GREENPEACE

April 2006

The Greenpeace response to the Department of Trade and Industry's Energy Review consultation document 'Our Energy Challenge' (January 2006)

1. INTRODUCTION

Greenpeace welcomed the 2003 Energy White Paper, with its firm commitment to decarbonising the UK economy in order to cut CO2 emissions by 60% by 2050. We firmly agreed with the findings of the White Paper that the best way to achieve the stated goals of tackling climate change, ensuring energy security, and guarding against fuel poverty (all at least cost) would be a combination of energy efficiency and renewable energy. We also welcomed the recognition that nuclear power is not the answer, because "its current economics make it an unattractive option for new, carbon-free generating capacity and there are also important issues of nuclear waste to be resolved."[1] While we believed that the target to achieve 20% of our electricity from renewables by 2020 could have been much more ambitious, we noted many sound policies and initiatives which we looked forward to seeing enacted with their required urgency.

Three years later Greenpeace believes that progress has been poor. A catalogue of government failure to implement properly the policies laid out in the last White Paper has created the perception among some commentators that renewables and energy efficiency are not, after all, up to the job. Despite the fact that in 2003 the Government said they would give renewables five years "to deliver" before being re-evaluated, a new Energy Review is now being conducted in a political climate where some politicians assume that, contrary to all the evidence, nuclear power is now the only way to meet these energy criteria of reducing CO2, creating a secure energy system and doing so at low cost.

Greenpeace, along with many energy experts, continues to see renewable energy and energy efficiency as central to meeting the government's stated energy policy goals. It is unclear why nuclear power, whose own supporters often call it the "choice of last resort", is now being considered when there are alternatives that are cleaner, cheaper and more secure which have not yet been given the proper policy support and resourcing they need. Meanwhile the key problems of nuclear identified in 2003 – cost and waste – are far from resolved, and nuclear remains a risky, unpopular, wasteful technology that can do very little to tackle climate change or energy security.

Since 2003:

- There are no additional UK generating plants closing that were not already scheduled to close at the time of the Energy White Paper.
- Renewable energy and energy efficiency have become more viable and costs have fallen internationally as the global industries grow.

[1] *Our Energy Future – Creating a Low Carbon Economy*, DTI, 2003, p12

- The cost of the nuclear power legacy in the UK has risen dramatically[2], no cost reduction has been proven in new nuclear technology and the critical waste issue remains unresolved.
- The rate of renewable energy and energy efficiency growth in the last 3 years has been constrained, partly as a result of the failure in 2003 to fully close off the nuclear option.
- The international nuclear industry has admitted that nuclear power cannot be built fast enough to stop climate change.[3]
- The Tyndall Centre has stated that nuclear power can only account for 3.6% of primary energy use in the UK, falling way short on climate change and security of what is needed[4].
- The energy gap – or more accurately the electricity gap- which appears to be worrying Government, and may be behind the apparent enthusiasm for nuclear power, does not in fact exist. (see Annex 3)

Nuclear only produces electricity, and thus only marginally deals with our need for services such as hot water and central heating, and doesn't meet our energy needs for transport at all. Instead of focusing on electricity production, and looking to one big technology to meet our energy challenges, the government needs to address the energy system as a whole. Currently in the UK's big centralised power stations, two thirds of the energy in the fuels used is thrown away as 'waste' heat in cooling water, cooling towers and then in the electricity transmission and distribution wires. That is 65% of the energy lost before it even reaches businesses, factories or homes. If instead we locate energy production close to where it is used, it is possible to use both the heat and electricity generated and more than double the efficiency of our power stations. Such a 'decentralised' energy system, working hand in hand with renewable energy sources and more efficient end use, tackles head on the challenges of climate change, energy security, and cost. The last Energy White Paper recognized the need for radical change in this area: "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."[5] Indeed, Greenpeace maintains that the only real solution to meeting our energy needs sustainably is such a reform of the current centralized energy system.

For its part, nuclear is a red herring in the energy debate, a dangerous and expensive distraction from the real solutions. As the Secretary of State for Trade and Industry launching the 2003 Energy White Paper said: "If we achieve a step change in both energy efficiency and renewables we will be able beyond 2020 to move to 2050 without the need for a generation of nuclear power stations…"[6] Clearly that step change has not happened, but nor was it expected to happen in just 3 years. Patrica Hewitt MP, the then Secretary of State for Trade and Industry also made it clear in the House of Commons that a renewed push for nuclear power could well ensure that it never happens. Hewitt said:

"It would have been foolish to announce…that we would embark on a new generation of nuclear power stations because that would have guaranteed that we would not make the necessary

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[2] "True price of UK's nuclear legacy: £160bn Fresh analysis shows mushrooming cost of clean-up" by Jason Nissé. *The Independent* 2 April 2006

[3] "Nuclear Power 'Can't Stop Climate Change'" by Geoffrey Lean, *The Independent*, June 26, 2004

[4] http://www.guardian.co.uk/science/story/0,3605,1688034,00.html

[5] Our Energy Future – Creating a Low Carbon Economy, DTI, 2003, p16

6 "Five years for green power to prove its worth: Ministers throw down gauntlet on alternative to nuclear comeback", by David Gow, Tuesday February 25, 2003; *The Guardian*

investment in both energy efficiency and renewables. That is why we are not going to build a new generation of nuclear power stations now."[7]

In this submission, Greenpeace draws on the findings of two recently commissioned pieces of modeling work to show that nuclear power is unnecessary, and that a combination of decentralized energy, energy efficiency and renewable energy can meet our energy needs and the government's energy policy goals more cheaply, easily and safely. Many other independent studies and scenarios support this view.

Firstly we examine the promises of the last Energy White Paper, and where the government should be doing more to fulfill its existing targets and policies. We then turn to each of the 5 key issues raised in the consultation document:

- Reducing CO2 emissions;
- Ensuring reliable energy supply, and the issue of dependence on gas imports;
- Nuclear;
- Carbon Abatement and other low carbon technologies;
- Affordable heat.

A list of possible (rather than prescriptive) policy delivery mechanisms can be found in Annexes 1 and 2. Further annexes provide more detailed discussion of the issues around nuclear power and the full findings of our two recent reports on energy scenarios for the UK and for London.

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2. GOVERNMENT FAILURE TO IMPLEMENT THE PROMISES AND POLICIES OF THE 2003 WHITE PAPER

If the government is genuinely concerned about climate change and energy security then it should be addressing the failures in policy development and implementation since the 2003 Energy White Paper – where measures to support a sustainable low carbon economy have been dropped (eg. The ten year solar PV programme scrapped after 3 years), watered down (eg. European Emissions Trading cap and Building Regulations), compromised (eg. Renewables Obligation) or neglected (eg. failure to reform OFGEM and uncertainty over nuclear new build). It must also stop promoting emissions growth in other sectors (eg. air and road travel) that swamp any reduction that low carbon technologies might deliver.

The government would do well to strengthen and pursue the following existing policies and targets with significantly increased commitment and resources rather than getting distracted with the prospect of nuclear power solving all their problems. (Some possible policy delivery mechanisms are outlined in Annexes 1 and 2.)

- **10% of electricity generated from renewable energy sources by 2010 (with an aspiration to obtain 20% by 2020)**

It is likely that the Government will miss its target for generating 10% of electricity from renewables by 2010 that was set out in the 2003 Energy White Paper. In contrast, Spain

[7] Hansard; 24 February 2003 : Column 32

increased its 2010 target for renewables to 12.1% in 2005.[8] The UK still has only 1.3GW of wind power installed, compared to Spain's 9GW, and Germany's 17GW.

The Government's main support mechanism for renewables, the Renewables Obligation, has incentivised onshore wind, but has failed to support adequately other renewable technologies. It also fails to tackle the inefficient and outdated regulatory regime that discriminates against the smaller-scale renewable technologies essential to a clean, decentralised energy system.

The Government provided capital grants for the first round of offshore wind developments, but failed to provide support for the second round where most capacity was expected, and it failed to alleviate sufficiently the cost of connection to the National Grid. It also failed to alleviate the level of risk premium required by investors because of the instability of Renewable Obligation Certificate (ROC) prices available under the RO. As a result, several large scale consented projects are unlikely to be built. The Government pledged £50 million for research and development of wave and tidal power, but so far little or nothing has been to done to incentivise these potentially crucial technologies in the market place.

• 10GW of combined heat and power generation by 2010

The Government has failed to aid development of combined heat and power (CHP) generation, cited as a major contributor to the 10% renewables target, particularly after the CHP industry was devastated by the New Electricity Trading Arrangements (NETA). As a result, very little new CHP capacity is being built. Yet The Netherlands increased its use of combined heat and power so successfully that in the period from 1985 to 1995 it grew to be the biggest single source of generation in Holland and according to the government will continue to grow playing the most important role in the Dutch energy system[9]. It also played the most significant role of any policy instrument in reducing CO2 emissions in the Netherlands in the period 1990-2000 and was the most cost efficient policy instrument for reducing emissions[10]. As a key element of accessing the benefit of DE, the neglect of UK CHP has been particularly damaging.

• 20% improvement in energy efficiency in households by 2010

The policy mechanisms for delivering CO2 reductions from households are inadequate. While the 2003 White Paper expected around 10MtC of reductions per year by 2010 to come from energy efficiency, the Energy Efficiency Commitment is expected to deliver just 0.7MtC of savings per year by 2010. The Government has scaled down energy efficiency requirements in the new Building Regulations, and a new home built to new UK building regulations will use on average 65% more energy than a new home built in Sweden to Swedish building regulations.[11] ODPM also backtracked on key commitments to ensure energy efficiency improvements during the refurbishment of existing houses – these will now be required only on buildings larger than 1000m2, which will let most houses off the hook. While each new home is currently responsible for on average 3.057 tonnes of CO2 per year (from energy use in the home)[12], existing homes are responsible for around twice this figure.

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[8] Ernst & Young, 'Renewable Energy Country Attractiveness Indices' 2005

[9] *On the essentials of Combined Heat and Power* (CHP), personal research paper, Kees den Blanken, Director Cogen Nederland.

[10] *Ibid*

[11] Comparison of elemental U-values requirements for new build, Appendix 2 of *Putting Climate Change at the Heart of Energy Policy*, EST, 2002 (Sweden averages 0.19 and England and Wales 0.31. NB This requirement is unchanged in the 2005 revision of Part L of the Building Regulations)

[12] *One Planet Living in the Thames Gateway*, WWF and Bioregional, 2003 (p47)

• £150 million ten-year programme for solar panels on 70,000 domestic roofs and 1,400 larger buildings

The current Government support programme for solar energy is to be wound down six years early, despite attracting major private sector investment in solar PV manufacturing. The programme spent just £31 million of the £150 million committed in 2002.[13] The UK has only 7.8MW of installed solar PV capacity compared to the stated commitment to match the solar capacity of Germany's 794MW and The Netherlands' 48MW as well as that of Japan.[14] [15]

The "Clean Low Carbon Transport" vision outlined in the 2003 Energy White Paper

The Tyndall Centre recently concluded that if aviation continues to grow at its present rate then all other sectors will have to reduce emissions to zero in order to meet the Government's 2050 carbon reduction targets.[16] The Government's Aviation White Paper states that it wants to encourage growth at airports across the country, predicting a three fold increase in passenger numbers by 2050 "if sufficient capacity were provided"[17]. The White Paper states "The Government invites airport operators to bring forward plans for increased airport capacity in the light of the policies and conclusions set out in this White Paper. In doing so they are asked to produce new or revised airport master plans as quickly as possible".

As pointed out by the House of Lords EU-Sub committee on Environment and Agriculture, "It is extraordinary that on the one hand the Government is concerned with climate change and on the other it's encouraging a rapid increase in air travel".[18]

The Department for Transport predicts a 20 – 25% rise in traffic on UK roads by 2010.[19] In response, the Government proposed as part of its 10 year transport spending plan to widen 360 miles of the road network, build 80 new trunk roads and 100 new bypasses on trunk or local roads. In addition, tax on fuel has been frozen for a number of years since the abolition of the fuel tax escalator and there are no plans to put in place mandatory fuel efficiency standards that would bring UK vehicle efficiency in line with the EU average.

The role of technology versus targets in the effort to protect the climate.

Recently Mr. Blair has advocated new, clean technologies as a way of combating climate change, apparently down-playing the role of binding international agreements on CO2 emissions like Kyoto Protocol. Even if one were to accept this questionable approach - which closely matches that of the USA (hardly a leader in the global fight against climate change - it can scarcely be

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[13] Renewable Power Association press release, 'Government U-Turn Threatens solar PV Industry', 2 March 2005

[14] Eurobserv'ER, Photovoltaic Energy Barometer, www.energiesrenouvelables.org/observer/stat_baro/erec/baro166.pdf

[15] '*United Kingdom: PV technology status and prospects'* Gary Shanahan, Renewable Energy Development and Deployment Team, Department of Trade and Industry 24th July 2003 http://www.oja-services.nl/iea-pvps/ar02/gbr.htm (last accessed 12/04/06)

[16] Anderson, Kevin, Bows, Alice and Upham, Paul. Growth scenarios for EU and UK aviation: contradictions with climate policy. Tyndall Centre for Climate Change Research. University of Manchester. 2006

[17] '*The Future of Air Transport – White Paper and the Civil Aviation Bill'* – 16th December 2003

[18] Lord Renton of Mount Harry, Chair House of Lords EU-Sub Committee on Environment and Agriculture, 10 November 2004

[19] *'Managing Our Roads'* - Department for Transport, 2003

credible when the UK Government's approach to cultivating new renewable technologies where we have a strategic advantage has been so poor. The UK has systematic advantages in cultivating new marine renewables like offshore wind, wave and tidal (see section 5, employment potential) but these have been lost – the first new wave farm will be built in Portugal and offshore wind in UK has stalled. Thus the Blair policy appears to be to shift UK from adopting a policy where progress is slow, to a different policy approach where we are already in the process of failing.

3. REDUCING CO2 EMISSIONS

Firstly it should be recognized that the Government has probably underestimated the scale of the challenge when it comes to cutting carbon emissions. It appears more likely that we will have to reduce emissions by *more* than 60% globally by 2050 to ensure that we stabilize CO2 at below 380ppm in order to limit global temperature increases to below 2 degrees C above pre industrial levels. In order for us to stay within these limits, global emissions must peak and start to decline by 2015. The International Climate Change Task Force recently concurred that there may be as little as 10 years for us to get emissions under control or face climate change going out of control.[20]

Greenpeace, along with all the major environment and development NGOs, is calling on the government to adopt an annual Carbon Budget, which sets emissions limits across all sectors of the economy to ensure concerted action that will bring down carbon emissions at the rate of 3% a year, every year.

One look at the scale of carbon reductions necessary, and the urgency in achieving those cuts shows that nuclear – due to its long build times and small contribution to overall energy supply (see section 5 below) - has no real role to play in tackling climate change.

Many energy scenarios, including that outlined in the 2003 Energy White Paper, have shown how it is possible to achieve deep cuts in carbon emissions without nuclear power:

- In 2000 the Royal Commission on Environmental Pollution published an in depth report on how the UK could meet ambitious long climate change targets. It developed two scenarios in which 60% cuts in carbon dioxide could be achieved by 2050 without nuclear power. At the same time as concluding that the UK should commit to 60% cuts it stated that: *'New nuclear power stations should not be built until the problem of managing nuclear waste has been solved to the satisfaction both of the scientific community and the general public'*[21]
- The 2002 PIU working paper on Energy scenarios to 2020 had four scenarios, and it was two non nuclear scenarios which achieved *'significant reductions in carbon emissions, in line with what would be needed to meet the Royal Commission on Environmental Pollution's suggested target of a 60% reduction from current levels by 2050'*[22]
- The Energy Saving Trust, commenting on these PIU energy scenarios in its submission to the Energy White Paper, said: *'…with reasonable advances in energy efficiency and*

[20] Climate crisis near 'in 10 years'" by Alex Kirby *BBC News website*, 24 January, 2005, (see http://news.bbc.co.uk/1/hi/sci/tech/4202649.stm)
[21] RCEP(2000) *Energy- The Changing Climate*, The Stationery Office.
[22] PIU working paper:
http://www.strategy.gov.uk/2002/energy/workingpapers.shtml

renewables , it is clear that carbon reduction of 30% or more can be achieved even with the expected rate of closure [of nuclear stations]'[23]

Recent modelling commissioned by Greenpeace and undertaken by the World Alliance for Decentralised Energy[24] (see Annex 6) quantifies several possible scenarios for the future UK energy system, putting numbers to the options so that the choices can be clearly compared on the most important criteria: cutting carbon emissions; energy security (especially natural gas consumption); investment cost; and the impact on consumers' electricity bills.

In particular the model directly compares a decentralised energy future, where 75% of new capacity is decentralised, against a centralised generation energy future where all new capacity is centralised and in which nuclear power is pushed forward at an ambitious rate.
Compared to the nuclear power scenario modelled, the decentralised scenario is:

- **Cleaner** - CO2 emissions are 17% lower in the decentralized scenario than in the nuclear scenario.

- **Cheaper** – The overall capital costs are over £1 billion lower in the decentralized scenario than in the nuclear scenario and the retail costs of electricity to the end user are lower too. Note that the model does not include the cost of managing nuclear waste, so in reality the cost advantage of the decentralized scenarios will be much greater than the £1bn. Recent estimates of the existing nuclear waste cost are as high as £70 billion.

Total demand for electricity is assumed in both scenarios to grow in line with DTI projections. In practice there is much that could be done to reduce demand by 2023 – indeed demand reduction is likely to be the most cost-effective means of improving security of supply and reducing CO_2 emissions. One of the variant scenarios investigated this and reached the conclusion that even more significant advantages are possible when energy efficiency, more ambitious renewables development and a decentralised energy system are combined. In this scenario, with bold energy efficiency and more ambitious renewable growth, CO2 emissions were cut by 30 % and the total investment cost was £18 billion less[25], all compared to the centralised nuclear baseline scenario modelled. Meanwhile retail costs were the same as this centralised nuclear baseline scenario.

Another recent Greenpeace commissioned report, Powering London into the 21st Century, by PB Power[26] (see Annex 7), assesses the opportunity for decentralised energy including combined heat and power in London. It models scenarios to predict the emissions reductions and gas consumption of a DE approach when compared to the predicted results for London of a national programme of new nuclear power. It shows that London, the largest city in Europe, could slash its CO_2 emissions by adopting a dynamic decentralised energy policy, at the same time as consuming less gas and vastly reducing its reliance on centralised fossil fuel generation – all without any need to rely on new nuclear power and before energy efficiency/demand management measures are applied.

Key findings are that CO_2 emissions from London could be reduced by over **27.6%** from current levels by using a range of existing DE technologies and without new nuclear power stations being built. This reduction is in line with the Government's target of a 60% reduction by 2050, even though it uses a number of conservative assumptions. CO_2 emissions from London could be

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[23] Energy Savings Trust (Sept 2002) *Putting Climate Change at the heart of Energy Policy*. http://www.est.co.uk

[24] Decentralising UK Energy: Cleaner, Cheaper, More Secure Energy for the 21st Century, Greenpeace, 2006

[25] The main reason for the additional cost advantages of this bolder vision (called the Greenpeace scenario in the report) is that the reduction in energy demand through efficiency reduces in turn the overall amount of new capacity needed. So less new power plants are built and the cost is less. Many energy efficiency measures themselves can also have negative cost (i.e. they save more money than it costs to implement them).

[26] Powering London into the 21st Century, Greenpeace, 2006 (LINK)

reduced by nearly **32%** by using a higher deployment of DE technologies and assuming some newer technologies become commercially established, once again without new nuclear power stations being built.

It is clear from the findings detailed above that decentralized energy generation has enormous potential for cutting carbon emissions. This is because:

- The fuel efficiency of decentralised energy is generally higher than of centralised generation, because localised energy generation allows for the use of both the heat and power outputs of the process. Consequently, a decentralised energy system requires less generating capacity and uses less fuel to meet the same electricity demand.

- Generating electricity near the point of use reduces the electricity network required, so it avoids network losses and reduces the transmission and distribution costs of power plants. This is especially relevant to the UK, because most demand growth for electricity over the coming 20 years is expected in urban areas like the Southeast. In these areas the national grid is already close to capacity and so significant new investment to upgrade it would be required for new centralised generation.

- Decentralised energy requires less backup capacity than centralised generation because, unlike a system consisting of a few large power plants, a system of many small generators cannot suffer a major impact from the outage of a single generator. This also means that electricity supplies under a decentralised system are more secure.

It also tends to be a cheaper way of achieving emissions reductions than the centralized, nuclear route, as generating electricity near the point of use reduces the electricity network required, so it avoids network losses and reduces the transmission and distribution costs of power plants. This is especially relevant to the UK, because most demand growth for electricity over the coming 20 years is expected in urban areas like the Southeast. In these areas the national grid is already close to capacity and so significant new investment to upgrade it would be required for new centralised generation.

Energy Efficiency

While there are massive opportunities for cutting emissions by addressing heat loss and transmission loss on the energy supply side, it should not be forgotten that energy efficiency on the demand side has been shown time and again to be the cheapest way of securing emissions reductions. As the last Energy White Paper noted: “the cheapest, cleanest and safest way of addressing all our goals is to use less energy. We have to improve energy efficiency far more in the next 20 years than in the last 20;”[27]

Dr Kevin Anderson, Senior Research Fellow at the Tyndall Centre for Climate Change Research, also rejects the argument that nuclear power is the only way for Britain to meet its greenhouse gas targets: “That argument is way too simplistic. We can easily deal with climate change without nuclear power… If you've got money to spend on tackling climate change then you don't spend it on supply. You spend it on reducing demand."[28]

US researchers have estimated that for the same investment, energy efficiency can achieve up to 10 times more carbon savings than nuclear power.[29]

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[27] Our Energy Future – Creating a Low Carbon Economy, DTI, 2003, p16

[28] “Nuclear power 'cannot tackle climate change'”, by David Adam Tuesday January 17, 2006; *The Guardian*

[29] *Nuclear power: economics and climate-protection potential,* Rocky Mountain Institute, 2005 *http://www.rmi.org/images/other/Energy/E05-08_NukePwrEcon.pdf*

Yet government progress on domestic energy efficiency, in particular, seems to have stalled. There is much more that could be done to ensure that buildings waste less energy, through tougher regulations for new build and greater efficiency incentives for existing stock. Zero emissions developments already exist in the UK and elsewhere, using locally and renewably generated heat and power, along with highly efficient electricity and heat generation and delivery infrastructure. Calculations by Bill Dunster, the architect of BedZED (the largest zero emission community in the UK, comprising 100 homes in South London) show that, through economies of scale and supply chain efficiencies, the cost of Zero Emmission Developments can be equal to standard houses when 5000 units are built. This is a very small proportion of anticipated build capacity over the coming years.

The predicted scale of housing developments in the UK provides an exceptional opportunity to develop alternative models of energy supply and to drive the small scale renewable energy market. A recent government report suggested that 210,000 new homes will need to be built each year in England to meet rising demand for affordable housing.[30] If we build 210,000 homes a year to current standards, we will be pumping out an extra 28.9 million tonnes of CO2 each year by 2050. This represents a 19% increase on the UK's current total CO2 emissions – clearly incompatible with a 60% cut by 2050.

Meanwhile, London Mayor Ken Livingstone is forging ahead of central government and has committed as part of his Energy Strategy for London to ensuring at least one major zero emissions development in every London borough by 2010. He has also promised to make both the 2012 Olympics and the Thames Gateway development (should he be devolved control over that project) as close to zero emissions as possible, and has directed planners in London that "major developments should be zero emissions developments."[31]

Britain's primarily Victorian housing stock is notoriously energy inefficient. But there are a range of measures that government should be taking to improve the efficiency of the nation's existing homes. These are primarily demand side incentives - a reduction in VAT on all energy efficiency goods to 5%; Local Authorities (and all public bodies) to be given Best Value Performance Indicators related to energy efficiency; the adoption of a reduction in stamp duty linked to a buildings performance at the time of sale; council tax rebates directly linked to a property's performance (as is being piloted in Braintree, Essex and soon due to be adopted by other councils); and support for the development of attractive mortgages linked to energy performance.

Decentralising power, when allied with microgeneration, can also have beneficial impacts on consumer energy awareness and use. Programmes by Government to stimulate greater awareness of efficiency have generally not been a success and this appears to be because underlying assumptions in information campaigns are misplaced and counter productive[32]. New research by the Sustainable Consumption Roundtable on peoples' attitudes to energy on fitting of microgeneration equipment shows that these attitudes can change markedly.

Energy generation – from mini wind turbines, solar panels and air source heat pumps – has been shown to engage homeowners and students to take action to cut energy use. According to the report, households without these technologies failed to understand not just how they used energy

[30] The Barker Review of Housing Supply, 2004
http://www.hm-treasury.gov.uk/consultations_and_legislation/barker/consult_barker_index.cfm

[31] Draft supplementary planning guidance – Sustainable Design and Construction, for the London Plan, March 2005 (p39).
http://www.london.gov.uk/mayor/planning/docs/Sustainable_Design_and_Contstruction.pdf

[32] FUTERRA Sustainability Communications Ltd., 2004. The Rules of the Game: Evidence Base for the Climate Change communication strategy. Climate Change Communications Working Group (DEFRA, EST, UKCIP, Env. Agency, DTI, Carbon Trust).

(100% claimed that switching suppliers was the only way to reduce energy bills), but also failed to link climate change with their own behaviour. Households generating their own energy were shown both to understand, and control their energy use. [33]

Thus in the UK context a decentralised model of power generation is highly cost-effective in its own right, and would act as a stimulator of further action on efficiency and effectiveness of energy use. It cannot be emphasised enough that many studies of energy efficiency indicate that many measures can be taken which have a negative net cost[34]. Decentralised energy generation offers the opportunity to tackle the non-financial barriers – informational, cultural, inertial – in a new and effective way. Other policy measures, particularly ESCos will promote this as well.

4. ENERGY SECURITY

While UK gas reserves are predicted to decline to 20% of current volume by 2025, only 30% of current gas capacity is used for electricity production, begging the question of how a new generation of nuclear plants that may or may not be in operation by that date will be able to contribute greatly to energy security when they can only contribute to electricity production.

In the meantime, it is most likely that the UK will secure gas supplies from countries close to home like Norway or though the recently expanded interconnector to the Continental Shelf.

- The EU is surrounded by major gas exporting nations competing to supply the European Market.
- The gas industry is making investments in Liquid Natural Gas (LNG), cutting dependence on piped gas.

The key to ensuring our long term security is not to dive headlong in to nuclear, it is to acknowledge the role of gas in the decades to come and upgrade our energy system (including both heat and electricity) in order to make the most efficient use of our remaining gas supplies and the imports we receive. The most efficient use of gas lies in generating heat and electricity close to the point of demand though Combined Heat and Power units that are capable of achieving double the efficiency of the most modern Combined Cycle Gas Turbine plants that are being built today. Decentralising the energy system will not only help make dramatic inroads in to our overall energy demand, by doing so it will do more for ensuring our energy security than any number of expensive nuclear power stations.

Our current, centralized energy model is poorly equipped to ensure the security and reliability of our energy supplies, because:

- It makes highly inefficient use of the primary energy inputted, thereby unnecessarily driving up primary energy demand
- It leaves us dependent on a few energy sources, most or which must be imported, that create security of supply risks:
- Small incidents have major impacts on a centralised grid leading to major and costly interruptions of supply.
- Dependence on fossil fuels leaves the system open to price fluctuations.
- It perpetuates business as usual instead of the innovation urgently required to transform the current outmoded system here in the UK.

[33] The Hub Research Consultants, Oct 2005. Seeing the Light: the impact of micro-generation on the way we use energy, published by Sustainable Consumption Roundtable; a joint initiative od the Sustainable Development Commission and the National Consumer Council

[34] See for example IPCC, 2001. Summary for Policy Makers working group III Table 1. Many examples are also available (by implication) at http://www.est.org.uk/myhome/whatcan/calculate/

On the other hand, the 2003 Energy White Paper found that: "Renewables and smaller-scale, distributed energy sources – eg micro-CHP and fuel cells – will help us avoid over-dependence on imports and can make us less vulnerable to security threats."[35]

Decentralised energy also requires less backup capacity than centralised generation because, unlike a system consisting of a few large power plants, a system of many small generators cannot suffer a major impact from the outage of a single generator. Under the current system, immediately available back-up capacity – known as spinning reserve - must be ready to cover for the loss to the system of the single biggest generating unit in the network. Currently in the UK that means that part loaded coal plants are kept running as they are necessary to back up Sizewell B nuclear power station. This creates an over-specified – and expensive – transmission and distribution network. It also means that electricity supplies under a decentralised system are more secure.

If the government is concerned about increased dependence on gas (whether imported or not), then the answer lies not with centralized fossil fuels or nuclear, but with a decentralized, diverse system that uses less primary energy, and therefore less gas. Recent modelling by PB Power (see Annex 7) showed that London's projected heat and electricity demand could be met without assuming any exceptional demand-side energy efficiency gains while using **23.6%** less (low DE scenario), or even **35.5%** less (high DE scenario), primary energy than in the high nuclear scenario.

Moreover, despite the use of natural gas for CHP as a proportion of overall fuel mix and the increased use of gas in power stations (without the nuclear contribution) London's overall gas consumption would fall and would be **7% lower** (low DE scenario), or even **14.9% lower** (high DE scenario) than for the centralised high nuclear scenario.

The report also shows that the high efficiency of DE will result not only in a lower consumption of natural gas but also a the use of a wider variety of energy sources, many of which are based on local supplies, thus enhancing energy security. These findings suggest that the most effective way for London to reduce its CO_2 emissions and increase its energy security is by adopting a DE pathway.

WADE's modelling of UK future energy scenarios demonstrated that under a decentralized pathway, gas consumption would be 14% lower than under a centralized nuclear scenario. If energy efficiency, more ambitious renewables development and a decentralised energy system are combined, gas consumption could be cut by 25%.[36]

5. NUCLEAR

The problems with nuclear power in brief:

Timing – the first new reactor in any new build programme would not come on line until 2017-2018 – that's using even the most optimistic estimate of the nuclear industry.

Construction time and CO2 offset – a replacement programme of 10 reactors would offset 4% of total UK CO2 emissions. Twenty plants would offset only 8% by 2035. To build 20 reactors by 2035 would entail one reactor being built every 1.4 years from next year – a totally unachievable target.

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[35] Our Energy Future – Creating a Low Carbon Economy, DTI, 2003, p9

[36] *Decentralising UK Energy: Cleaner, Cheaper, More Secure Energy for the 21st Century*, Greenpeace, 2006

Costs: a programme of 10-20 reactors would entail upfront commitment of at least £17bn-£34bn (for construction alone) to untried, untested reactor designs. None of the reactors proposed for the UK have been built or operated anywhere in the world.

Waste – ten new reactors alone would quadruple amount of high level radioactive waste and spent fuel created the UK would have to be deal with. It would increase the amount of radioactivity in the wastes, above that in all the wastes that currently exist, by 150%.

No waste repository – there is no operating repository anywhere in the world for high level waste and spent fuel – disposal plans are not based on proven technologies or operational experience.

Liabilities funding: there is no legally binding requirement for the industry to set aside sufficient amounts for funding decommissioning and waste management. UK legislation currently allows for future private nuclear operators to be bailed out (again) by the taxpayer.

Licensing –The nuclear industry wants major issues such as environment, safety and security to be purely the domain of the Nuclear Installations Inspectorate closed door system – leaving only 'local' matters for planning inquiries.

Security – proposed amendments to the regulation of 'sensitive nuclear information' will include either the vetting, or exclusion, of anyone wanting to see vital information on issues that can impact on health and safety.

Manipulation of the market – in addition to changes on licensing and planning, in the longer term the industry wants mechanisms in place which it give a guaranteed price. This is contrary to the policy on a liberalized energy market.

Taxpayer subsidies:– the industry is looking for Government guarantees and support for construction, insurance and nuclear decommissioning and waste liabilities. These will be challenged under EC state aid rules

Terrorism – a new build programmes would mean more reactors, spent fuel stores and transports of highly radioactive wastes continuing up to 2185 – all would provide targets for terrorist groups.

Proliferation: the majority of nuclear technology and materials are dual use capable - they can be used in civil or military programmes. Advocating nuclear power here as a solution to climate change will encourage the spread of dual use technology and materials.

Public opinion – the majority of people are against nuclear power and would like to see more renewables and energy efficiency instead.

Summary

The 'relevant questions' posed by the Energy Review on nuclear power are:

> *are there particular considerations that should apply to nuclear as the government re-examines the issues bearing on new build, including long-term liabilities and waste management? If, so what are these and how should the Government address them?*

The brevity of this question implies either a disconcerting lack of understanding or disregard of the many other 'issues' surrounding nuclear power. Just a few of the other questions which constantly arise in relation to nuclear power are:

- Can it deliver on time – and how much can it really contribute to CO2 reductions from the UK electricity sector?
- What are the costs for the whole project – from construction, through decommissioning, to final waste management programmes?
- What financial support from the Government does the industry need – and is that compatible with a liberalized energy market *and* legal under EC competition laws?
- What are the security and civil liberties implications of new build?
- What would be the impact of an accident?
- Are there proliferation implications if the UK advocates nuclear power as a solution to climate change?
- Does the public want nuclear power?

Timeliness in reducing CO2. A key question on the nuclear industry is not just whether or not it can deliver, but whether it can deliver enough, on time, to be a serious player in reducing carbon emissions. The SDC report [37]stated that doubling the UKs nuclear capacity by 2035 would only offset 8% of CO2. To double of the current nuclear electricity capacity, by building 20 1GW reactors, is unfeasible in that timeline. On current estimates is it unlikely that even the first new station - assuming a twin reactor site - would be on line (or even partially commissioned) by 2018.

A new build programme is not a timely response to the immediate need to act on implementing the energy systems required to reduce CO2 emissions well before a new build programme would 'take effect' i.e. 2025-2030. Even doubling current nuclear generating capacity will account for only around 1/10th of the Government's targets for CO2 reductions beyond 2020 – up to 80% by 2050.

Licensing: The nuclear industry is lobbying for radical changes to reactor licensing in order to speed up the process of getting design clearance and siting permission. The UK's licensing process is already a closed door process but the proposed changes would even further alienate the public and local authorities by attempting to include major issues such as environmental impact, safety and security in the licensing procedure. Little would be left to discuss at planning inquiries as BNFL advocates in its submission to the Environmental Audit Committee[38].

Costs: On page of 11 of Annex 4 to this submission there is a summary of construction and operational costs for reactors produced for the Environment Agency. The different figures for construction costs, combined with uncertainties over licensing and the future of the energy market in general could have a massive impact on estimating returns for investors.

However, even if the nuclear industry succeeded in reducing uncertainties through a totally closed licensing process and final design sign off before a public inquiry, there significant variables over construction time and costs. These variables in turn would be subject to influence by factors independent of either industry or Government control would continue to create unease in the investment community.

Estimates for new build, drawn from actual costs of past reactor projects indicate prices will be far higher than the industry's figures for new reactors. The costs for waste (including decommissioning, clean-up, storage and disposal) for new build are not quantifiable. Estimates remain estimates.

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[37] http://www.sd-commission.org.uk/pages/060306.html

[38]Activities to Underpin a Predictable timeline for Replacement Nuclear Build.' BNFL, Supplementary Information to BNFL's submission to the Environmental Audit Committee's inquiry Keeping the Lights On: Nuclear Power, Renewables and Climate Change.

Amounts of radioactive waste: Inventories of radioactive waste prepared for the Committee on Radioactive Waste Management (CoRWM) show that a series of ten new reactors would quadruple to the amount of high level radioactive waste and spent fuel with which the UK would have to deal. The increase in highly radioactive and long lived spent fuel would increase the total radioactive inventory in *all* the UK's nuclear wastes by 150%. A programme of ten new plants would also create an additional 100,000 tonnes of depleted uranium wastes.

Liabilities arrangements: Any repository built to take wastes from the existing programme and new build would be a massive subsidy to future reactor operators. Apart from being challenged under state aid laws, it would surely be necessary to make any new build owners factor the additional costs of future liabilities into their financial arrangements.

Liabilities estimates: The nuclear industry is notoriously bad at estimating what it costs to deal with spent fuel, decommissioning, clean up and long term management costs. Recently the estimate of cost to the taxpayer for British Energy's (BE) bailout – which covers only spent fuel - has risen from £3.4bn (2003 figures) to £5.1bn. This is a staggering 30% increase and more than the NHS deficit. Worse still, it does not even fully cover all of BE's liabilities. Decommissioning and clean up costs, which may be borne by the taxpayer if BE cannot meet them, have not yet been disclosed.

The NDA has stated its estimates for decommissioning and clean up are approximately £72bn, not including all spent fuel costs or disposal of plutonium and uranium – nuclear materials which have not yet been designated as wastes. The chair of the NDA has said that dealing with the UK's plutonium stockpile as waste could add a further £10bn to the final bill.

In addition, CoRWM's work on costing different waste management options has thrown up estimates ranging from £7bn-£30bn. The final costs for past and present nuclear activities has been put at £160bn (including some military wastes, but these make up only a small percentage of the total).

Segregated funds: The amount of time taken to build reactors impacts on the time it takes to realise a return on capital. As experience with BE has shown, companies will put investor and shareholder expectations on returns and dividends *before* properly financing segregated funds for liabilities. Due to the lack of legally binding requirements for segregated funds there is absolutely no obligation on the industry to adequately invest in ring-fenced funds for waste and decommissioning costs for nuclear new build - unless segregated funds are made a legal requirement. Because of this, the risk to the public purse of having to bailout future private nuclear operators for liabilities is significant.

Investors and state aid: Even if the Government gives in-principle agreement to new build, it would not necessarily mean private investors would be willing to fund the enterprise. Uncertainty over costs is a significant factor in private sector reluctance to invest in new build. It is highly unlikely that the financial sector would provide capital for new build unless construction costs and liabilities are extensively underwritten by the firm guarantees of public finance. Government subsidies of the order needed to kick start new build, and provide for liabilities, would not be compatible with liberalised energy markets. Moves by the Government to finance new build would be challenged under European Competition law. The recent decision by the EC on the NDA taking over BNFL's liabilities noted that the Commission is 'committed to taking full account of the polluter pays principles in the implementation of state policy' on nuclear liabilities.

Security and civil liberties: Since the terrorist attacks on New York in 2001 the UK government has introduced several new offences in relation to nuclear sites and materials. For example, it is an offence, punishable with up to 7 years in prison, to disclose information the disclosure of which might prejudice the security of any nuclear site or of any nuclear material.

The latest offence tailored for the nuclear industry is under the Terrorism Act 2006 which has made it a criminal offence, punishable with up to one year's imprisonment to trespass on or near a nuclear site.

Such offences will not put off a terrorist bent on attacking nuclear sites or obtaining nuclear material. What they will do is stifle what would otherwise be legitimate debate, exchange of information and peaceful protest. They demonstrate that nuclear power has brought with it a democratic deficit.

Accident – assets very quickly become liabilities: The amount of Government financial support that would be required to facilitate private sector investment in nuclear new build would be massive. It would be a major gamble with public money on a large, centralised energy system which may not provide returns on the investment – and which could rapidly become a liability through accidents or technical failures.

Insurance underwriting by the Government is also 'unquantifiable'. Financial compensation arrangements following a major accident or terrorist attack on a nuclear installation would have to stretch decades into the future and no reasonable estimates can be given for the financial costs of such an eventuality. Little is known about the full scope of security measures and cost associated with the nuclear industry.

Security of supply: There are significant risks that a series of ten or twenty reactors, of an untried and untested design, will not work to expectations. That would mean many years of opportunity to implement workable and clean renewable technologies and energy savings measures instead of nuclear power would be lost. Greenpeace believes that investing a nuclear programme which has many risks attached to it would actually undermine security of supply – not enhance it.

Proliferation: Embarking on a new build programme in the UK would send a signal across the globe that nuclear power is an appropriate response to tackling climate change. Yet the majority of materials and technology used in nuclear power programmes are dual-use – that is they can be used in civil *and* military programmes. Quite simply, spreading nuclear power spreads the wherewithal for nuclear weapons proliferation.

Terrorism: A global increase in the use of weapons usable nuclear materials would serve to further increase the chances of these materials falling into the hands of terrorists. More nuclear reactors here and the attendant spent fuel stores, means more terrorist targets – which could, over time, increase the likelihood of a successful attack on such an installation.

Fuel source: Nuclear power is not a major source of CO2 emissions, but the nuclear fuel chain does give rise to CO2 emissions. Studies have shown that overall the use of nuclear power produces more CO2 emissions than renewable energy sources such as wind. The CO2 emissions associated with nuclear power will increase as companies are forced to use lower grade uranium ores as more accessible, higher-grade uranium reserves are used up.

Public opinion: Nuclear new build is conditional on the development of acceptable solutions to the problems of managing nuclear waste. In addition the public expects and deserves an open process in which concerns about safety and security can be fully discussed. Current proposals run totally counter to this view. There is no 'solution' to the nuclear waste problem – only 'least worst' options. The public is likely to be even more determined in its opposition to new build once it realises the extent of the additional nuclear wastes which will be produced by this form of electricity generation. In addition, the timescale over which hazardous nuclear waste transports could take place, up to 2185, will also be a matter for public concern.

5. CARBON ABATEMENT and LOW CARBON TECHNOLOGIES

The extent to which low carbon technologies, such as renewable energy and microgeneration technologies, can reduce carbon emissions is discussed above, as is the role of decentralizing our energy system in facilitating the use of such technologies. It has also been shown that within a decentralized system, such technologies can deliver better energy security than increased reliance on centralized fossil fuels and nuclear.

It is worth also examining briefly the costs, the employment opportunities and the question of whether it is in fact possible to develop both nuclear and real clean energy solutions simultaneously. We also comment on the role of Carbon Capture and Storage (CCS) in abating carbon.

Costs:

There have been few comprehensive studies comparing the costs of different low carbon generating options, with the most authoritative study of future generating costs still being those quantified by the Government's Performance and Innovation Unit as part their research to inform the Energy White Paper[39]. The PIU concluded that by 2020, onshore wind will offer the lowest generation costs, closely followed by energy crops, offshore wind and Combined Cycle Gas Turbines. Nuclear power and fossil fuels with carbon capture and sequestration internalised in to the cost price did not do so well. The question might well arise as to what has changed to substantially undermine those projections. The only changes would appear to be that fuel prices have gone up. Thus the continued emphasis on support for renewable energy technologies is justified on the grounds that by 2020 they will likely be the cheaper option, as well as the ones compatible with action on climate change and increasing diversity of power supply within the UK.

ETSU's analysis for the DTI's 1998 Renewbles Review assessed the ``practicable potential'' for renewable energy in the UK in 2025, taking account of cost, planning constraints, build rate and network constraints, and concluded that 228 TWh/y was available, equivalent to two thirds of existing electricity demand. Most of this is from offshore wind (100 TWh/y) and wave power (50 TWh/y). The *economic* resource of renewable energy in the UK (recoverable at 4p/kWh or less) in 2025 was estimated at 224 TWh/yr. Seen in these terms, the 2010 target, equivalent to around 35 TWh/yr, looks extremely modest indeed.

The costs of nuclear power are discussed under section 3 above, but it is worth noting that centralized systems by their very nature are expensive, particularly for domestic consumers; a third of domestic electricity bills pays for the actual electricity product, with the rest paying for the centralized system and its administration. Decentralised generation can avoid a large proportion of transmission and distribution costs, but this competitive advantage is currently inhibited by unfair market and regulatory regimes.

[39] Performance and Innovation Unit, 2002. '*The Energy Review*', Table p.199 http://www.strategy.gov.uk/downloads/su/energy/TheEnergyReview.pdf

Employment potential:

As climate change is now an internationally accepted problem the growth in use in Low Carbon Technologies is likely to be considerable. The first movers in the market are likely to gain considerable benefit as Denmark did from wind power and Germany is hoping to do from solar PV. A report commissioned by Greenpeace from Energy for Sustainable Development did a case study of Offshore Wind, finding that if 20% of UK electricity were provided by offshore wind by 2020 it would create nearly 50,000 jobs in that year[40]. This is aside from the export potential that such an industry would have. These jobs arise because renewable energy costs arise to a much greater extent from skilled labour than fossil fuel or nuclear generating stations. Wind generates work in manufacturing, operation and maintenance, rather than revenue flows for fuel costs (which for the UK will increasingly be heading overseas). Moreover, marine renewable technologies require many of the same engineering skills that the UK possesses thanks to its history in the North Sea offshore oil and gas industry, which is now in decline. Other renewables will help provide jobs in areas where they are badly needed. Decentralised biomass generation will provide employment in rural communities as well as a new source of income for farmers. Wave power offers strong potential for the Scottish Highlands and Islands.

The UK could act as a crucible for development of new technologies and skills in much the same way that Denmark has done from the onshore wind market. The UK is well positioned to take advantage of the experience in offshore operations and fabrication as well as the considerable wind resource available to this country. A similar argument could be made about wave and tidal stream power where device developers have set up in UK. Unfortunately the engineering lead set by the UK is likely to be squandered by *ad hoc* short term support. The first commercial wave farm in the world will be built in Portugal even though it is being built by a British firm, and the UK has the best wave resource in the world[41].

Why nuclear power is incompatible with real clean energy solutions:

It has been suggested by some within government that in order to spread the risk and ensure diversity of energy supply, we should replace or even expand our nuclear capacity while simultaneously pursuing a large scale renewables programme and decentralizing our energy system.

However investment in new nuclear capacity represents a huge opportunity cost: first, because greater amounts of CO2 can be cut more rapidly at less cost by existing, off the shelf technologies, ready for application now, and secondly, investment in nuclear capacity will create a significant chill effect. The scale of the financial, political and institutional commitments required to build new nuclear power plants will undermine support for new technologies (such as renewable generation) and more efficient existing technologies (such as DE) and energy efficiency measures; even announcing future investment in nuclear will dramatically undermine a potential global market with significant first mover advantage for the UK.

This assumes that time, money and political attention are unlimited. It fails to account for the effect that nuclear investment would have on both the development of renewables capacity and on the networks needed to deliver a DE system. If there is a limited fund of money (which there must be given the government's limited investment in renewables and energy efficiency under

[40] Offshore Wind, Onshore Jobs, ESD for Greenpeace, 2004

[41] Ocean Power Delivery, 2005. Order signed to build world's first wave farm in Portugal, News Release 19 May 2005. http://www.oceanpd.com/docs/OPD%20Enersis%20Press%20Release.pdf

existing policies) then spending it on nuclear will inevitably undermine or even totally destroy investment in renewable technologies, energy efficiency and decentralizing our energy supply. Moreover, nuclear requires a programme of at least 10 new reactors to make the economics viable, which in turn requires and would lead to a regulatory approach and centralised grid strategy suited to nuclear but not to DE. Government advisers and even ministers have repeatedly recognized the incompatibility of nuclear and renewable energy:

- The Sustainable Development Commission has recently pointed out that *"A new nuclear programme could lock the UK into an inflexible, centralized electricity-generating system for the next 50 years. Investments to develop the electricity networks to cope with more decentralized, small-scale technologies will be suppressed just as their potential is growing."*[42]

- The Performance and Innovation Unit energy review in 2002 stated that "*A large nuclear programme could in practical terms 'crowd out' other options including renewables*" and that "*Nuclear investments are large-scale. Moreover, costs are best reduced if a series of stations can be built to the same design. Nuclear power tends, therefore, to be a relatively inflexible source of carbon savings as a programme of series build would entail considerable investment in large-scale and long-lived plant. A sustained programme of investment in currently proposed nuclear power plants could adversely affect the development of smaller-scale technologies*"[43]

- In 2003 at the announcement of the Energy White Paper, Patricia Hewitt said that *"It would have been foolish to announce…that we would embark on a new generation of nuclear power stations because that would have guaranteed that we would not make the necessary investment in both energy efficiency and renewables. That is why we are not going to build a new generation of nuclear power stations now."*[44]

Carbon Capture and Storage

There is much talk about the potential of carbon capture and storage (CCS) technology as a potential carbon abatement option. The development of the technology is in its early stages, but the number of pilot projects is increasing. However, CCS will not begin in earnest before 2020 and will probably not become commercially viable as a possible effective mitigation option until 2030.[45]

Carbon Capture and Storage raises a number of serious financial, environmental and 'in principle' concerns:

• CCS is expensive. It increases the costs of power generation between 40% and 80% compared with conventional power plants, depending on the location of the plant, the storage site, and the transport and capture technology used.

• CCS technology reduces the efficiency of power plants. Between 10-40% more fossil fuel must be burned when CCS is used to achieve the same power output.[46]

• CCS produces additional long-term costs. Monitoring and verification over the years is necessary to guarantee the retention of the stored carbon dioxide. Even then, opportunities to intervene in order to prevent or control unexpected leakage are likely to be limited.

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[42] *The role of nuclear power in a low carbon economy*, Sustainable Development Commission, 2006.
[43] *The Energy Review*, Performance and Innovation Unit, 2002 (p22 CHECK)
[44] Hansard; 24 February 2003 : Column 32
[45] Prospects for CO2 Capture and Storage, IEA Books, 2004
[46] IPCC SRCCS, SPM (download from: http://arch.rivm.nl/env/int/ipcc/pages_media/ccs-report.html); Chapter 5 – Underground geological Storage

• Leakage not only poses the risk of environmental damage, it may also jeopardize future stabilization targets when CCS is used excessively or if CO_2 is stored in unsuitable storage sites. Studies indicate that for stabilization at 450ppm leakage rates must be less than 0.01% per year to be acceptable for all IPCC emissions scenarios (SRES). In addition, if leakage rates were above 1% per year, the amount of released CO_2 would be higher than the allowable emissions past 2100.[47]
• CCS needs a lot of research for development. There is an increasing risk that investment and funding may be shifted away from renewable energy and energy efficiency improvement.
• CCS poses huge environmental risks if leaks occur, such as water acidification, degradation of marine ecosystems and potential asphyxiation of plants, animals and humans. In the worst case scenario, CO_2 leaking from storage sites could become higher than industrial emissions[48].
• Power plants that store CO_2 could only become a reality in the next 15 to 20 years at the earliest. This means they will not make any significant contribution to protecting the climate until after the year 2020
    • The global applicability of CCS is far from proven. Whilst geological formations in the UK may be relatively well characterised as suitable for this approach, the same cannot necessarily be said of major growth areas of growth in electricity use such as China, India or South East Asia.

Greenpeace opposes any CCS efforts which lead to the following:

• the undermining or threats to undermine existing global and regional regulations governing the disposal of wastes at sea (in the water column, at or beneath the seabed).
• continued or increasing finance to the fossil fuel sector at the expense of renewable energy and energy efficiency.
• the stagnation of renewable energy, energy efficiency and energy conservation improvements
• the promotion of this possible future technology as the only major solution to climate change, thereby leading to new fossil fuel developments – especially lignite and black coal-fired power plants, and the increase of emissions in the short to medium term

CCS may be an option in the future when all the questions have been answered and problems ironed out, but there is an urgent need for immediate action. That action must be the massive and widespread deployment of available renewable energy, low carbon and energy efficiency technologies, which are available right now.

7. AFFORDABLE HEAT and FUEL POVERTY

Cheap energy has proved a poor policy instrument to tackle fuel poverty – more people are becoming vulnerable as energy prices rise. Fuel poverty measures instead need to focus on energy efficiency measures (rather than winter fuel payments). Such measures could be socially prioritised as they have been in Woking, where the council estimates that it supplies heat *and* power to potentially fuel-poor households for 6-7% of the state pension – well below the 10% (for heat only) threshold that the government uses to define fuel poverty. The council uses a district energy network and private wire system, which has made economic use of CHP, a hydrogen fuel cell station and solar PV to power, heat and cool municipal buildings and social housing.[49]

[47] Hepple R.P., Benson S.M. (2003): Implications of surface seepage on the effectiveness of geologic storage of carbon dioxide as a climate change mitigation option.
[48] ibid
[49] *Decentralising Power: An Energy Revolution for the 21st Century*, Greenpeace 2005

Aberdeen City Council has also delivered affordable warmth for council tenants in multi-storey flats via community combined heat and power, and reduced tenant bills and carbon emissions by 40 per cent in the process.

The key to the success of these pioneers is the establishment of local energy services companies which can generate energy and energy savings locally and bill customers directly for an affordable supply. Savings arise for the customer, ESCO and local authority thanks to efficient generation and distribution in local networks, cutting out the energy loss and costs associated with less efficient centralised supply. Profits can be recycled to install more energy generation capacity or energy efficiency measures. Aberdeen City Council now receives income of around £60,000 per year from supplying affordable energy to its tenants.

Low carbon technologies and building design can also deliver significant savings on heating costs. The heating requirements of the BedZED homes in Sutton are around ten per cent that of a typical home built to 2002 Building Regulations, as super-insulation and passive solar negates the need for any central heating system at all, and hot water requirements are met by wood fuel[50].

Greenwich Millennium Village comprises nearly 1100 apartments and 300 homes in what now provides a climate-proof low-carbon model for the rest of the Thames Gateway growth area. An 80 percent reduction in energy use is achieved through a combination of local electricity generation, improved insulation, and energy-efficient devices for the apartments. Greenwich Millennium Village was the first UK private housing development to incorporate a combined heat and power (CHP) system, which provides central heating, hot water, and electricity. Passive design is also important in minimising energy use. The buildings were purposely shaped and positioned to make full use of the sun for both light and heat.

In Denmark a strategy of decentralised energy focused on district heating and improving efficiency in the housing stock has led to an amazing result that the final energy consumption for space heating has *fallen* by over 15%, while the actual floor space heated has *increased* by over 20%.[51]

In the UK, research has suggested that people living in new zero emission homes could each save £94 a year on their energy bills compared with those living in new homes built to current standards (2002 building regulations). This represents a nearly 50% saving.[52]

To have any chance of successfully tackling fuel poverty, the government needs to take urgent steps to improve the energy efficiency of the existing housing stock, ensure highly energy efficient (if not zero emission) new build and make use of decentralised energy systems to reduce heat wastage and cut fuel costs. The government should also develop initiatives to tackle the 9% of households which obtain domestic heating and hot water through electrical equipment. This is an inefficient and wasteful use of electricity, akin to using a chainsaw to cut butter.

[50] BRE Energy Efficiency Best Practice Programme, 2001, *General Information Report 89*
[51] Estimated from table: 'Energy consumption for space heating in households'; published in presentation *Reliable Danish Energy Policy*, Lars Gullev, Danish Board of District Heating, see: http://www.ees.dk/db/files/dbdhs_praesentation.pdf.
[52] *One Planet Living in the Thames Gateway*, WWF and Bioregional, 2003 (p20)