blankets in pursuit of domestic energy security and ensure the availability of affordable heating and power for both population and industry. Top speed, flexibility and sustainability have become of the essence.

As the impacts of Climate Change are increasingly felt in 'The Global North' a new division of the UK electorate into two substantive camps is likely to occur: one that does, one that does not, support urgent radical transition to carbon zero. Political allegiances may switch. How many will continue to support a Tory Party intent on protecting private fossil fuel interests, let alone one displaying evidence-based corruption? A Labour Party determined, come what may, to prioritise the interests of People and Planet will reap electoral rewards. More importantly it will save our lives, our future and the planet we inhabit.

Labours' leadership is determined to take the leading role in global Climate policy on taking office, which Sunak declines. Ed Miliband's connections between climate and our Cost of Living, Climate and Energy crisis and Rachael Reeves' promises of Green Levelling Up and Green Economics, all begin releasing policies from suffocating silos. The Party has committed to clean renewable Tidal, Solar and Wind power, by 2030, a full 20 years ahead of the previous 2050 target at a time when a volatile energy situation defies definitive prediction and when reputable climate change forecasts are nothing short of bleak. Policy has leapt forward. But Fijian shunting communities ever further uphill out of rising tides reach and a Bangladesh submerged beneath flood waters indicate terrible futures ahead; futures we need to avert.

We bring ideas to the table we believe complement, rather than replace, Labour's plans. An affordable National Heat Plan' designed to dispatch waste, untapped geothermal and latent heat

and directly meet heat demands with carbon-free and low-carbon, heat would cut the amount of power that needs to be generated to meet energy demands and the amount of carbon that generation emits. Geothermal, and Tidal Stream Marine power will bring secure continuous power on stream to meet the remaining demand for power relatively speedily and relatively frugally so that investment capital will be released. This kind of Renewable Energy Diversity is essential to sustainability, energy security and affordability. We cannot risk being held hostage to domestic shortages of non-renewable energy resources Extending the range of green and renewable energy options broadcast at conference would necessitate no dramatic change of policy direction; no change in intent. It would bolster, rather than replace current solar, wind and Tidal commitments and greatly increase the probability, in current tempestuous circumstances, that Labour achieve its 2030 target.

Accelerated Labour Party Climate objectives can only be achieved if many local actors, public, private and voluntary, are able to push things forward with speed flexibility and vision. Empowered, their activities will build community agency, assets and well being. Local empowerment brings hope and purpose to communities about the prospects of controlling the worst excesses of climate change. It partners them with central and local government. It is cost effective in many ways, it brings additional investors, it multiplies central investment, it saves on energy transport and transmission costs, and it deepens shared awareness of the issues, affecting energy use as well.

We look forward, therefore, to a future in which democratic local government orchestrates the harnessing and distribution of waste power station, sewer and underground tunnel heat to course through District Heating Schemes into homes, offices and factories. We see it ensuring widespread geothermally warmed coal mine flood water heating th 25% UK homes that are of above coal mine tunnels. We foresee councils harnessing latent canal heat to provide cheap space and water heating for nearby communities whilst latent river heat invades Egham. We see more and more industries powered and heated by heat wasted in their production processes, especially hi energy ones. We see Recycling, Re-Use, Re-Purposing and Repair playing a key role as they lower overall energy inputs into products - each activity consuming far less energy than production from primary materials; and each questioning the throw away mantra of capitalist consumer economics. And then we anticipate communities forging closer links with their environment and its biodiversity as they actively participate in the preservation and restoration of Natural Carbon Sequestration and Storage, the prevention of the widespread expulsion of carbon stores into the atmosphere that will occur if natural storage capacity degenerates. We see them actively expanding the far more extensive natural storage than is generally believed to exist through massive hedgerow planting; wall and roof green cladding schemes local green spaces planted with carbon hungry greenery.

Democratically elected councils acting in conjunction with their local communities and other stakeholders would logically be responsible for co-ordinating extensive exploitation and development of our neglected site-specific indegenous renewable geothermal, waste, latent and tidal energy resources; recycling re-use, repurposing and repair and Natural Carbon Storage restoration and extension. All relate to the health and well-being of both the local electorate and economy. Heat hardly travels well. They are obvious agencies to partner a national Labour government in national climate strategy. Many have undertaken climate-led projects, in relatively recent years, in advance of a Labour government. Local Green New Deal councils have undertaken retrofitting, passivhaus new housing developments and local heating networks, whilst Community Wealth Building authorities like Preston, have focussed upon the improvement of their local economy and retention of wealth within it. The roles they do and could play synergise completely with Starmer’s radical devolution ambitions.- as equals, not subordinates to national government, free from restraints that have bound them.(Keir Starmer. Let’s End the stifling over-centralisation of power in our politics. Labour List. 26.04.2022).

Labour Conference 2022 Climate Policies

Leadership Climate Promises made at the 2022 Labour Party Conference positively responded to a key electoral priority: Climate Change. Policies proved perhaps, more acceptable than anticipated, to a left steeled for the abandonment of the 2019 Green New Deal (GND), strategy so strongly associated with Jeremy Corbyn. Welcome commitments were made to public investment in decarbonisation; publicly managed investment finance, effective regulation; green-led Levelling-Up and the possibility of public ownership. Ambitious targets were set-out by Rachael Reeves, Keir Starmer and Ed Miliband for green investment in retrofitting, solar and wind power expansion, and tidal power; an inspirational picture was painted of a more egalitarian low carbon; Britain actively Levelling-Up, enhancing local wealth, reducing householder outgoings and creating green jobs. A Britain producing 'home-grown' green technologies within a Green Industrial Revolution in which Nuclear and Carbon Capture and Storage still found a place.

The initiative came at a time when prospects for Climate Control had seldom seemed worse and pronouncements of Climate experts underscored our plea for speed. Professor Johan Rockstom, Director of Potsdam Institute for Climate Impact Research, Germany, warns that "the world is very close to irreparable damage", not least since emissions that must halve by 2030 to meet the 1.5 degree target, continue to rise with the post-Covoid increase in demand and the Russo-Ukrainian war. The UN Secretary General was sounding the alarm, observing our headlong advance toward "economy-destroying levels of global heating. Inger Anderson, head of the UN Environment Programme (UNEP), was insisting that we should use the energy crisis to speed-up delivery of a low-carbon economy". And Professor Myles Allen of Oxford University had demanded "why are we only talking about transition and not about obliging highly profitable industry to clean-up the mess caused by their products."(see: Damian Carrington. Environment Editor. World Close to Irreversible Climate Breakdown, warns major studies. The Guardian, 27.10.2022)

Against this grim backdrop Keir Starmer, Rachael Reeves, and Ed Miliband's Opening Speeches determinedly 'Went for Green'. Starmer set an ambitious target: 2030 by which to realise carbon zero and hoped that, under Labour, Britain should assume a leading global role in Climate strategy

Ed Miliband stressed that our three predominant crisis: energy, cost of living and climate, all sprang from one cause: carbonisation. Labour, he announced, offered solutions: a Windfall Tax; a plan to make Britain the first major country in the world and aim for a much earlier zero-carbon target: 2030. An extensive insulation programme financed by £60 billion across a decade, would, he projected, "insulate 19 million cold, draughty homes, saving £1000 off bills and cutting carbon emissions, led by our brilliant Labour local authorities." (Ed Miliband Conference Speech. Labour Party 26th September 2010). Finance would come from Labour's Climate Investment Pledge, spent in such a way as to create well-paid jobs in every region of the country."(Stronger Together, A Fairer Greener Future. Labour Works 2022).

A Green Industrial Revolution led by Labour and its Green New Deal - the sole mention of Corbyn's legacy – would, he opined, make Britain "a clean energy superpower" (Ed Miliband Conference Speech. Labour Party 26th September 2010) with its EV Revolution; green steel production, decarbonised industry fuelled by global wind and solar energy. On-shore wind power would double; solar, treble; off-shore wind power quadruple, yielding £93bn savings and £475 off householder bills by 2030. Bills would fall since the "price of solar and wind energy is nine times less than that of gas" (Ed Miliband Conference Speech. Labour Party 26th September 2020).

Rachael Reeves anticipated her role as "Britain's First Green Chancellor" when her 'Green Prosperity Plan' would give British people a share in a new 'National Wealth Fund'. £28 billion a

year would be invested in green energy: three renewable energy sources: tidal, solar and wind; plus nuclear power, hydrogen and carbon capture. UK production of green technologies would replace many that are currently imported. Electric batteries would become UK produced in factories spread across the land. Carbon capture and storage facilities would be developed in Grangemouth, West Wales, Humber, Teeside and Mersyside . Wind turbines would be UK manufactured. Five thousand new jobs in solar, tidal, hydrogen and nuclear energy development would be created. Wealth would flow back into communities and high streets . Labour would invest in Britain's future with a "real plan for levelling-up" (Rachael Reeves Labour Party Conference Speech 2022). Great British Energy would develop eight new battery factories, four clean steel plants, nine renewable-ready ports for off-shore wind and net-zero industrial clusters in every region.

The idea of all the Labour-led green activity, employment and equalisation of opportunities across the land, Rachael Reeves conjured up, excites. But will it suffice to secure carbon zero by 2030 at a time when Climate Changes like drought wildfire and flood rise to the top of the Climate Agenda and demand immediate practical responses. Will it suffice to overcome War-induced energy insecurity? Will it be fluid enough to respond to fast changing circumstances, engender energy diversity and speedy security? Will it stay ahead of resilience imperatives?

Before even opening No. 10s front door, let alone crossing the threshold, Starmer admitted that it might prove necessary for a Labour government to fall back upon coal supplies; an ambition that seems to be entirely at odds with his ambitions for a 2030 net carbon zero date and a future in which Labour might take a lead in international climate affairs. Recovery from Covoid-19 has already pushed carbon emissions up, and now as recovering national economies faced a European war-induced energy supply crisis, too many were threatening cto return to their indigenous coal and oil black gold reserves.

When Labour takes power, it must ensure Britain provides a strong green example; emphasise that options other than coal, oil and gas fossil-fuels are available that will increase national energy security and decrease dependence upon energy imports. Failure to reduce carbon emissions can only precipitate multiple economic, social and environmental crises and the climate leadership Starmer craved will requires him to say so.

In the absence of concerted climate leadership and initiatives the one-fifth of greenhouse gases coal-burning still produces will rise as fossil fuel thoughts morph into fossil fuel emissions. S. W. Germany's Brexbach Plant is preparing burn 100,000 tonnes of coal per month this wintertime. Twenty more German coal plants are either restarting or being kept open beyond their scheduled closure dates. Italian Enel SpA intended conversion of Italy's largest two power plants from coal into gas has been shelved. Austria's last coal-fired plant is leaving its Rest Home; the Netherlands cap on coal production has lifted. (De Smog). A viscous circle commences as the greater the volume of coal combusted the greater the climate crisis becomes to control.

Labour's Bridge Strategy.

Climate Change policies announced from the Conference platform in 2022, represent a 'bridge' strategy like others taken by a number of developed nations in their quest for net zero to span the

gap separating a fossil fuel, from a zero carbon economy. Countries considering "how to rapidly reduce carbon emissions have taken on an all-of-the-above attitude that the world, and especially the US, must include all technical solutions, including carbon capture, extracting more fossil fuel, and keeping nuclear plants running as a bridge to carbon reduction" (Dina Raso and Greg Williams. 'Climate Money Watchdog. October 2022).

Reputable climate researchers, argue against the heavy, cumbersome and expensive infrastructural nuclear and carbon capture and storage components of 'bridge' climate strategies, substituting as we ourselves support, the rapid development of a wider renewable energy mix for them. We cast the net even wider, including A National Heat Plan incorporating waste, latent and geothermal heat.

Professor Mark Jacobson, known in certain quarters as responsible for the American Green New Deal, together with his Stanford University team, has found fast transition best effected using only renewable energy sources and excluding other 'bridge technologies'. He advocates universal electrification, exclusively generated by renewable technologies: "off and on shore wind electricity, solar panels for rooftops and power plants, concentrated solar power, solar heat, geothermal electricity and heat, hydroelectricity, and small amounts of tidal and wave electricity. (Jacobson in Dina Raso and Greg Williams. 'Climate Money Watchdog. October 2022).

Rupert Way of The Institute for New Economic Thinking and Smith School of Enterprise and the Environment joins others in challenging IPCC's insistence that renewable solutions are overly expensive "that the further decarbonisation needed to provide more than a 67% chance of keeping warming below 2 degrees Celsius would equal a GDP loss in 2050 of 1.3% to 2.7%. (Empirically grounded technology forecasts and the energy transition. Jule Journal Vol.6. Issue 9. 21 September 2022. pp 20567-2082) Way finds fast transition cheaper because energy costs fall sooner and savings accrue over a longer time period and maintains that "rapid green energy transition will likely result in overall net savings of many trillions of dollars—even without accounting for climate damages or co-benefits of climate policy." (Jules Journal as above).

Labour's green promises were sharply distinguished from the short-lived Truss-led Conservative government in power at the time, which sounded the retreat from any shade of green whatever. But they do still share Conservative attachments to nuclear power, carbon capture and storage. Other viable green alternatives, quicker to develop and come on-stream might become more attractive to Labour when the depth of the economic black hole dug by the Tories is discovered, and when continued rises in carbon emissions undermine the possibility of attaining the 2030 carbon zero deadline.

Truss intended lifting the fracking ban, (reversing in the process as Ed Miliband observed, a ban imposed by her own party in 2019), intensifying the exploitation of North Sea oil and gas in order to extract, enthused Rees-Mogg "every drop of oil and gas". Solar arrays were to be banned from agricultural land in recognition of a growing food crisis; wind turbines from on-shore sites. A new enemy: an 'anti-growth coalition' including offenders as inoffensive as the Council for the Protection of Rural England and as legitimate as Extinction Rebellion was targetted, one Labour might do well to be-friend rather than disarm.

She had one point – food security is an important, under-broadcast issue. But the devil in in the detail. Breton farming practice – the installation of solar arrays mounted upon flexible stands, high enough to permit the under-passage of agricultural machinery, could profitably become part of Labour's response to such Tory injunctions.

Conservative Climate Polices are bolt-ons; added extras. Conference showed that Labour has developed a far more 'joined-up' approach in which social, economic and environmental policies are inter-twinned.

'Green Levelling-Up, Ground Up', might be an accurate description of the green economics Rachael Reeves championed at Conference expressed by her plans to create employment opportunities and wealth via investment in targetted industries. They synergise also with the Community Wealth Building undertaken by Labour local authorities such as Preston, and 'Local Green New Deal' (LGND) strategies pursued by Local Authorities like Manchester, Tyneside, West Midlands, Bristol and many others in their determination to tackle climate change; enrich residents and localities.

Labour's approach to social and economic issues taken at Conference, looked toward micro-economic investments to resolve climate and levelling-up challenges. An approach entirely distinct from that of Truss and Co. who promulgated long-since discredited macro-economic Trickle-Down' and entirely absent from her successors agenda as well.

Prime Minister, Rishi Sunak, appears in deep hock to the hard Tory right . Why else did he retain Truss's Health Secretary Theresa Coffey as Secretary of State for Environment, Food and Rural Affairs (DEFRA) and re-appoint Suella Braverman as Home Secretary despite her then recent disgrace. Hard-right MPs secured Truss the Prime Ministership which Sunak lost. Now he seems indebted to them for his election; required to tow 'anti-green' lines. Graham Stuart, the new Climate Minister, is known for his insistence that Britain boasts "the greenest oil and gas". Even so, he has no Cabinet place. Neither do Alok Sharmer and Boris Johnson who were originally the only UK government members due to represent the UK at COP 27. The Prime Minister who initially refused to attend, was only belatedly shamed into attendance, by taunts of "a massive failure of Climate leadership".

Sunak's determination to lower national debt by a figure that would finance substantial Climate Control measures, is telling. So too was his reluctance to replace the loop-holed Windfall Tax he introduced during Johnson's administration, with an effective version. The original allowed corporations to offset liability against North Sea expenses like those incurred by de-commissioning offshore platforms. Unacceptable austerity looms on the horizon because yet another Tory government is determined to lower national debt. (Economics. The choice between cutting public services and taxing windfall profits is not hard. The Guardian 27.10.2022)

Conservative alignment with corporations like North sea oil and gas giants, who make huge profits and shareholder pay-outs, is all- apparent. Their policies enabled Shell profits to top £25b, just by the end of the third-quarter of 2022, financing more buy-backs and dividend hikes; providing bigger incentives for continued off-shore oil and gas field development. As well as making the rich, richer; it raises their stakes in the status quo. Fossil fuels for ever! There is certainly no evidence that fossil fuel corporations are changing their spots and substituting renewable energy business models for their established fossil-fuel ones.

We need to make our Labour's bold climate policies crystal clear. Labour's policies have outshone those of the Conservative Party and it is critical that they continue to do so for the sake of climate and electoral prospects. Labour has a far more outspoken determination to diminish, at least, energy giant favouritism as evidenced by its effective Windfall tax proposal.

But a windfall tax alone might suffice to finance Labours strategy. Flexibility and speed might need to go hand in hand with the frugality green choices afford. The very best value for money energy choices are those less expensive smaller scale green and renewable options which critics of 'bridge

strategies' advocate and that extend energy diversity, security, and decarbonisation. Jacobson found infrastructural technologies: nuclear, carbon capture and storage; cumbersome and expensive. Renewables formed a less expensive, 'super-highway' to carbon zero. (Jacobson in Dina Raso and Greg Williams. 'Climate Money Watchdog. October 2022). Geothermal power plants, for instance, cost around 4 time less than nuclear power plants. Waste, latent and geothermal heat all provide more for less, as does recycling, repair, re-use and re-purposing and natural carbon storage – the epitome of frugal, rather than austere government.

Conservative energy policy reflects individualistic Conservative politics. Heat pumps and 'hydrogen' boilers are individualistic. They require individual investment to resolve collective difficulty; externalise climate costs away from culpable corporations and onto individual householders shoulders. District Heating (DH), systems being installed by communities and councils to distribute cheap heat to consumers, synergise entirely with the very essence of Labour's heritage: collective principle, action and achievement.

Local Labour council climate action returns local authorities to their municipal roots, making direct practical provision for community needs. Later we detail innovations. Here we simply list some. Kingston-upon-Thames' council and Thames Water Authority plan to circulate waste sewer heat via a local DH system to affordably heat local homes. (Thames Water. England's first sewer-powered domestic heating scheme planned for Kingston. 26.02.2021). Seaham council and the Coal Authority have determined to pump-up geothermally warmed abandoned coal mine flood water to heat homes. (Seaham Garden Village Mine Energy District Heating Scheme. The Coal Authority. 2020). Islington council heats a DH scheme with waste underground tunnel heat instead. (World-first scheme is launched using waste heat from the tube to warm homes two leisure centres and a school in Islington. Islington. 05.03.2020) West Midlands hospitals are warmed with latent heat from canals. (Gillian Ambrose. West Midlands canals to help heat hospitals in renewable energy drive. The Guardian 18.02.2020)

Collectivism once overcame difficulties faced by the workforce within the workplace. Now it can overcome difficulties faced by the workforce at home. Collective District Heating can boost standards of living, energy security and climate control for People and Planet.

<u>Beyond 'The Bridge'.</u>

Decarbonisation quite suddenly needs to be achieved far faster and sooner than we ever imagined necessary. The pace of Climate Change and European War, have brought questions of national energy security, safety and resilience to the fore. But it is highly unlikely that nuclear, hydrogen heating, carbon capture and storage can come on stream swiftly enough to respond to a timetable that has been vastly accelerated. Labour's 2022 Conference climaye policies established true and significant green intent. Recent events already seem to require more.

We continue by more detailed discussions of Labour's proposals and our responses to them within three substantive parts: 'Cleaning Up the Mess' - Natural and Technological Carbon Capture and Storage; 'Cutting the Problem Down to Size': Recycling, Re-Use, Re-Purposing and Repair, A Heat Plan: Green and renewable innovations with low or no carbon emissions, which reduce the volume of power that needs to be generated; and 'Clean Consumption' : Nuclear and Hydrogen, Geothermal and Tidal renewable power. There are obvious overlaps between categories but the arrangement serves to easily compare bridge with green or renewable alternatives.

Cleaning-Up.

Cleaning up historic and current carbon is part of any strategy designed to limit Climate Changes. Technological Carbon Capture and Storage (CSS) included in Labour's policy portfolio is not the sole solution. Natural Carbon Capture and Storage appears, by far, to be the preferable option. It affords flexibility, diversity and compared to its technological pretender, speedier. Fringe benefits: greater diversity, the return of rare species; expansion of wildlife populations. Importantly – think economic black holes here - it offers far better value for money than CCS.

CCS ranks among Professor Mark Jacobson's less desirable slower, heavy and expensive 'bridge technologies. Inadequately tried and tested for high volume carbon capture it neither nimbly reacts to new priorities or possesses fringe benefits. Plus we must not forget that only CCS technologies which remove atmospheric carbon reduce the problem: "point source carbon capture and storage – such as from chimney stacks or during the manufacturing process does not reduce GHG levels, but avoids increasing them". (Lisolette Jensen. Members Research Service. PE 733.679. 2021 Briefing. Towards Climate Neutrality. Promoting Removal, Storage and Recycling. European Parliament. October 2021) All in all it appears to offer poor value for money and funds would far better finance natural carbon storage renovation and expansion.

No longer can natural carbon capture and storage systems: trees, peat bogs, soil and so forth, absorb the increased carbon load we now produce. CCS pretends to technologically replicate our natural carbon cycle in order to capture excess current and historic atmospheric carbon; substitute science for biology: capture atmospheric carbon and store it deep underground out of harms way.

Unsurprisingly most CCS investment emanates from the wealthy oil industry who possess resources and motive. The industry possesses large-scale development experience, requisite skills and some 50 years experience in carbon burial. Moral justice might be said to be satisfied when a polluting oil industry finances restitution. But the industry has a vested interest in so doing - CCS development suggests that a possibility exists that oil, may safely continue to generate fossil-fuelled energy. More. Fossil-fuel corporate investment in CCS may not become success stories. We should bear in mind that their protestations of support for green alternatives are not born out by investigations which found no evidence that the sector was turning away from fossil-fuel based, and toward green renewable based, business models. (https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0263596)

In Iceland, a nation whose geologically is eminently suitable for carbon storage; 71 CCS companies boast their own industrial trade association. In Squamish, Canada a prototype plant produces fuel from the carbon they capture -after all we are going to need carbonised fuel for many years to come – aren't we! (Source: The Climate Question. Carbon Capture and Storage. BBC 13.06.2021). But the company admit that carbon capture and storage large scale operations are eons away. Consumer products might derive from captured carbon as well. (Lucca Henrion & Jo Arvai. Using captured CO2 in everyday products could help fight climate change. The Conversation. 08.09.2022).

In the UK CCS development is underway in the 'East Coast Cluster' in North Eastern England intent on building upon the skill base and land supply in Teeside and the Humber -an area emitting "nearly half of carbon emissions from UK industrial clusters" (East Coast Cluster. Northern Endurance Partnership. (NEP)). Here 'The Grid' has partnered with BP, Shell, Total and Equinor.

But extortionately high financial and resource costs will inhibit extensive CCS installations. Just retrofitting Louisiana's 'Diamond Vault' will cost $900m and the process will probably cut electricity generation by around 30%. And even if CCS effectively captured sufficient carbon to

resolve our overload we would need to double our current water consumption levels to satiate the thirst of the beast!

The industry itself concedes that it will be a long time before it possesses sufficient capacity to capture historic, let alone current, carbon levels; few spokespersons pretend CCS could be much more than a holding operation to lower carbon levels until renewables catch-up with energy demand. A small number however continue to suggest around 10-20% of fossil fuelled energy production will continue in the medium to long term for those industries that either cannot covert in time, or at all.

CCS technology encourages complacency. Its makes great bedtime reading with its happy- ever-after-ending. https://www.theguardian.com/environment/2022/oct/15/emissions-capture-carbon-cost-water-electricity?CMP=Share_iOSApp_Other But long CCS lead-times do not speak to the urgency of our situation.

Natural Carbon Capture and Storage.

Natural Carbon Sequestration and Storage protection, restoration and extension, represents a frugal and far more effective approach to Climate Control than is commonly believed. More. It consumes less embedded carbon than the technological alternative.

Declining natural sequestration and storage is leaving a substantial hole in the natural systems that have kept our climate stable for aeons. Losses are vast and the reversal of this trend has become imperative if we are to prevent the release of considerable additional carbon into the atmosphere. "In 2019 total carbon capacity of the EU Greenhouse gas emissions and removals from Land Use Change and Forestry had decreased by 20% compared to 2005" (Lisolette Jensen. Members Research Service. PE 733.679. 2021 Briefing. Towards Climate Neutrality. Promoting Removal, Storage and Recycling. European Parliament. October 2021). Alarmingly the decline accelerated from 2013 onwards.

Soil and plants, wet peatland mosses or bogs, trees and shrubs from forest biomass to hedging; marine systems: inorganic carbon and fixed carbon in seaweed, sea shelf sediment and living organisms all store carbon. The former absorb about one-third of carbon emissions, although regrettably storage capacity does not increase in line with plant size. (Carrington, Damian. One of Earth's giant carbon sinks may have been overestimated- study. The Guardian. 24.03.2021).

Protecting soil's existent carbon storage capacity is has become majorly important. More. Extending it is perfectly possible, by agricultural management practices, for instance ,without compromising other ecological functions.

Planting public spaces with specific selected plants, shrubs and trees, particularly bamboo, can substantially increase carbon storage. Live oak the best tree, East Palatka Holly the second, Slash Pine the third and Bald Cyprus fourth, for example.

Housing density may be increased to release and preserve more green space by in-filling or new well designed schemes such as York councils' award-winning passivhaus scheme which boasts high building density, but has incorporated a high degree of communal outdoor space not least by banishing cars to the far edges. (Passivhaus Newsletter Sept – October 2022).

Inner urban Living Roofs and Living Walls can help contain the 60-80% of Global Greenhouse gases which cities produce by sequestering and storing 375 g per square metre – 375,500 g per 100

square metres. No longer overly costly and unreliable, the "green roof and wall market is expected to grow by $10,31 billion from 2018-2022."(Green Living). In fact they are already growing. Basel boasts 1,000,000 square metres of green roof space; Washington: 245,470; Paris, the world's largest 14,000 square metre urban farm.

Planting vertical walls and roofs enable urban building density intensification without losses of wildlife and greenery – indeed green living surface areas could increase along with their carbon sequestration and storage capacities. Increasing building densities is one way we can improve settlements resilience to adverse climate change-led extreme weather events and temperatures extremes. Increasing settlement densities whilst covering vertical walls and roofs simultaneously increases carbon sequestration and settlement climate resilience.

The shade and evaporation living walls and roofs afford cools buildings and inner areas protecting human health - 15,000 Europeans died in this year's heat; 35,000 in the far hotter 2003 summer.

Constantine, Algeria has achieved an impressive 1.3 degree Celsius ambient city air temperature reduction just by greening 50% of its roofs firmly establishing that living walls are not mere eye candy but serious contenders for a permanent place in urban climate plans. (Making our economy greener with Green Roof and Wall Infrastructure. Green Journal. June 24. 2021.)

Vertical farming, living walls and roofs not only restore green space, (and fresh produce) to dense urban areas, biodiversity gains follow as well - the birds and wildlife now proven to enhance human well-being. (David Batty. Birds and Birdsong encounters important for mental health, study finds. Guardian 27.10.2022 and Biodiversity and Health Convention on Biodiversity. 23.08.2022).

These possibilities are exciting indicating aesthetically pleasing ways to extend terrestrial carbon sequestration and storage at the same time as increasing resilience to climate change that increase wildlife habitats and improve well-being,

Hedges may also, at first glance seem an inconsequential part of any plan designed to control climate change. But, like living walls and roofs, they can play an important role. As long ago as 2013 The Irish Environmental Protection Agency, |(IEPA), discovered that increasing the area covered by hedgerows and non-forest woodland patches across the Irish landscape, could, together with the sink activity of existing hedgerows, "potentially result in a net removal of 0.27–1.4 MtO_2/year, which would increase the total land use, land-use change and forestry (LULUCF) sink estimate by ~8–28%." (Irish Environmental Protection Agency. Climate Change Research Programme (CCVRP), 2007-2013 Report Series NO 32).

The Council for the Protection of Rural England believes that a 40% increase in UK hedgerows would result in a net CO2 sequestration potential of 18.5 million tonnes. That might only represent one-twentieth of the UK's 364 million tonnes of carbon emissions in 2019; but it is only the projected result from a 40% increase in hedge coverage. If we could dig for Britain in wartime surely we can wield spades for climate control now. At present only 36% of urban roads are hedged. And the National Union of Farmers have lobbied government hedge plantation subsidies, to replace those hedges they were once paid to destroy.

Hedges also provide corridors for threatened wildlife: mall mammals: hedgehogs, mice, shrews and foxes; amphibians: slow worms, newts, toads and frogs and birds. (Mick Hanley. Associate Professor. (Reader) in Plant-Animal interactions, University of Plymouth. Growing bigger prickly hedges can reduce the chance of extreme weather – and a lot more. The Conversation. 22.09.2021).

The government did grant-aid a Game and Wildlife Conservation Trust scheme to develop a code that will promote hedgerow development and act as a tool for the calculation of their carbon capture a very small sum indeed: £81,561. But hedge initiatives clearly justify far more funding than such a paltry sum.

Carbon sequestration and storage by hedges, has even been regarded as superior to that of forests. "Hedgerows soak up carbon at twice the rate of woodland because of their three-dimensional structure. And they already store 9 million tonnes of carbon" (Robert Stockhill Hedgerows could play a Role in Carbon Capture in the UK. Viable Earth. August 2021). But forests are still generally believed to be 'the best' when it comes to expanding natural carbon storage.

A National Hedge Planing Scheme would involve communities across the land in actively expanding the kind of natural carbon storage capacity which would also boost biodiversity by establishing new corridors for safe wildlife passage and food supplies for mammals, amphibians and, with the right choice of hedge, nesting and nourishing for bird populations.

Tree planting has been seized upon as a way communities may 'fight back'. But the right trees have to be planted in the right place and even then, persistent problems with woodland and forests expansion may temper, without entirely dousing, enthusiasm for their expansion.

Large amounts of carbon are released when disturbed by storm, fire or drought because trees store most carbon above ground. Fire permanently destroys above-ground tree growth and most tree carbon storage lies in it. Fire-damaged trees rarely re-establishes themselves.

But Bamboos store carbon in their rhizomes, and so retain most of their subterranean carbon store during fire. Afterwards, phoenix-like, they spring back to life from their subterranean rhizomes. Could bamboo forests clad UK hillsides? Certainly they deserve a key place in public and private planting schemes. When forest biomass increases in size, soil carbon sequestration and storage capacity does not . Limitations like these mean the most careful consideration needs to be made when expanding woodland and forest to the selection of tree species and the pros and cons of different types of planting. (Portugal intensified tree density in forest and woodland with Eucalyptus used in its paper industry. But it is quite highly flammable and conflagration has caused extensive fire hazards and damage).

Long term carbon emissions would, the European Environment Agency opines, most benefit from unmanaged forestation. Younger forest realising a higher rate of wood growth, achieves less tree carbon storage counterbalanced by high carbon storage in living biomass, deadwood and soil. Intensive forest management might maximise carbon harvests but lose biodiversity and ecosystems. "To sustainably store carbon for the long term would need further sustainable use of the harvested wood and wood products (e.g. for construction applications)". (Briefing No 05/2022 Carbon Storage and Sequestration in Terrestrial and Marine Ecosystems: a lever for nature restoration).

At first glance trees offer the very best natural terrestrial carbon sequestration and storage rates – three times those of wetlands and agroecosystems; and greater longevity than many plants. But mosses have an "ability to store millions of tonnes of carbon dioxide" (Restoring our Precious Peatlands. Lancashire Wildlife Trust 2020) and continue sequestration for decades – sometimes much longer. At the end of the day their storage capacity generally exceeds that of other habitats.

Low lying, they suffer less weather-led disruption, damage and destruction than above-ground level tree growth. Wetlands can incrementally expand their stores because their 'wetness', facilitates on-

going accumulation of organic matter. ‘Wet’ they are not vulnerable to fire. They soak-up heavy rainfall; slowly releasing it over time and avert flooding too.

Wet peatland has been long-since neglected and is in urgent need of protection and restoration lest its climate-toxic stores are released. Once damage has gone beyond a certain point, restoration becomes unviable.

Peatland restoration is being undertaken by The Lancashire Wildlife Trust (LWT), for Lancashire, Manchester and North Merseyside, in an area where 98% of lowland peatland habitats in their area had been destroyed! Heysham and Cadishead Mosses have been successfully restored; Little Woolden and Astley Mosses are in the process of restoration. (Restoring our Precious Peatlands. Lancashire Wildlife Trust 2020).

Marine ecosystems “represent the largest long-term sink for carbon in the biosphere, storing and cycling an estimated 93% of the Earth’s CO_2. Most ocean carbon is inorganic and concentrated in the North-East Atlantic. 23% of anthropogenic CO_2 ‘Fixed’ carbon, organically bound within living organisms, decaying matter in organic compounds in water or sediments is stored in lower amounts.

Maerl seaweed, growing on the seabed in Scottish, Northern English and Irish Seas, affords the most significant seaweed carbon sequestration and storage capacity whilst seaweed detritus transfers what may prove to be globally significant amounts of carbon to sediment. Seagrass beds which offer another important marine carbon sequestration and storage system and Maerl can both be expanded with minimal disruption to other marine ecosystems.

Sediment only stores 1% of total marine organic carbon but it can be stored there for thousands, perhaps, millions of years. Sub-tidal sediment with a high percentage of mud, stores most carbon but can easily be disturbed by fishing, dredging and off-shore, sea shelf installations so it requires tight regulation and surveillance and possibly more Marine Protection Areas (MPAs).

Skilled localised job opportunities in wet peatland recovery and maintenance, woodland management and expansion, inner urban living wall and roof design and installation; appropriate planting schemes design, installation and management, marine conservation and cultivation; agricultural management and regulation would also be generated.

Labour government and Councils may act in tandem to preserve and expand soil, tree, plant hedge, bog and marine sequestration and carbon storage through planning legislation, agricultural policy and regulation and reward. Implementation of a radical natural carbon storage agenda offers a speedy route to conserve and substantially expand, natural carbon stores, with action at the local level, co-ordinated by local authorities, determined by expert wildlife organisations, and enacted, at least partly by communities enabling them to recover some measure of involvement in, control and power over, climate action.

Cutting the Problem Down to Size.

Section Two discusses the abilities of Recycling and a National Heat Plan both to reduce the volume of power we need to generate in order to meet energy demand and lower carbon emissions.

Lowering the amount of power we need to generate, in itself, reduces carbon emissions because given a high percentage of power is still generated from fossil fuels. (Natural gas carbon emissions may be lower than those associated with coal, but they still need to be eliminated if we are to reach net zero). A National Heat Plan does the same because it satisfies the demand for heat with a secondary 'carbon-free' product – waste heat, low to zero carbon geothermal and latent heat sources. Recycling reduces the amount of power that has to be generated either by fossil or green energy resources, to meet energy demands because it almost always produces materials for less energy than consumed in the initial extraction process.

A National Heat Plan

A National Heat Plan makes the very best possible use of our indigenous 'primary' heat resources: geothermal and latent heat and our secondary one: waste heat. Meeting national heat demand that represents a full 50% of all our energy demand directly with heat, lowers our current dependence upon fossil fuels and energy imports to so do. It decarbonises as it raises national energy security.

Geothermal heat can be extracted from deep and shallow-drilled aquifers, hot springs, and geothermally warmed flood water in dis-used coal mine tunnels (Mine Water Heat (MWH). Latent heat: from sea, canal, river and lake water; waste heat: from industrial processes and activities, sewer tunnels, electricity transformer stations, underground train tunnels and power stations.

Heat demand is generally, as a paper on geothermal heat potential lamented, "delivered by burning gas oil and coal or by electricity consumption. Only about 1.77% of energy consumption (for heat only) is that sold directly as heat from combined heat and power schemes. The UK's approach to de-carbonising heat is to switch domestic and other heat production away from direct use of fossil fuels to electricity. In this way greenhouse gases can be captured at source – the power station. However electricity production from gas at the power station is only about 35% efficient; the remaining 65% of energy liberated by burning the gas goes up the chimney as unused heat". (Nadia Narvayan, John Gulyas and Charlotte Adams. Is the UK in Hot Water? Geoscientist 28(9) 10-15, 2018).

A Heat Plan ticks several boxes. It provides cheap heat for consumers , so ameliorating 'The Cost of Living Crisis'. It increases energy security, taking full advantage of both 'un' and 'under' exploited indigenous UK energy resources in itself increasing energy diversity and sustainability. It can generally be relatively speedily implemented. More. It speaks to Rachael Reeves' Green Levelling Up and extends new economic activity and employment opportunity even further afield than anticipated by our Chancellor-in-Waiting.

Around one-third of the UK's carbon emissions are attributable to domestic heating. This makes domestic heating emissions a prime target. Preventing heat loss in existing and future housing stocks by retroffitting and high building standards respectively, will help lower this amount.

An extensive retrofitting programme such as that advanced by Ed Miliband, prevents heat loss, decarbonises, lowers heating demand and bills. (Hopefully the programme will utilise sustainable insulation materials). Comprehensive internal retrofitting may prove impossible due, for instance, to smallness of room sizes. But living green roofs and walls possess sufficient insulation properties to lower heat loss by more than 30%. (Plymouth University's Sustainability Hub).

Tightly monitored high building standards can virtually prevent heat loss in new build properties. Pursuit of the kind of exemplary passivhaus developments Norwich and York councils commissioned can produce such warm houses that some tenants don't turn on the heating.

Contemporary ventilation systems utilise waste heat to recover ventilation costs. The “use of units with recuperation or re-circulation in ventilation systems allows the system to use the energy of the exhaust air. This process makes it possible to reduce the energy costs related to heating the supply air and recover the cost to operate the ventilation system” . (John Terry. The Energy-Saving Role of Heat Recovery and Recirculation in Ventilation Systems. Engineering Systems. May 19th 2021). https://www.renewableenergyhub.co.uk/main/heat-recovery-systems-information/how-do-heat-recovery-and-ventilation-systems-work/)

Waste heat capture and consumption improves both energy efficiency and energy security and lowers energy bills. Power generation is typically an inefficient process – power plant conversion of raw energy into useable electrical power only achieves 37% efficiency for coal; 56-60% for gas, 55% for nuclear and 30-45% for wind.

This can be greatly improved when plants convert to Combined Heat and Power Plants (CHP). Years ago local authorities like The London Borough of Lambeth investigated the possibility of harnessing heat wasted by local power plants. Feasibility studies were completed. Trade Unions in the heavy engineering sector like Parsons and Vickers, situated on Tyneside campaigned for CHP turbine production to save jobs in their depressed industrial sector. In SERA we featured them in our BBC 2 Open Door Programme: ‘Work Not Waste’. Nothing happened. Forty odd years have passed and the inner city power plants of which we held such high hopes have all but vanished from view. But CHP attractions are untarnished.

CHP still affords substantial opportunities to improve energy efficiency and security. The technology retains its potential to greatly improve the efficiencies achieved in the conversion of raw resources into consumable energy; to use skills; revive heavy engineering industry and create jobs and community wealth in North-East England. The first pamphlet I co-wrote with the late Jan Vernon did not mention Climate Change. (Frankie Ashton and Jan Vernon Combined Heat and Power. SERA. 1980). Forty stagnant years later we still lack CHP and face a critical Climate Crisis.

Other sources of waste heat are there for the taking as Local Authorities have demonstrated. In 2010 the Greater London Authority produced a London Heat Map and a London Heat Network Manual to guide local authorities, planners and energy service companies through the development and delivery of heat networks and grid decarbonisation based upon Department of Energy and Climate Change and Government Standing Assessment Procedure. (London Councils London Heat Map (London Heat Map. Greater London Authority 2022). What happened?

Waste Underground Tunnel Heat was harnessed and distributed via a district heating scheme by Islington council. financed by Kwasi Kwarteng’s 2020 allocation of £20million for nine heat schemes in the South East and the Midlands. Bunhill 2 Energy Centre uses a fan to extract Northern line warm air which heats water that then travels via 1.5 km of subterranean pipes to heat 550 homes connected to the DH system. It builds upon an earlier system Islington developed that hears 800 homes bringing the total connections to 1350 households. Bunhill 1 and 2 now possess capacity to heat a total of 2,200 homes! (Anon. World first scheme is launched using waste heat from the tube to warm homes, two leisure centres and a school in Islington. Islington for A More Equal Future 05.03.2020).

Public sewerage heat from the UK’s 16 billion litres of sewerage wastewater daily dumped in sewers could yield 20twh of heat per annum – sufficient to provide space heating and hot water for 1.6 million homes. Kingston upon Thames council in conjunction with Thames Water is developing a scheme to capture sewer heat and distribute it via district heating. The success of this initiative, involving just its smallest plant: Hogsmill, is predicted to realise 1.5Twh of heat energy and could

open the floodgates to more extensive heat recovery; even power generation. (England's First sewer-powered domestic heating scheme planned for Kingston, Thames Water. 26.02.2021).

Waste materials can become fuel from which heat may be produced, though emissions need thorough, continual assessment. Reuters recounted how Coca Cola and cement giants masqueraded as Batman heroes, cleaning-up plastic waste and substituting it for coke cement kiln firing fuel to lower carbon emissions beneath those of coke. (A Special Reuters Report: Trash and Burn. Big Brands Stoke Cement Kilns with Plastic Waste as Recycling Falters. 28.10.2022). (.https://www.reuters.com/investigates/special-report/environment-plastic-cement/) Plastic incineration releases toxicity alongside climate change accelerants. This may, as cement giants insist be reduced so long as kiln attain high enough temperatures but this is not necessarily the case and serious attention need to be paid to risks attendant upon waste incineration. (https://factor.niehs.nih.gov/2022/8/science-highlights/burning-plastic). (https://www.no-burn.org/the-hidden-climate-polluter-plastic-incineration/)https://www.reuters.com/investigates/special-report/environment-plastic-cement/

Latent Heat.

Freshwater latent heat is largely un-tapped in the UK despite published government research that clearly and accessibly spells-out its potential to satisfy many demands for heat from residential areas adjacent to it. Urban areas like Nottingham, Hereford, Ponterfract and London whose adjacent rivers boast over 100 Mw of total capacity are potential beneficiaries. The heat demands of smaller riverside settlements like Chertsy, Egham, Goole , Gainsborough, Tewksbury Bewdley, Ross-On-Wye, Wallingford and Selby which fall beneath 500 GW per annum, could be met by latent river water heat. In total latent river heat capacity totals around 6GW, canals 84 MW ; coastal and estuarial, 340mcubed.

Latent heat has been captured from West Midland canals to heat local hospitals – another scheme financed by ex Minister Kwasi Kwartang's £20 million grant aid for local heat projects. (Jillian Ambrose. West Midlands Canals to Help Heat Hospitals in renewable energy drive. The Guardian 18.02.2022). Its also been tapped in Bristol from its canal to heat a local housing scheme.

Geothermal Heat

Geothermal heat, lies, untapped beneath our feet. But estimates predict that geothermal heat could satisfy demand for heat at current levels for the next 100 years and save 160 million tonnes of CO2 emissions each year. Yet the government still favours shallow geothermal source heat pumps. Pricey, they externalise climate change costs onto individual householders and are only truly suited to well insulated homes. But in October 2022, a cross-party group of UK MPs came out in favour of geothermal energy and other investigations sing the same tune. (Madeline Cuff Can Geothermal Energy Supply All of the UK's heating needs? New Scientist 20.10.2022). Whether or not the Conservative government acts upon research findings remains to be seen but Labour should certainly take up the gauntlet.

On mainland Europe, geothermally powered district heating schemes are becoming popular. The continents' most substantial scheme operates in Asturis, Northern Spain whilst in Heerland, Netherlands, the worlds first mine water heat power station operates. Geothermal heat extraction by

deep or shallow drilling, is increasing; popular in cities for fuelling new collective district heating schemes and turning existing fossil-fuelled systems green. Paris is drilling on its outskirts to replace fossil-fuelled, with fossil-fuel free district heating. Vienna, Pisa and Sienna have schemes. Baden and Alsace are exploring options. (District Heating in Europe's Green Energy Transition. Grundfos e-book 07.04. 2022)

Progress has not been entirely trouble-free. Basel authorities in Switzerland, halted deep drilling on account of earthquake tremors. But an alternative approach has been designed to to enable drilling to re-commence. Nearby across the border in Germany homes are being warmed by newly installed schemes and more are planned. (Alexander Richter. Low risk geothermal sees revival around Basel Think Geothermal Energy 18.02.2022).

Deep drilled aquifer water may often be harnessed at temperatures high enough to be distributed via District Heating schemes for space and water heating. Alternatively it can be extracted from shallow aquifers at lower temperatures and temperature-boosted by heat pumps.

Southampton council persuaded the Department of Energy, who refused to actually finance the scheme, to drill a borehole to service a local energy network. Finance was secured from the EU. (Thomas, L. R., Southampton No 1. (W, Esplanade) Geothermal Well – geological well completion report. Natural Environment Research Council unpublished). Despite the passage of numerous years the project has not been replicated although Southampton are keen to now extend its energy network and make it entirely fuelled by green energy.

Granite deposits are believed to represent prime sources of geothermal hot water aquifers. Eden Project Domes and administration buildings are already beneficiaries, and plans are afoot to provide domestic heating in nearby St Austell too. (Eden Geothermal Project. Eden Geothermal 2021). Other private geothermal heat and power innovation is underway in Cornwall in its granite rock. Cornwall Council is also planning its own geothermally-heated housing scheme and looking forward to the inward investment, employment opportunities and wealth it believes to be on their way.

Deep-drilled aquifers might yield the highest temperature water, but geoscience insists that useful geothermal heat can be obtained from a far wider spatial spread by shallow drilling for water of 30-100 degrees. It expands the spatial range where schemes might be developed and also possesses the advantage of utilising existing technology.

Another breakthrough has been the 2018 a Durham University geological study which concluded that heat could be obtained from limestone karst rock excluded from the 1986 preceding Geological Society study. Yorkshires' Limestone Pavement outcrop areas in the Dales, The Peak District, North-East England, South East of Dartmoor in Devon, to a lesser extent in North Devon, the Mendips in Someset and the Forest of Dean in Wales all boast limestone karst geology. Whilst spas emmenating from this rock in Buxton Spa, Matlock Spa, Bath's 46 degree thermal spa, Hotwells, Bristol, Builth Wells and Welton north of Lincoln all offer development potential.

Geothermally heated coal-mine tunnel flood water – Mine Water Heat, is being promoted by The Coal Authority. Its already being pumped-up in Gateshead and Clydebank then returned to the tunnels for re-heating – the sustainable circular energy economy in action. The Gateshead project is being financed by the government Heat Networks Investment Project. (HNIP)..https://mapapps2.bgs.ac.uk/coalauthority/home.html. Another scheme is under development at Seaham, North-East England under the auspices of the Coal Authority where housing in a planned Garden Village will be heated.

Harnessing geothermally heated coal mine tunnel flood water would extend economic regeneration through the Midlands, Derbyshire, the South-East, Wales, NE England and Central Scotland's coal belt. Coal mines could once more become the hub of activity in areas decimated by their loss and the faith in Labour renewed in areas like Blyth Valley, Bolsover Leigh and Batteslaw.

District Heating Schemes, aka Heating Networks have been developed on very small scales and democratically developed, owned and managed under the auspices of community agencies or local authorities. The most efficient are site-specific circulating waste, geothermal or latent heat into nearby local consumers buildings - heat does not travel well. We propose district heating based solely on renewable sources of primary or secondary energy: latent and geothermal, waste heat or heat from waste.

Waste wood is certainly more acceptable than felled 'waste wood', chipped in the US and shipped across the Atlantic to Drax Power Station on the pretext that it comprises a 'green' alternative to the coal it replaced. It may prove the only local heat resource readily available in some isolated, rural locations and burning it in small local boilers to provide local populations with low-carbon heat, as in Lot, France, might generate less carbon than the transportation and extraction of alternative fuels.

When local woodland is the source of the wood then brash – wood which would otherwise possess no economic value; may fuel communal heating schemes as in Springbok Sustainable Wood Heating Co-Operative as firewood. Proper woodland management ensures to woodlands accessibility for human leisure and wildlife prosperity and rare butterflies have thrived within it. (Surrey housing Co-Ops woodland scheme entices rare butterflies to return. Guardian. 09.09.2021). (https://www.theguardian.com/environment/2021/sep/09/surrey-heating-co-op-woodland-scheme-entices-rare-butterfly-return). Directors, believe the scheme could be usefully replicated in the interests of lowering greenhouse gas emissions whilst conceeding the bad name acquired by biomass within the Climate Control arena.

Denmark also recently celebrated its substantial carbon emission reductions that resulted when it switched from coal to wood-fuelled district heating. However given question-marks hovering above questions of biomass emissions, it might consider switching again to its recently discovered plentiful low to no carbon geothermal resources.

The picture of biomass emissions remains cloudy as illustrated by the following extract. "Heat from solid biomass can reduce global warming potential as well as depletion of fossil resources and the ozone layer by >90% compared to fossil fuels. However, acidification, eutrophication and human and eco-toxicities are much higher than for heat from natural gas. Biomass heat is also 23% more expensive than heat from gas boilers. However, with the subsidies available in the UK, it is 52% cheaper. Using the waste wood and energy crops available in the UK could meet 5% of the national heat demand and save 7.3 Mt CO2 eq./yr, or 1.5% of UK emissions". (Environmental and Economic Sustainability of Biomass Heat in the UK. Energy Technology 8(1) November 2020).

New Conservative Energy Bills being introduced in the 2022-23 parliamentary sessions could advance the development of low carbon heat networks aka District Heating Schemes. The Energy Bill, introduced in the 2022-3 parliamentary session by Conservative Life Peer, Lord Callanan features low-carbon heat schemes and heat networks and government Guidance to their Energy Security Bill, published in September 2022, announced that Heat Networks "will play a key role in achieving net zero". The Climate Change Committee estimated that around 18% of UK heat could come from heat networks by 2050 to support cost-effective delivery of our carbon targets. This would involve an expansion of 16% of heat network heat, that currently only stands at a lamentable 2%. (up from around 2% currently). The committee considers that they represent a proven, cost-

effective way of providing reliable, efficient, low carbon heat at a fair price to consumers, while supporting local regeneration. They are uniquely able to unlock otherwise inaccessible larger scale renewable and recovered heat sources such as waste heat from industry and heat from rivers and mines"(The Department for Business, Energy and Industrial Strategy. Guidance. Energy Security Bill Factsheet : Heat Networks Regulation and Zoning 06.09.2022)

A National Heat Plan makes the very best possible use of our indigenous resources, primary – geothermal and latent heat and secondary: waste heat. Lowering our dependence upon fossil fuels and energy imports, it decarbonises as it improves national energy security and increases energy efficiency. A National Heat Network conjures up a vital picture of a more localized system of heat supply, less dependant less upon imports from other regions or overseas countries but upon a diverse and sustainable range of local energy resources. Cheaper heat means better health and well-being for local people, less days off work and school, less demand for social care and medical services, less costs to the NHS and Social Services. Affordable tariffs, varied for those in social housing as in Paris for instance, round off the picture. Wealth goes into local community pockets and stays there to support the butcher, the baker and the candlestick maker. It all equals the healthier, wealthier communities Community Wealth Building Councils crave.

But Labour seemed to back hydrogen as a fuel to produce heat for homes at its 2022 Conference and hydrogen heating, an overly pricey, quasi 'Bridge' technology, has no place in our National Heat Strategy. Rachael Reeves' "I'm a massive fan of hydrogen"; quote, prominently displayed in the Conference Hydrogen Zone spoke to the success enjoyed by the hydrogen industry's lobbying.

Hydrogen-ready boilers are unlikely to ever consume anything but gas -no-one can provide a date when green clean hydrogen might fuel them. Even hydrogen fans anticipate fossil-fuel gas will back-up green hydrogen when solar and wind are not supplying green energy for electro-static hydrogen production. Fortuitously hydrogen- ready boilers can burn gas too. Some models burn a 20%hydrogen/80% gas blend but that will much dent carbon emissions!(Ballance, Dr Tony Making the Hydrogen Economy a Reality' Interview 26.10.2017) Blue hydrogen might hold the fort until green arrives but it is not necessarily clean and requires production point carbon storage facilities. Thankfully, Dr Alan Whitehead, MP. Labour's Green New Deal and Energy Shadow Minister rejected it as anything but a very temporary possibility.

Cornwall Insight predicts that Hydrogen heating could raise energy bills by an unthinkable about 70%. As Joules Journal insists (Cornwall Insight) Its "hydrogen use for domestic heating is less economic, less efficient, more resource intensive" than several low- and no-carbon alternatives, (and) associated with larger environmental impacts." (Joules Journal)

David Cowdry, Director of External Affairs, at the independent renewable charity M.C.S. which commissioned Cornwall Insights' study, opines:"evidence from independent researchers and industry experts clearly shows that while there will be a role for green hydrogen in industry and transport it it not effective or viable for home heating"(David Cowdry Publication of Hydrogen Strategy. MCS Charitable Foundation. 18.08.2022).

Two-thirds of new homes in England to the end of March 2022, use gas despite the deadline for gas boiler use supposedly being 2025. Regulation seems to have been patchy at best, non-existent at worst. Climate control costs are once again being externalised both by industry and state. Individual householders will face high retrofitting costs three years hence.down the line.

Speedy provision of the cheap heat our National Heat Plan offers helps keep us ahead of the game to the benefit of consumers, climate, energy security and democracy and local economies across the UK.

Waste heat can also generate electricity. Waste Heat to Power (WHTP), technology can generate in-house electricity for institutions and industry from waste heat produced in the course of production of goods and services. Steel plants and data storage facilities are hi-energy economic activities. But Industrial process heat can be recovered in many industries.

Brewing has proved particularly innovative in this field. Heineken aims to achieve electrical self-sufficiency by generating power from waste rice husks, - a by product of its beer production, though emissions need measuring to assess just how green it may be. And Austrian "Göss Brewery" produces carbon neutral beer using electricity generated by an internal waste heat recovery system. It has installed a solar thermal plant and in addition takes -in hydroelectricity and waste heat from a nearby sawmill. (http://ec.euopean.eu/futurium/eu/energy-transition)

Recycling, Re-Use, Re-Purposing and Repair

Recycling, Re-use, Re-purposing and Repair (RRRR) mean our products are made with less average energy inputs per item. These processes and practices are intrinsic to energy and carbon emission savings because it takes less energy to produce goods from recycled materials than from primary ones. And it takes less energy to re-use, repair or re-purpose goods than to make them in the first place. All belong in the Climate Control toolbox.

"Extracting and processing raw resources (wood, oil, ore) to make usable materials (paper, plastic, metal) requires a lot of energy. Recycling often saves energy because the products being recycled usually require much less processing to turn them into usable materials". (American Geo Sciences Institute. How Does Recycling Save Energy? 2022). Glass is almost certainly the exception - better re-used than recycled. The same hi temperature processes required to melt 'ingredients' like sand, needs repeating when glass is recycled. America only saves around 10-15% of energy by recycling glass and Labour committed to a bottle-back scheme back in 2020.

On the other hand metals extraction consumes much energy; recycling metal consumes far less. But Beryllium recycling saves 80%,[5]lead 75%,[9]iron and steel 72%,[9] and cadmium 50%.[10] Aluminium production consumes more energy than any other product and recycling aluminium tins saves 94% of energy. America made 3.7 million tons of recycled aluminium in 2018. This saved sufficient electric power to supply 8 million homes. Green Alliance predict that "all critical material demands for low carbon technologies could be met from secondary materials by 2050.

Wales is 1st in the UK, 2nd in European and 3rd in global recycling league tables, recycling some 62.8% of its waste (Sandra Laville. Wales in the 2nd best recycler in the world. The Guardian. 10.12.2017). 'My Recycling Wales' campaign extended £6.5 million in support of local council and institutional practices; reinforcing 'extended producer responsibility' for production and product waste disposal, issuing plastic-free awards, promoting repair cafes, offering companies Circular Economy Funds to drive consumption of recycled plastic. Its a campaign Labour needs to emulate.

The more non-recyclable materials that are transformed into recyclable ones the more energy consumption may be reduced. Recyclable plastic production and use is increasing. The fashion industry is taking on board ideas like 'second-hand' returned fashion items sold alongside new items. Fashion is being created from damaged and discarded clothing, maybe by mixing several fabrics in new individual items – a new designer trend. And bigger-scale sorting of re-usable, remodel able clothing and fabric from materials suited to mattress wadding and rags is even being undertaken by automation in Australia. Its about time when we contemplate the fabric dunes made

from discarded clothing in South American deserts like Chile, many of which never even reached shop rails.

More energy may saved by pressing more waste materials and products into productive service: sewerage sludge agricultural fertiliser (Takero Minami Nikkel Asia., 2015) and , cement filler sludge sewerage sewerage sludge and mycellium bathroom tiles (Denzeen 2021); , , cement kiln fuel in (Mexico;) heat for District Heating Networks. Tyres have been recycled for asphalt, and civil engineering applications. (These cutting edge in innovations need energy consumption and emission figures to confirm their value).

Five main actions are required by Labour. First support, subsidies even, for the substitution of fabrics that can be recycled and biodegraded for ones that cannot. 'New cotton', has been created through cotton growers experimentation - adding cotton wastes to new crops. |In Wales bags are being made from salmon 'leather'. Second promotion of re-use and repair activities. Tax deterrents to non-repairable product manufacture. Third taxation hikes to price non- recyclable fabric and clothing out of the market place. Polyester manufacture produces greenhouse gas emissions from 70 million barrels of oil each year and takes several hundred years to decompose. (Fast Fashion. We All Have to face Up to Clothes Climate Impact. BBC News 28.01.2021). Fourth penalising the kind of overproduction that consumes energy only to create fashion dunes in deserts - 39,000 unsold garments, produced in India and Bangladesh for European, American and Asian markets are consigned to Chiles; Atacama Desert every year. Fifth textiles and clothes should form a separate recycling stream.

Section 3: Clean Consumption

This last section begins by discussing clean energy power generation. Labours remains wedded to attachment to Nuclear power as a clean energy provider along with solar and wind and some Tidal. Geothermal, plus extensive Tidal power is sidelined. Yet Tidal power is so abundant and reliable it could be a base-load energy supply. We share entirely Labour's commitment to solar that could be buttressed by expansions to Community Energy activity and extensive rooftop solar installations . Wind also. Both will, as Labour pronounced, make a significant contribution to low cost energy to power UK homes , institutions and industry. The National Heat Strategy discussed in the previous section is also a key element of any Clean Energy Economy.

Nuclear Power

Nuclear power has become a prime deposit in Labour's Climate Bank. Eye-wateringly expensive like CCS, and involving similarly attenuated lead-times, nuclear power still operates, decades after its inception, without proven long-term safe storage facilities for spent fuel and still occasions concerns about operating hazards. War has now vividly illustrated other serious safety issues: weaponisation or unintentional 'war damage' wreak devastating consequences. Europe's largest nuclear power plant is situated in Ukraine within an area of active conflict, and at risk of catastrophic damage. It has also been actively weaponised: its director kidnapped; its boundaries breached by Russian forces. Unsurprisingly nuclear safety agencies have been are on high alert. And all the time Climate change is itself now starting to undermine conditions once believed to secure the safe operation of nuclear plants. Drought depresses river levels once believed sufficiently high and reliable to guarantee the waters needed to cool plants. Along the Rhone-Soane valley and Loiret in France, and the Rhine in Germany previously continuous nuclear energy production now has to be disrupted so that nuclear plants can cool down to a level safe for

production. Situating future development in coastal locations simply makes them more vulnerable to attack from the sea.

Far more cost-effective, safe and localised alternatives exist – frugal energy for the taking.

Tidal Stream Energy.

Tidal stream energy does feature in Labour's Climate policy commitments but the extent of that commitment remains unclear.

The last Labour government invested in tidal stream energy research. But under the Coalition government, enthusiasm waned. From 2016 onwards Conservative administrations have enthusiastically predominantly lly turned to nuclear and off-shore wind instead. Since Off-Shore Wind was re-classified as Marine Energy under Alok Sharmer's Environment Ministership, Tidal power has been obliged to compete with Off-Shore Wind power for Marine Energy Funding. More recently the Conservatives 'British Energy Security Strategy' completely omitted Wave, Ocean Thermal, Ocean Salinity, Tidal Lagoon, Barrage and Temperature Conversion. (OSTEC).

Nonetheless despite the best attempts of successive Conservative governments to side-line its potential the UK retains sufficient advantages to enable it to press ahead with Tidal Stream Energy expansion and reap considerable financial returns attendant upon its international development. It retains established centres: The European Marine Energy Centre (EMEC) Ltd., (Orkney 2003); Siemens Test Centre in the Bristol Chanel and SW Energy Park, Cornwall have survived. Demonstrations can be found in Scottish and Welsh developments. The UK remains a world Tidal Power leader despite being cold-shouldered by Conservative government and serious investment by Labour could place it in a strong position within a market projected to be worth £130 billion. Investment of just a fraction of the nuclear budget could realise 24GW of tidal stream power by 2050.

The best sources of UK tidal power alone: the Pentland Firth, St Georges Channel, Anglesey, and the Isle of Wight, could satisfy 15% of UK energy requirements.

Costs have fallen steadily. A 2021 projection predicted that economies of scale and increased unit production will effect further falls. Skills in turbine manufacture and design exist.

And Tidal Stream energy could provide a secure alternative base load to nuclear and fossil fuel. There is always a high tide at any one point in time along the UK shoreline mea ning that Tidal Stream Energy may always be available, unlike solar and wind that are weather-dependant with, as yet, under-developed storage provision.

Geothermal power

Geothermal power missed the boat. It received no acclaim in Labour's 2022 Conference policy pronouncements, despite its affordability, reliability and established performance. Produced from indigenous energy resources it could significantly improve national energy security. Offering flexibility in development and funding plants may be constructed in stages, 20-30 MW at a time in response to evolving financial and environmental conditions.

Plants generally operate 90% of the time because they do not rely upon weather-dependent energy sources.

The cleanest natural gas plants still produce six times the carbon dioxide emitted from geothermal plants.

Geothermal power is eminently affordable. The Union of Concerned Scientists calculate that binary geothermal power plants are four times cheaper to build than nuclear alternatives and have none of the decommissioning and fuel handling costs incurred by nuclear ones. (What is Geothermal Energy? The Complete Guide. The Switch. Renewable Energy. 2021).

Twenty other countries now generate geothermal electricity. Italy developed the earliest plant in 1904. The USA now operates many including the worlds largest. In 2019 geysers from New Mexico to Utah, generated 16 billion kw hours of electricity 0.4% of all American energy. Twenty-five percent of Icelandic national energy is geothermal. Her Reykjavik plant generates electricity and directly heats and cools buildings. In Denmark deep groundwater resources are estimated to possess sufficient capacity to heat half the country.

Solar and wind power

Solar and Wind power feature strongly in Labour's Climate policies. In line with Rachael Reeves vision they can provide a wealth of employment opportunities across the land. Green industries can produce presently imported wind turbines and solar technologies presently produced in China and Norway..

Rooftop installations have recently been found by a Cork University Study, to possess extensive green global energy potential, (University College Cork. News and Views. First Study to assess global energy potential from rooftop solar photo-voltaics 06.10.2021)) These can lower institutional, industrial and domestic energy costs; even profit for surplus sales to the grid although rewards are presently poor for offloaded surplus energy.

Community Energy Enterprises (CEEs), throughout the UK have been installing community solar power across Britain for years. Prevented from retailing surplus energy to the grid in exchange for reasonable rates of remuneration they have not realised predictions that they possess of substantial potential. The Local Electricity Bill, drafted by CEEs now has cross-party support of almost half the House – high time for official Labour Party Energy Policy Support and promises of in-power enactment.

CEEs and Local Authorities are well placed to spearhead rooftop solar development, whose extensive global potential was identified in a recent Cork University study. Local Authorities like Nottingham and public institutions - Torbay hospital to cite just one example, have pursued rooftop possibilities knowing it makes financial sense to do so. They require support from a future Labour government to extend such innovations. CEEs appear to sit uncomfortably alongside local council solar development and negotiations to find common ground and boundaries are indicated.

Problems exist with weather-dependent energy sources. It has proved so difficult to store surplus solar and wind energy that production has been halted. This means that their full potential contribution to UK energy demand has not been realised. Two solutions were mooted. Water might be pumped uphill into expansive 'reservoirs ready to generate energy in its descent. Or capacious batteries produced incorporating lithium. But the latter is mostly found in the global south and extraction processes have imposed unacceptable costs on nearby communities and their environment. But new developments in the Netherlands afford an alternative more viable solution – the consumption of surplus electricity in electrostatic production of hydrogen – a product that can

more easily be stored underground. Another alternative might be found in Chinas'first hybridized solar and tidal plant in the world.

Conclusion

Labour's 2022 Climate commitments outclass Conservative ones. They are decidedly low key with the new leadership displaying little enthusiasm for the matter, with the hard right pulling many leadership strings and a cabinet firmly embedded in corporate energy interests. Labour's Conference Climate Policies addressed both People and Planet; two sides of the self-same coin; spoke loud and clear to electoral hopes and fears. We share those hopes and fears. Applauding Labour's bold stance we trust she will hold steady; ready to be flexible, continue consultations with Labour members, affiliated trade unions and front bench MPs, and remain ever open to adjustment in this all important period for our Climate and electoral prospects.

At last years' Conference Labour boldly proposed accelerating the rate of transition to green energy, aiming for a 2030 zero carbon date. But Climate Changes and War are already jeopardising the ability of Labour's Climate policies to realise this ambition. Their impacts illustrate why we need flexible, diverse and speedy Climate Control strategies: flexibility to adapt to changing circumstances, diversity to strengthen sustainability; speed to achieve transition before the need for mass resilience measures push prevention to the side-lines.