

DECENTRALISING POWER: AN ENERGY REVOLUTION FOR THE 21ST CENTURY

JULY 2005

Climate change has thrust electricity generation under the political spotlight. Our current centralised electricity system dominates the developed world. Yet it is the embodiment of technological inertia, performing little better today than it did in the 1970s.

The debate over the UK's energy future routinely overlooks an issue that is key to our rising emissions – the huge wastage inherent in our centralised electricity system. Because we generate electricity in large power stations far from our cities, almost two-thirds of primary energy inputs to the system are wasted – partly from the wires that transmit the electricity around the country, but mostly in the form of waste heat from the power stations themselves. If this could only be used rather than lost into the sky, it would be more than enough to meet the entire space and water heating needs of every building in the country. In the face of climate change and mounting security concerns, such wastage is indefensible.

Reform of the centralised electricity system is urgently needed, to put an end to this environmentally destructive wastage. The scope for reducing electricity demand, and thus CO₂ emissions, through energy efficiency measures is widely accepted, if weakly pursued by government. Less well known, but at least as important, is the potential to reduce wastage and emissions by remodelling our electricity system around a decentralised pathway, where energy is produced close to where it is consumed.

A decentralised energy (DE) system has two key characteristics. Firstly, buildings (from terraced houses to industrial units) double up as power stations because they have within them one or more energy generating technologies such as solar panels, wind turbines or cogeneration units. Local impact is important, cumulative impact could be enormous. Secondly, local energy networks proliferate, distributing heat and power. These networks will be supplemented by community scale plants generating close to the point of demand. For example cogeneration plants with heat, the by-product of combustion for electricity, being captured and distributed for nearby use. This radically improves efficiency and so reduces overall demand, increasing security of supply and cutting emissions.



'Transforming today's centralised, dumb power grid into something closer to a smart distributed network will be necessary to provide a reliable power supply – and to make possible innovative new energy services.'
 The Economist Technology Quarterly

30% of UK CO₂ emissions come from electricity production

67% amount of primary energy input that is wasted in the current global centralised model of power generation

Front Cover: Solar thermal panel. Langrock/Zenit/Greenpeace.
Above: A trigeneration plant, housed in a multistorey carpark, powers Woking's town centre. Greenpeace/Cobbing.
Below: Photovoltaic installation at an inner city playground, London. Greenpeace/Davison.



DECENTRALISED ENERGY – THE BENEFITS

Decentralising the UK's electricity system represents our best chance of getting to grips with our greenhouse gas emissions. By enabling the effective use of heat and by establishing a more appropriate infrastructure and regulatory regime which encourages renewables and other low-emission technologies, a decentralised model could halve our electricity system's contribution to climate change within a few decades, reducing UK emissions by at least 15%.

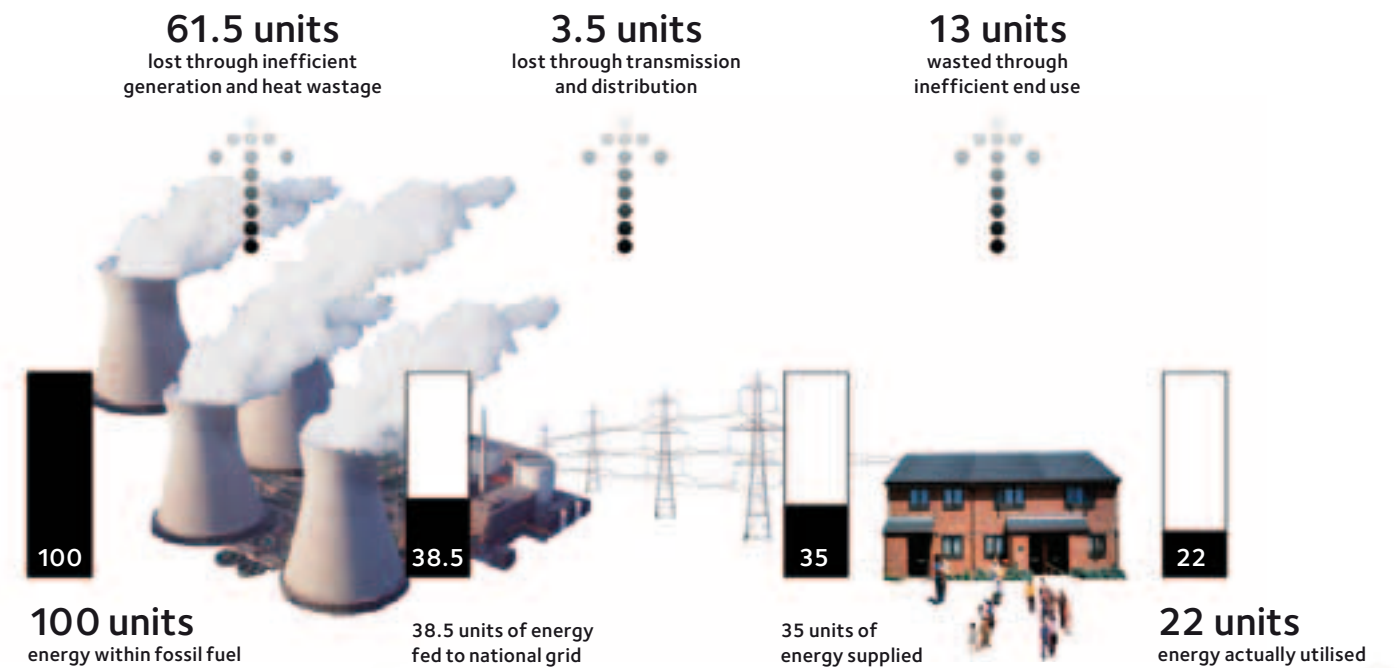
In the long run, a decentralised system may also prove cheaper, cutting the need for investment in hugely expensive high-voltage transmission networks. By boosting the market for renewable generation and related technologies, it would also stimulate innovation. It would deliver an electricity supply far less vulnerable to massive system failure as a result of sabotage or extreme weather.

Decentralising energy would also democratise energy, providing real opportunities for local political leadership on climate change, and curbing the influence of the centralised industry's powerful vested interests. By enabling local action and empowering individuals and communities as producers, decentralisation has the potential to bring about a massive cultural change in our attitude to and use of energy.

In global terms, decentralising energy could revolutionise the lives of the billions of people who currently lack access to basic energy services. Decentralised energy is highly flexible, allowing solutions to be tailored to local conditions and be installed much faster than a centralised system. Western governments must rise to the challenge of promoting globally a far more sustainable energy model than they themselves have achieved so far. They have a moral duty to incubate and disseminate technologies, skills and knowledge suitable to both international development and tackling global warming.

'DE presents a unique opportunity to help developing countries progress towards the provision of clean, affordable, reliable energy, towards economic growth and poverty alleviation.'
 Dominique Lallement,
 World Bank, 2001

'The current power infrastructure is as incompatible with the future as horse trails were to automobiles.'
 Kurt Yeager, President, Electric Power Research Institute



Centralised energy – yesterday's technologies: Wasting more than two thirds of the energy available from fossil fuels. ©Greenpeace/breeze.

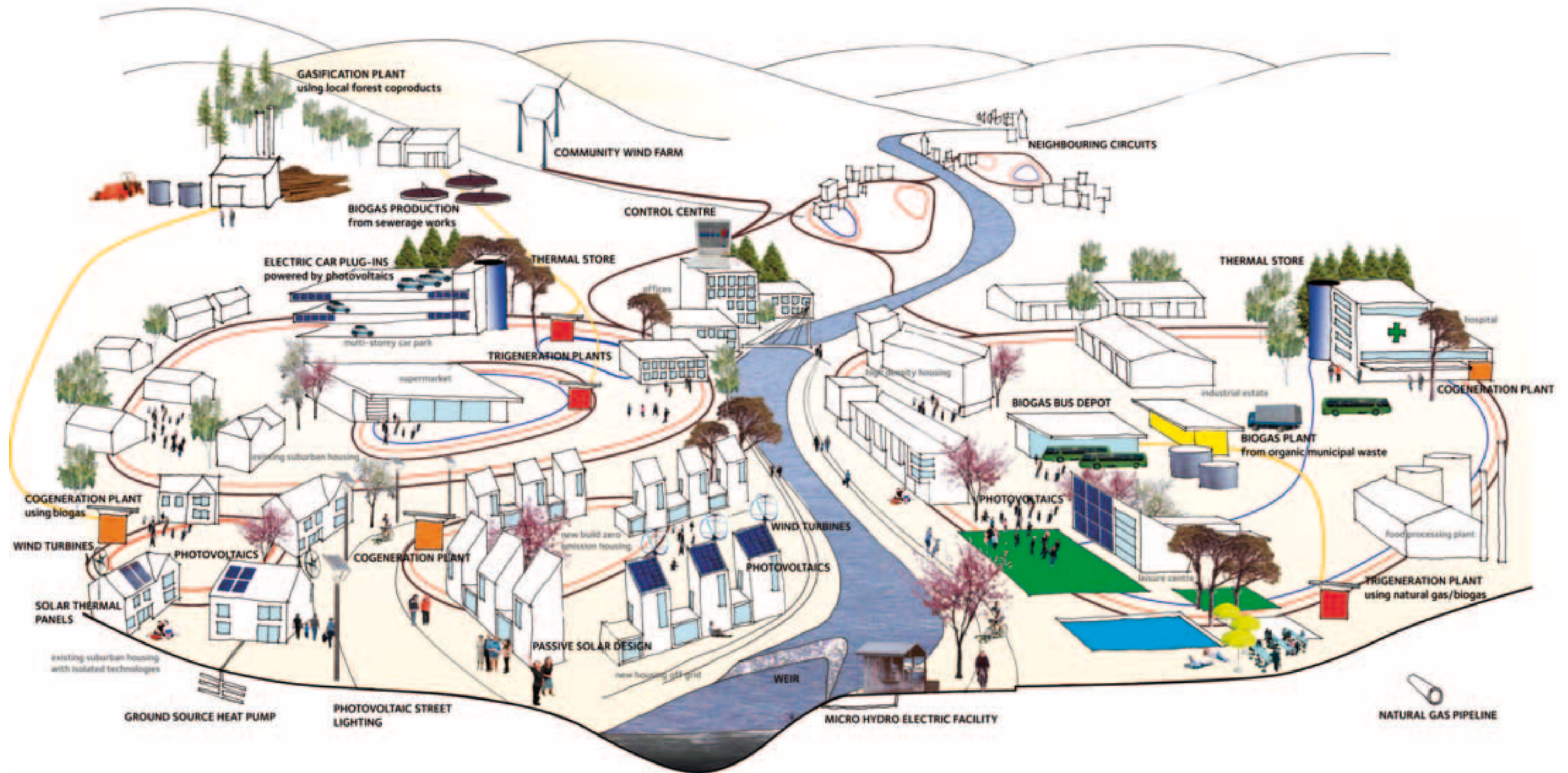
To summarise, overhauling our outdated electricity infrastructure and pursuing a decentralised pathway would enable the UK to:

- slash CO₂ emissions
- bring down energy consumption levels
- deliver enhanced energy security
- drive technological innovation and real competition in UK energy markets
- foster the inherent economic advantage of renewable technologies
- save consumers money in the longer term
- increase public involvement in tackling climate change
- increase opportunities for local political leadership in the energy sector
- reduce the influence of vested interests
- incubate and export technologies which are safe for global dissemination and urgently required for international development.

'The nationwide and local electricity grids, metering systems and regulatory arrangements that were created for a world of large-scale, centralised power stations will need restructuring over the next 20 years to support the emergence of far more renewables and small-scale, distributed electricity generation.'
 Energy White Paper, 2003

3 times more energy is put in to the centralised model than is demanded by consumers

77% of Woking Borough Council's CO₂ emissions were slashed by setting up DE networks and instigating energy efficiency measures



Decentralised energy future – today’s technologies

Existing technologies, applied in a decentralised way and combined with efficiency measures and zero emission developments, can deliver low carbon communities as illustrated here. Power is generated using efficient cogeneration or tri-generation technologies with the heat (and sometimes cooling) plus electricity distributed via local networks. This supplements the energy produced from building integrated generation. Energy solutions come from local opportunities at both the small and community scale with this town

making use of – amongst others – wind, biomass and hydro resources. Natural gas, where needed, can be deployed in a highly efficient manner. Private wire electricity networks deliver power in the town but are connected to neighbouring networks and the national system to allow for export and import and to assist in security. This town’s decentralised system is flexible and able to adapt to future circumstances. More importantly it can be constructed relatively swiftly using technologies available today. ©Greenpeace/breeze.



BARRIERS TO DECENTRALISED ENERGY

Despite its many benefits, the barriers to DE in the UK remain immense. Because we have a choice of electricity providers it is perceived that the market is liberalised and competitive. But the reality is that the centralised system severely limits the way in which electricity is generated and delivered. The only real choice is who we buy our centralised electricity from. DE, however, offers a genuine alternative but is largely excluded from the market place due to protectionism, short-sighted and inappropriate regulations and failures in cost and benefit allocation.

40% of national electricity demand is met by DE in the Netherlands

22% of primary energy input is eventually used in the home – the rest is lost in the current centralised system and wasted through domestic energy inefficiency

‘How did world electricity come to this? And where might it go from here? The question is too important to leave to insiders. How it is answered will affect everyone on earth.’

Walt Patterson, Royal Institute of International Affairs

This situation reflects the sharp misalignment between the energy regulator Ofgem’s remit and the key policy goals set out in the Government’s 2003 Energy White Paper. The Government’s failure to correct this misalignment in turn illustrates its own fractured approach to energy policy reform, in which a rag-bag of decentralised and renewable energy initiatives are plastered over a fundamentally faulty system. Further obstacles to reform are posed by the centralised energy sector’s huge influence in the corridors of power.

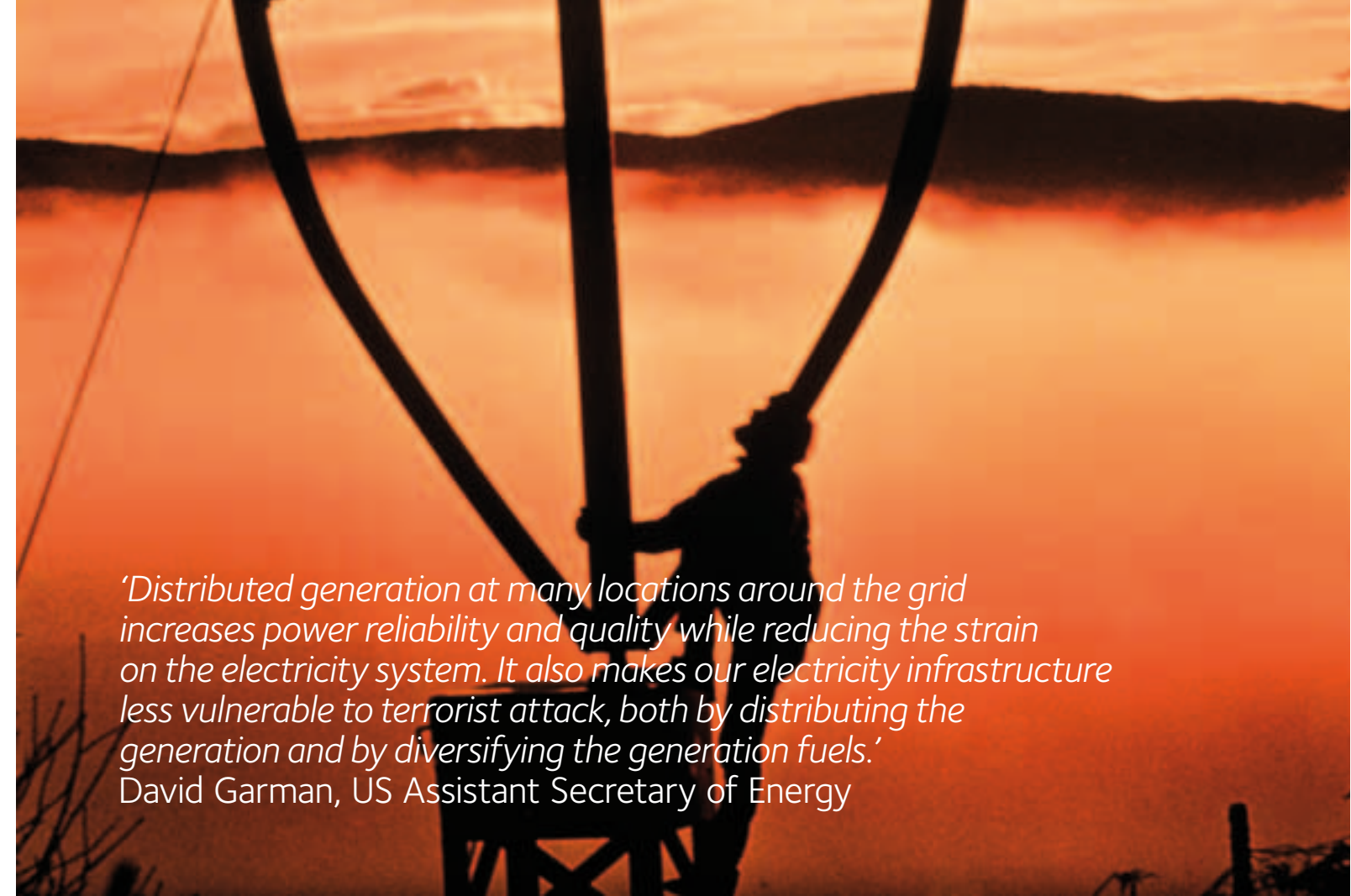
\$2.7 trillion could be saved globally to 2030 through energy policies incorporating DE and energy efficiency measures

20% of the UK’s CO2 emissions results from the energy wasted by the current centralised fossil fuel power generation

Top: A hydrogen fuel cell provides electricity and heating to Woking’s leisure centre. ©Greenpeace/Cobbing.

Above: Cogeneration plants fuelled by bagasse – the dry residue of sugarcane – could make a major contribution to meeting electricity demand in sugar-producing countries. Henley/Panos Pictures.

Left: The photovoltaics facility on the roof of Berlin’s Federal Chancellery shows leadership on climate change. ©Langrock/Zenit/Greenpeace.



‘Distributed generation at many locations around the grid increases power reliability and quality while reducing the strain on the electricity system. It also makes our electricity infrastructure less vulnerable to terrorist attack, both by distributing the generation and by diversifying the generation fuels.’
David Garman, US Assistant Secretary of Energy

To tackle climate change, renewable energy technologies, like wind, can be embraced by changing the UK’s electricity infrastructure. Centre for Alternative Technology.

MOVING TO DECENTRALISED ENERGY IN THE UK

Despite all these barriers, there has been significant innovation in decentralised energy in the UK. Networks such as that set up by Woking Borough Council, alongside energy efficiency measures have slashed emissions by 77% and cut energy prices for low-income households, offering important lessons for UK policy-makers.

But much remains to be done to make decentralised energy commonplace. Bold government leadership is required. The time is ripe for change: key parts of the UK’s networks and generation capacity are reaching the end of their natural life, and closures should be pursued as a strategic opportunity to remodel our electricity system.

While Ofgem has recently taken some small steps in support of decentralised energy, it should be given an explicit obligation to deliver a fully sustainable energy system within a few decades. The electricity market needs fundamental reform, to promote meaningful competition and to support and stimulate technological advances. At the same time the economic regulation of the electricity sector must be overhauled, abolishing the present system under which network operators are rewarded for continued investment in outdated grid assets, and instead incentivising them to connect decentralised generation and to become active managers of efficient local networks.

Removing the barriers to decentralised energy will facilitate the emergence of new enterprise models, particularly energy services

companies (ESCOs) focused on the efficient delivery of local low-emission energy – offering a genuinely competitive and innovative alternative to business-as-usual in the electricity sector.

The UK’s ambitious house-building programme presents an exceptional and immediate opportunity to pump-prime the ESCO and DE marketplace. At the same time, established householders and businesses need access to a user-friendly microgeneration package. The public sector, the farming community and industry must also be empowered and incentivised to drive the expansion of decentralised energy. In particular, the ceilings on the use of private electricity wires to supply domestic customers, and on electricity exports onto the grid from private wires, should be lifted. These measures should rapidly transform the economics of decentralised energy, strengthening the ESCO and DE marketplace further. Over time this will increasingly allow UK electricity consumers to choose local low-emission power over ‘dirty’ centralised power.

Electricity is the lifeblood of any modern society, but for too long politicians have allowed its importance to eclipse the wastage and lethargy inherent in our present system. The energy debate is heating up again. If the Government is to make the right choices about future electricity supply, it needs to consider not only better generation technologies, but also how it can revolutionise the entire electricity system.

KEY STEPS TO DECENTRALISED ENERGY

Greenpeace calls for:

- 1. The Government to use the tax system to reward householders and businesses that install DE technologies such as solar panels, micro-wind turbines or cogeneration systems.** Tax incentives could include reduced stamp duty, council tax or business rates for properties capable of generating their own electricity, and expanded capital allowances for businesses.
- 2. All new buildings to be required to incorporate DE technologies.** This would steadily cut emissions from the building stock and enable the retirement of power stations, while also transforming the economics of DE by creating economies of scale and cutting installation costs.
- 3. Local sustainable electricity systems to be encouraged through the removal of current limits on the development of private wires.** Limits on the export of power from these sustainable local systems should be raised. Together these measures would enable electricity consumers increasingly to choose clean local power over dirty centralised power.
- 4. Local government to become a key player in moving to sustainable energy systems.** There should be area-based CO₂ reduction targets, along with a statutory requirement for all councils to develop an energy strategy.
- 5. All electricity suppliers to be required to purchase surplus electricity from domestic power generators,** at rates that will ensure the take-off of domestic generation.
- 6. Inefficient, centralised power stations to be heavily penalised to reflect the damage they cause and to ensure that the most polluting are closed.** One way to do this would be to tighten up the European Emissions Trading Scheme. In addition, supplementary fiscal measures could be enacted at UK level, such as a tax on waste heat.
- 7. No new fossil-fuel generation to be permitted unless it includes cogeneration.**
- 8. A nationwide network of biomass or biogas cogeneration plants to be developed,** with Regional Development Agencies playing a leading role.
- 9. Energy regulation to be completely overhauled.** Ofgem should be transformed into a sustainable energy regulator with its primary duty being to deliver substantial emissions reductions through the encouragement of DE. BETTA (British Electricity Trading & Transmission Arrangements) should be replaced with a more flexible and responsive system, which encourages genuine competition, and rewards rather than penalises cogeneration and renewables.
- 10. The publication of a Decentralised Energy White Paper.** Instead of a new white paper on nuclear power, the Government should pull together all relevant parties to set out the necessary steps for a coherent and rapid transition to a decentralised energy system.

Renewable technologies, such as micro wind turbines, can be incorporated into all new building designs.
Greenpeace/Davison.

For a copy of the full report please visit: www.greenpeace.org.uk/DecentralisingPower

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Greenpeace's clean energy campaign is committed to halting climate change caused by burning oil, coal and gas.

We champion a clean energy future in which the quality of life of all peoples is improved through the environmentally responsible and socially just provision of heating, light and transport.

We promote scientific and technical innovations that advance the goals of renewable energy, clean fuel, and energy efficiency.

We investigate and expose the corporate powers and governments that stand in the way of international action to halt global warming and who drive continued dependence on dirty, dangerous sources of energy, including nuclear power.