

THE CASE AGAINST COAL-FIRED POWER GENERATION

And the case for real solutions to climate change and energy insecurity

Summary

* The single greatest threat to the climate comes from burning coal. Coal-fired generation is historically responsible for most of the fossil-fuel CO₂ in the air today - about half of all fossil-fuel carbon dioxide emissions globally. (1)

* Coal-fired power generation is the most environmentally damaging means of generating electricity yet devised. In fact, in carbon terms, coal is the dirtiest fuel known to man. (2)

* As we close old coal-fired and nuclear power stations in the next decade we will lose capacity currently providing around 35% of our electricity output. But Gordon Brown recently committed to targets which will require us to generate about 35% of our electricity from renewables alone by 2020. If we hit these renewables targets and ensure we burn fossil fuels efficiently by utilizing the potential for Combined-Heat-And-Power (CHP) and other efficiency measures, there is no energy gap. We can keep the lights on and cut emissions.

* The world's most respected climate scientist, Jim Hansen from NASA, is so concerned about plans for new coal plants in Britain that he took the unprecedented step of writing to the Prime Minister to say that with the decision over whether or not to allow Kingsnorth, Brown has "the future of the world in his hands." (3)

* Coal-fired power generation really is an outdated technology for a 21st century, climate-changing world. Even today, Britain's centralised, inefficient coal-fired power stations waste over two-thirds of the energy they generate. (4) Burning coal in the UK has already halted the decline in emissions seen in the 1990s following the 'dash for gas' and has undermined progress from other sectors in cutting emissions.

* If Gordon Brown gives the go-ahead to a new generation of coal-fired power stations beginning with Kingsnorth in Kent, it will undermine - perhaps fatally - Britain's chances of meeting its climate change targets. If Britain is to cut its emissions by 80% by 2050, the eight planned new coal-fired plants alone will wipe out half of our 'carbon budget.' (5)

* The decision over whether to approve the plant is likely to be the most important climate decision of Brown's premiership. Opening the flood gates to new coal stations now would lock Britain into high levels of emissions for decades to come and signal Brown's surrender on meeting his own climate targets. (6)

* The threat from a proposed new coal-fired plant at Kingsnorth in Kent is the most significant challenge to the new Climate Bill. (7)

* A new coal plant at Kingsnorth will emit more than 8 million tonnes of carbon dioxide every year. (8) That's more than the emissions of the 30 lowest emitting countries combined. (9)

* The old-style conventional technology E.ON want to use will mean that over half of all the energy Kingsnorth would create would be lost, in the form of wasted heat. (10) Compare that with the state-of-the-art power plants they use in Scandinavia which run at up to 94% efficiency. (11)

* Emissions from just the first three of the proposed new coal plants would be around the same amount as ALL of the projected emission savings of an entire new nuclear programme. (12) This just goes to show the government's incoherent approach to tackling energy security and climate change.

* Jim Hansen, director of the NASA Goddard Institute for Space Studies - one of the first climate scientists to warn of global warming, says:

"The only practical way to prevent CO2 levels from going far into the dangerous range, with disastrous effects for humanity and other inhabitants of the planet, is to phase out use of coal except at power plants where the CO2 is captured and sequestered." (13)

* Claims that the Kingsnorth plant will be "ready" to adopt so-called Carbon Capture and Storage (CCS) technology in the future are undermined by the evidence. "CCS" technology is still fraught with uncertainties and the Nobel Prize winning UN Intergovernmental Panel on Climate Change does not expect CCS to become commercially viable on any large scale for decades. (14)

Even the Chancellor, Alistair Darling, told Parliament CCS is *"still in the foothills"* and *"may never work."* (15) There is no commercially operating CCS plant anywhere in the world and the technology remains unproven.

The industry itself forecasts that CCS won't be commercially viable until 2020 at the earliest. Even if CCS became available at this point, it would still mean at least a decade of unabated new coal-fired generation, emitting millions of tonnes of CO2 each year.

* Gordon Brown recently committed the UK to the European deal to create 20% of Europe's energy from renewable sources by 2020. In reality this means that around 40% of our electricity in Britain would come from renewable sources by 2020. This was underlined in an exchange between the executive director of Greenpeace, John Sauven, and the Prime Minister in December 2007 (16):

JOHN SAUVEN - I just wanted to push you a bit further on the EU 20% renewable energy target because I know you're waiting for the EU to report on that, probably in January. Do you accept that for the UK it will approximate at about 15% of total energy which would translate, since most of it would come from electricity, at about 40 to 45% of our electricity coming from renewable sources by 2020.

GORDON BROWN - Yes, I do accept that it would be a very demanding target for Britain and whether it's the figure that you mentioned or a figure around that figure we are going to have to change quite fundamentally.

If Brown means it, Britain could become a world leader in clean energy and slam the door on the energy gap - and all without coal-fired power generation. Any back-up capacity required could come from industrial CHP, which can provide the same electricity output from just nine sites as eight nuclear plants. (17)

* We know large scale renewables can be deployed because already Germany has 300 times more solar power and 10 times more wind power than us. In 2007, Germany's renewables supplied more electricity than all of the UK's nuclear power plants combined. (18)

* Other countries like Denmark and New Zealand, as well as states like California, have adopted 'market-friendly measures' to stop new coal plants without damaging their economies or energy security. The Californian economy has doubled whilst its energy consumption has stayed the same.

* Gordon Brown must rule out coal and set a completely new industrial framework for delivering on his renewables commitments. He cannot afford to listen to the naysaying of his officials in his Business Ministry any longer. Britain needs a massive and successful renewable energy sector to compete in the 21st century.

Myth buster and FAQs

"Carbon capture technology means that cleaner coal exists and is a viable low-carbon fuel."

Carbon Capture and Storage (CCS) technology promises to remove dangerous greenhouse gas emissions from the coal power generation process before it gets into the atmosphere. As such it has been presented as a sort of fossil-fuel Holy Grail. The trouble with CCS is that no-one knows when - if ever - it will be commercially available. At the moment there are only a few small scale demonstration plants.

The whole CCS enterprise is loaded with uncertainties. It doesn't mean it won't happen. But it does mean we have to take a long sober look at what role we assume CCS can play in cutting CO2 in the crucial period up to 2020, when CO2 emissions need to peak.

The theoretical possibility of CCS is being used by government and industry as a smokescreen to bulldoze through new, conventional coal-fired power stations in the UK.

To be clear - Kingsnorth, and others like Tilbury, Blyth, Ferrybridge, Fiddler's Ferry, High Marnham, Longannet and Cockenzie, would each emit millions of tons of CO₂ and are NOT CCS plants. They are plain, old-fashioned coal plants. There is no such thing as "cleaner coal".

"That's not what the industry says."

Well, actually, it depends who you listen to. Centrica says that conventional coal isn't attractive as a generating technology unless CCS is proven:

"We believe that any investment in coal without carbon capture will be increasingly risky. We therefore have no current plans to invest in coal generation without carbon capture." (19)

Centrica again:

"Supercritical technology, while cleaner than technology at existing coal plants, does not represent the cleanest form of clean coal generation without a carbon capture and storage solution, and would still be nearly four times more emitting than IGCC technology with carbon capture. It should also be noted that several clean coal projects proposed in the UK have to date only committed to their plants being "capture ready", rather than developing an integrated carbon capture and storage solution at the same time as the new generation plant. Almost any generation plant can be altered to capture carbon... We believe that government support for clean coal technology should be limited to those plants actually implementing carbon capture and storage, rather than capture-ready." (20)

Privately, E.ON are sceptical too. In an email they sent to officials at the Department of Business on January 16th 2008, the company says that CCS technology at Kingsnorth *"obviously... has no current reference for viability at any scale."* (21)

Other industry voices that have often been supportive of CCS remain reserved about its viability. The CEO of RWE npower, Andy Duff, for example, said:

"At this time there are still many financial, legal, regulatory, and technical hurdles to clear on CO₂ transportation and storage technology." (22)

"OK, but I've heard some leading politicians seem pretty confident about getting it off the ground."

Well, again - depends who you listen to. Business Minister, John Hutton, launching the Energy White Paper on 10th January 2008, told Parliament:

"By 2050 it is possible that most new coal-fired power stations will be able to deploy CCS technology...However, CCS is as yet unproven technology and we have to acknowledge there is some risk that safe and reliable CCS for power generation might not be proven or deployable at scale and at reasonable costs. This could happen if the projected costs turn out to be too high or if it proves to be difficult to develop safe ways to transport and store CO2."

His predecessor (now the Chancellor), Alistair Darling, was equally sceptical. He told Parliament last year:

"Yes, carbon capture and storage, if it can be developed, would help. But at this stage we cannot be certain of that. There is no commercial scale operation of CCS on power generation anywhere in the world." (23)

Also the financial sector has expressed reservations about investing in coal. In America, Morgan Stanley, Citigroup, JP Morgan Chase and Bank of America said lending for coal-fired power plants will be contingent on utilities demonstrating they would be economically viable under future federal rules on emissions. (24)

Standard & Poor's credit analyst David Lundberg:

"There is consensus that CCS will be an integral part of the solution to climate change. However, given its high costs, it will not be economically justified in the near term, when CO2 reduction requirements are likely to be small, and other approaches to CO2 reduction will be less expensive." (25)

All of which is to say that maybe CCS will work and maybe it won't, but either way it won't be ready in time to deliver the immediate cuts in CO2 that climate scientists say we urgently need. Until such time as CCS becomes a reality - energy efficiency, decentralised energy and renewable energy - must be prioritized and rolled out as quickly as possible.

"But if China and India are inevitably going to burn coal for decades to come then we need to become a world leader in 'clean coal' technology and export it to them."

Placing all our hope in making one unproven technology work just isn't a rational position - especially when there are real, tried-and-tested solutions like renewables, decentralised energy and energy efficiency. That's the modern, clean technology we should be exporting to the developing world.

Even if CCS works at some point in the future, China and India are developing so fast that the CO2 emitted in the meantime could be enough to contribute to pushing the world past the key tipping points. Industrialising nations should be supported in shifting to a low carbon energy

system from now - and that means efficiency, decentralisation and large scale renewables.

It's certainly worth mentioning that in the last year, China has been taking renewables much more seriously than the UK. The country's wind capacity grew by 156% to over 6000MW by the end of 2007. That's about 1.5 times the amount the UK has installed ever. They did it in a year!

China is now the fifth biggest user of wind energy in the world. Based on current growth rates, the Chinese Renewable Energy Industry Association (CREIA) forecasts a capacity of around 50,000 MW by 2015! (26)

"Won't the Emissions Trading Scheme sort things out?"

The emissions trading scheme is already up and running and yet we have 7 new coal plants proposed for the UK with at least three of them intended to be burning coal - unabated - by 2012 - the year that the tougher caps for emissions trading come into play. So clearly ETS is simply not working well enough to stop new coal plants.

The danger with ETS is more than this however because once new coal plants are built it will be hard to get rid of them. They become a high carbon cancer in the UK energy system and the UK becomes more and more locked into a high carbon energy system. That's precisely what Stern warned against. Gradually as carbon becomes more expensive the UK will get left behind, lumbered with increasing redundant technology and have less scope to change its system for the really deep CO2 cuts in the longer term.

By the same token we will not have taken the opportunity to develop our own renewable energy resources - having bought in credits from abroad instead - and so we'll be faced in future with buying in renewable technology from abroad and being charged over the odds for it. We will also have missed out on the industrial development and job creation that other countries who are pursuing renewables have already begun to realise.

"The only way we can keep the light on is by building new coal-fired power stations and groups like Greenpeace don't have a solution to our energy problems."

We do, it's simple, it's cheaper and it's working in other countries. And it's not just building wind turbines. We can keep the lights on by investing in energy efficiency, renewable energy and decentralised energy as well as using fossil fuels more efficiently than we do now.

As we close coal-fired and nuclear power stations in the next decade we will lose capacity currently providing around 35% of our electricity output. But Gordon Brown recently committed to targets which will require us to generate about 40% of our electricity from renewables alone by 2020. So if the Prime Minister is telling the truth, there is no energy gap.

Gordon Brown should put policies in place to deliver on the 33 gigawatts of offshore wind his government recently advocated and to kick-start other renewable and decentralised technologies where Britain can lead the world. He should look to deliver super-efficient power stations on the Scandinavian model - ones which are more than 90% efficient and can use both fossil fuels and cleaner fuels like biomass - and push for products and appliances that are designed to use energy more efficiently. If we do that we won't need new coal-fired power stations.

"But where's the evidence?"

There are now dozens of studies, including many by government, engineering consultants, eminent academics and energy industry bodies all showing how this scale of electricity generation could be met through energy efficiency, cleaner use of fossil fuels, renewables and state-of-the-art decentralised power stations like they have in Scandinavia.

A sizable portion of the 'gap' could be closed through energy efficiency alone - delivering a substantial economic savings at the same time. Government figures show that there is the potential to save over 30% of all energy (not just electricity) used in the UK solely through efficiency measures that would also save more money than they cost to implement. Government puts the total saving for consumers for this level of efficiency improvement at £12 billion. (27)

There are several government and industry figures published for the potential contribution from marine power - electricity harnessed from waves and tides. A conservative view based on these, including one of the government's own studies into what could be achieved economically by 2020, suggests that 12% of UK electricity - or 1/3 of the so called 'energy gap' - could be met by marine power in the next decade or so.

According to the government, there is the potential in the UK by 2015 to generate 25% of our electricity using Combined Heat and Power with greater capacity thereafter (28). CHP is a super-efficient way of generating electricity and using the subsequent heat that is otherwise wasted. Combined Heat and Power stations can mix efficient use of gas and coal with other types of cleaner fuels such as woodchip, straw or biogas, further reducing any reliance on gas.

John Hutton has also looked towards achieving 33 gigawatts of offshore wind. (29) The wind industry is confident that this is absolutely do-able. Their magazine, Wind Power Monthly wrote in February 2008:

"Today about 56GW of wind supplies 3-4% of Europe's electricity. That will need to move to 165 GW over the next 12 years, or 13.75GW a year. The challenge is not that great; the industry is already putting up more than 10GW in Europe every 12 months."

In 2007, the US installed 12 times more wind capacity than the UK. Spain 8 times, China 8 times, India 4 times, Germany 4 times and France - double. (30)

“Aren’t renewables notoriously unreliable? What happens when the wind doesn’t blow?”

The operator of the current electricity national grid said, *“...based on recent analysis of the incidence and variation of wind speed, the expected intermittency of wind does not appear to pose major problems for stability...”* (31)

Back up for the electrical grid already exists, because even major power stations have to come off line very rapidly in response to incidents - like safety scares at nuclear power stations such as those experienced in 2007. There is a considerable variability in the demands on the power system which grid operators are well used to managing.

The wind is blowing somewhere in Britain almost constantly. Research using meteorological records by the Oxford University Environmental Change Unit showed that over a 5 year period there was no wind in Britain for only 1 hour in every 5 years. Even then other renewables like solar, wave, tidal, biomass and biogas would still be generating power, with back up from the efficient use of fossil fuels.

Wouldn’t meeting our energy security needs by renewables, decentralised energy and efficiency mean much higher fuel bills for the British public?

Experience shows otherwise. Germany has developed a thriving renewables industry at a tiny cost to the consumer. For around £1 per month on the average household’s bill, Germany now generates 14% of its electricity from renewable sources. Last year German renewables generated more electricity than the entire UK nuclear fleet. Germany also employs a quarter of a million people in the renewable energy industry - bringing huge benefits to its domestic economy. For example, according to Wind Power Monthly (February 2008), sales of turbines, components, and other wind-related equipment to markets worldwide are expected to total some 7.4 billion euros, up from 5.6 billion euros in 2006.

In reality - it’s the rocketing price of oil and gas, not the cost of renewables that explains why fuel bills are on the increase. By developing a sizeable and robust renewable energy industry we are insulating ourselves against further spikes in the cost of fossil fuels, which will become more frequent with increasing demand from the Asian economies.

As time goes on, the “polluter pays” principle will lead to fossil fuels becoming a much more expensive form of energy generation. The cost of carbon, while relatively low today, will rise within the next few years to make dirty fuels less and less economic, while renewables become much

more profitable. In contrast, as mass production gets underway the cost of renewable technology will come down as it has in Germany.

Efficiency measures, which also make the target easier to achieve, will also bring bills down. A report written by a group of energy experts to inform the Government's 2003 Energy White Paper (32) estimated that the UK could save £12bn per year through proven and affordable efficiency measures. This equates to a saving of around £600 per UK household.

"Decentralised energy can't work here."

Yes it can. The government itself describes says DE *"has the potential to contribute to the energy mix and to assist with meeting greenhouse gas emission reduction targets in a variety of ways: making use of the waste heat produced through electricity generation to heat and cool buildings; reducing electricity losses through moving generation much closer to where electricity is used; reducing the need for large transmission and distribution lines with their associated environmental impact; facilitating the use of local renewable energy sources; and encouraging behavioural change through increased awareness of energy consumption."*

Decentralised energy already works on a massive scale throughout Scandinavia and Eastern Europe, for example. There are no technical barriers - only political ones.

"If we don't replace our coal plants, thousands are going to be left jobless."

The truth is that the renewables sector offers a huge opportunity for job creation whereas jobs in the fossil fuel industry simply aren't going to be sustainable in a climate-changing world.

Germany has already created a quarter of a million green-collar jobs and that's just in the past six years alone. Denmark's wind industry alone employs 20,000 and Spain's 35,000. Equally, the US employs literally millions in energy efficiency and renewables. (33) As so often, Britain lags behind.

The potential for employment in renewables far out does the relatively small numbers employed in UK coal burning and experience in the US shows that renewable energy creates more jobs per megawatt of power installed, unit of energy produced, and dollar invested than fossil energy. (34)

"We can have coal and renewables."

This is a political statement. At the moment, because of the conditions the government has established, the market is stacked in favour of coal. Increasingly the government is trying to fix the conditions to make nuclear more attractive too - although at this stage its future remains risky and uncertain. We need Brown to adopt a framework which will deliver on his promise of a successful renewables industry.

A policy framework for renewables and decentralised energy would look totally different from one that supports new coal. It would, amongst other things:

- * Value the efficiency of fuel burn and low carbon heat
- * Value short supply distances so as to avoid the need for expensive transmission and distribution lines
- * Value low carbon emissions
- * Be friendly to power being sold in small amounts, and be easy for small producers to engage with.

But in practice it does none of these things. The government's system is designed to accommodate for large, inefficient and remote power stations owned by large companies like the coal and nuclear utilities. In other words, nuclear and coal power stand like two bouncers at the door blocking the way for renewables and efficiency - and perpetuating our outdated, inefficient and centralised energy system.

Given that no credible person supports continued unabated coal generation in the face of climate science, then the need for low-carbon energy generation seems inarguable - and the barriers almost entirely political.

"If we don't go for coal we'll be dependent for gas on unstable regimes and countries like Russia."

The real threat to our energy security is interruptions to our oil supply. As the Government's most recent energy white paper showed, global gas supplies are becoming more varied and more stable. The UK simply isn't dependent on a handful of rogue states to keep our stoves running. For instance, we currently import very little of our gas from Russia. We do, however, need to build up strategic gas reserves, like they do in other European countries, to protect against future fluctuations in supply.

Proposed new supercritical coal-fired power stations include:

Kingsnorth (1600MW, E.ON, Kent) (Approved by Medway Council in January 2008. Final decision from the Business Minister, John Hutton, expected in October 2008.)

Tilbury (1600MW, RWE npower, Essex) (Scoping studies underway. A Section 36 application to government is expected imminently, possibly in October 2008. Construction for 2014.)

Blyth (2400MW, RWE npower, Northumberland) (Scoping studies underway. A Section 36 application to government is expected in November. Construction for 2014.)

Ferrybridge (Scottish and Southern Energy, 800MW, West Yorkshire) (Scoping studies underway. They plan to get a decision in 2010 to build and have online by 2014. *These plans replaced previous plans to 'refit' 500MW*)

Fiddler's Ferry (Scottish and Southern Energy, 800MW, Cheshire) (At pre-application scoping stage.)

Longannet and Cockenzie (3390MW, Scottish Power, Fife and East Lothian respectively) (Construction for both these plants could start in 2009 if approved to start using in 2012.)

High Marnham (1600MW, E.ON, Nottinghamshire) (At pre-proposal stage. Utility journal, Platts, report that E.ON have approached local MP Patrick Mercer and local residents about replacing the existing plant which was closed in 2003.)

Notes and references:

(1) Jim Hansen, Letter to Brown, 2007. You can view it here:

<http://www.greenpeace.org.uk/blog/climate/letter-to-the-prime-minister-20071219>

(2) Coal is the dirtiest fuel available and produces 0.65 kg of CO₂/ KWh. Source: PB Power www.pbworld.co.uk

(3) Jim Hansen, Letter to Brown, 2007. You can view it here:

<http://www.greenpeace.org.uk/blog/climate/letter-to-the-prime-minister-20071219>

(4) <http://www.greenpeace.org.uk/files/pdfs/migrated/MultimediaFiles/Live/FullReport/7154.pdf> (p.26)

(5) In December 2007, Gordon Brown said he aspired to an 80% cut in emissions by 2050. That would give us a carbon budget of 117.8mt/CO₂/per year. The new coal plants currently proposed - 10.6 GW of capacity - would emit more than 54 million tonnes of carbon dioxide which represents almost half of that quota. (10.6 GW x 7884 hours of generation per year, assuming 90% operational = 83.57 TWH/y. 83.57 TWH/y x 0.65 = 54 mt/CO₂/y)

(6) Coal plants typically operate for 30 to 50 years.

(7) With the government committed to legally binding cuts of 60% in emissions by 2050, this allows a 'carbon budget' of 235.6 mt/CO₂/y. The projected emissions of the new coal-fired capacity would consume 22.9% of that quota.

(8) 1.6GW x 7884 hours = 12.6 TWH/y. 0.646 kg (carbon factor of coal) x 12.6 = 8.14 mt/CO₂/y

(9) CAIT, World Resources Institute <http://cait.wri.org/>

(10) www.eon-uk.com/images/Environmental_Statement_Kingsnorth.pdf

(11) Avedore CHP power station in Denmark is run by Energie2 and runs at 94% efficiency. www.energie2.com

(12) The Sustainable Development Commission of the UK government projected a replacement programme consisting of 10GW of new nuclear capacity would displace 6.7MtC (page 6, <http://www.sd-commission.org.uk/publications/downloads/SDC-NuclearPosition-2006.pdf>)

(13) Jim Hansen, Testimony to the State of Iowa, 2007 http://www.columbia.edu/~jeh1/iowaCoal_071105.pdf

- (14) IPCC, Special report on CCS, 2006 http://www.mnp.nl/ipcc/pages_media/SRCCS-final/ccsspm.pdf
- (15) 23rd May 2007, Launch of the Energy White Paper
- (16) Q&A session, WWF event at the Foreign Press Association, November 2007
- (17) <http://www.greenpeace.org.uk/media/reports/securing-power> Poyry, 19th June 2008
- (18) German Environment Ministry
- (19) WWF 'UK Power Giants' Report, 09/2007
http://www.wwf.org.uk/filelibrary/pdf/uk_power_giants_wwf01.pdf
- (20) Ibid
- (21) Emails obtained by Greenpeace under the Freedom of Information Act - available to view at www.greenpeace.org.uk/coalsecrets
- (22) Modern Power System, June 12th 2007
- (23) 23rd May 2007, Launch of the Energy White Paper
- (24) <http://uk.reuters.com/article/environmentNews/idUKN1445731320080214?pageNumber=2&virtualBrandChannel=0>
- (25) Global Power Report, June 7th 2007
- (26) Global Wind Energy Council -
[http://www.gwec.net/index.php?id=30&no_cache=1&tx_ttnews\[tt_news\]=139&tx_ttnews\[backPid\]=4&cHash=6691aa654e](http://www.gwec.net/index.php?id=30&no_cache=1&tx_ttnews[tt_news]=139&tx_ttnews[backPid]=4&cHash=6691aa654e)
- http://www.offshore-sea.org.uk/downloads/Offshore_Energy_SEA_Scoping.pdf
- (27) http://www.cabinetoffice.gov.uk/upload/assets/www.cabinetoffice.gov.uk/strategy/p_iuh.pdf
- (28) Cogeneration Directive Assessment, DEFRA, November 2007
- (29) Statement from Hutton, December 11th, 2007
- (30) Global Wind Energy Council, February 2008
- (31) National Grid Transco, Seven Year Statement, May 2005
- (32) Cabinet Office, Performance and Innovation Unit, 2002, "*The Energy Review*"
- (33) Environmental and Energy Studies, Institute, Washington DC.
http://www.eesi.org/briefings/2007/Energy%20&%20Climate/11-8-07_green_jobs/EEREJobsFactSheet_11-8-07.pdf
- (34) Ibid