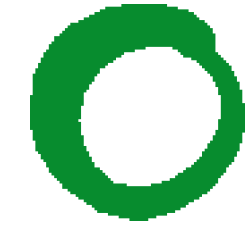
Tackling climate change without nuclear power

A report detailing how climate targets in the power sector can be met without replacing existing nuclear capacity



Friends of the Earth

1. Introduction

1.1 Background

The need to reduce our emissions of greenhouse gases to mitigate man-made climate change is now widely accepted. CO2 is the most significant of the greenhouse gases and the biggest source of this gas is from the burning of fossil fuels to create energy.

In its climate change programme[1] the UK Government sets out how it plans to achieve a 20 per cent reduction in 1990 emission levels of CO2, by 2010. Reductions in emissions in business, domestic, commercial and public sectors rely on reductions in emissions from the electricity supply network and for this reason Government has predicted that **reductions of 29 per cent of CO2 from the power sector are necessary to set us on course for meeting the overall target.**

There is much discussion about whether these targets are achievable and this has led to increased calls from some quarters for Government intervention in favour of a new generation of nuclear power stations. Friends of the Earth does not believe that this is credible as **the nuclear option involves high risks and high costs and cannot be relied upon to deliver**. We have therefore created a model to test the emissions resulting from various future combinations of supply mix and electricity demand. The aim is to use the model to produce credible scenarios that take into account the effect of increasing or decreasing electricity demand and the interplay between the major sources of electricity generation: nuclear, renewables, coal and gas. It will be seen that **it is possible to achieve 29 per cent reduction in CO2 emissions from the electricity generation sector by 2010 and 45 per cent by 2020 without needing to replace decommissioned nuclear plant**.

[1] Climate Change The UK Programme, Nov 2000

1.2 Summary of findings

Using our own model Friends of the Earth has selected a scenario that demonstrates it is possible to meet 2010 electricity sector emissions targets and achieve a 45 per cent reduction in emissions by 2020, without needing to replace lost nuclear capacity. The selected scenario shows that this is achievable through a combination of:

- modest reductions in overall demand for electricity;
- support for renewables and Combined Heat and Power (CHP); and
- market intervention to clean up emissions from the coal power sector.

If support measures, already in place for renewables are extended, then 20 per cent of electricity supply from these sources will be achievable by 2020. Declining use of coal in the power sector will reduce emissions but it will require clear and decisive policy decisions to bring this about as coal use is currently on the increase. The building of good quality CHP plants and new, cleaner, more efficient coal fired stations will ensure that diversity of supply is maintained and also allow domestically produced coal to compete with imported coal.

1.3 Keeping the lights on

The most significant losses in nuclear capacity will occur beyond 2010. It is therefore important that policies are introduced now that set us on the right path for maintaining security of supply and meeting emissions reductions targets into the future. An additional concern is that in 2015 there is likely to be a big dropping-off of coal plant under the Large Combustion Plant Directive. A clear and bold energy policy is needed for the remainder of this decade to enable us to deliver significant CO2 savings to 2010 and to ensure continuing security of supply beyond 2015. Policies need to be introduced now to allow for testing and modification so that they can carry us safely through the next decade.

1.4 Investment in sustainable low carbon technologies

The most important objectives for any energy policy are maintaining security of supply and reducing environmental impacts. The sustainable low-carbon technologies needed to achieve these aims already exist; however, the challenge facing decision makers is how best to encourage the required investment in a market that is currently over-supplied to almost twice the levels necessary to cover peaks in demand. By sustainable low-carbon technologies we mean those that minimise emissions of greenhouse gases and other environmental pollutants and maximise resource efficiency such as renewables, CHP and clean coal technologies – specifically Integrated Gasification Combined Cycle Technology (IGCCT).

1.5 Government support must deliver results

If the correct incentives can be designed and implemented, investment in new cleaner technologies will not only ensure security of supply and help meet environmental targets but will also bring economic development, increased resource efficiency and create jobs.

New industries, given the right environment, can be expected to grow exponentially, as the growth in the global wind power industry is already demonstrating. To achieve these

benefits it is important that there is a high degree of confidence in the industries' ability to respond to the stimulus provided. Prompted by the availability of indigenous gas supplies, technological change and stricter sulphur controls we have already experienced a huge expansion in gas fired power stations over a short period of time in the UK – the "Dash for Gas" added 21GW of capacity in just 10 years and displaced 86 TWh of conventional generation. The wind power industry was supported by subsidies in Europe and the UK and has similarly developed well in a short period of time – in 2001 the industry grew worldwide by 40 per cent.

If we compare this with the huge subsidies provided to the nuclear industry over the past 30 years there can be no confidence that another round of Government support for nuclear will deliver the required results. The last decision, made in 1979, to invest in a new nuclear programme ended with the forced abandonment of ambitious plans to build 10 new reactors, with only one being built with a huge delay and budget overrun.

The last nuclear power station to be built in this country - Sizewell B with a capacity of 1188MW - took 15 years to go from proposal to electricity production and cost more than twice the original budget. These facts swiftly brought to an end plans to build nine more reactors of the same design. In fact we have never built a nuclear reactor in this country on time or to budget or that has succeeded in achieving the levels of performance that were expected. Those reactors that have been built have continually emitted low level radiation to the atmosphere, contributed to a legacy of toxic waste that will last for tens of thousands of years. The reactors are now potentially catastrophic terrorist targets.

Within the new liberalised electricity market in the UK, the nuclear industry is fighting to avoid bankruptcy, and there are strong signs that liberalised markets will not support new build.

Previous energy policies designed around nuclear power have therefore failed to deliver a sustainable, economic low-carbon economy and brought us to where we are today. We cannot afford to make the same mistake again. The question is therefore not whether nuclear power can be replaced but how, and this model addresses this question.

2. The Friends of the Earth energy model

Friends of the Earth decided to conduct original research to answer the statement made earlier this year by the Minister responsible for energy, Mr Brian Wilson:

“Nobody has yet to begun to explain how we meet our emission targets if, at the same time, we are losing the nuclear contribution.”

2.1 Features of the model

We created a simple mathematical model in order to test different scenarios. The main aim was to see if emissions targets could be met while nuclear power was being phased out. The model we constructed used baseline data taken or derived from the Digest of UK Energy Statistics 2001, the Environment Agency's Pollution Inventory and directly from industry publications and has the following features:

- the timeline for the model is 2002-2020

- the model deals with the commercial generation of electricity to meet demand needs of all sectors

- all calculations are based not on generation capacity but on the actual consumption of electricity in TWhs, therefore fixed average load factors have been used to convert capacity into electricity output

- nuclear plant decommissioning dates are integrated to show decreasing contribution from nuclear generation

- variable parameters enable different scenarios to be explored

- it is assumed that gas use will be flexible, making up the remainder of demand once renewables and coal parameters have been set

- baseline figures for 2002 have been taken from the latest data available, ie Digest of UK Energy Statistics for 2001

2.2 Variable parameters

Electricity Demand	
Electricity demand, % annual growth 2003-05 % growth p.a. 2005-10 % growth p.a. 2010-20	These parameters allow us to examine the results of different rates of growth in total electricity demand. The National Grid in its 2001 Seven Year Statement estimates a growth rate of 0.6% (less than the industry's predictions of between 1.4 and 1.7%). Part of the difference can be accounted for by increased energy efficiency and increased deployment of point-of-use embedded technologies such as micro CHP and micro-renewables.
Good quality CHP, MW per year	This parameter allows us to examine the results of different rates of deployment of large scale CHP. The Government's own target is for 10,000 MW of CHP by 2010 requiring a build rate of 625MW per annum – this is less than the peak in 2000 when 844 MW was commissioned but considerably higher than the build rate in 2001 which was only 38MW (av. since 1997 is 312 MW)
Coal burning	**Coal creates up to three times as much CO2 per kWh as gas. Due to increased gas prices and the premium placed on flexible plant by NETA since 2000 coal use in generation has been increasing. The following parameters demonstrate the importance of tackling CO2 emissions from coal if we are to meet our targets.**
Coal phase-out, % reduction per year	This parameter allows us to examine the results of differing levels of coal use in the energy supply system – in the model any supply deficit not met by reductions in demand or increased use of renewables is automatically attributed to gas. Though challenging, the suggested phase-out rate from now to 2020 can be beneficially compared to the phase-out rate in the 1990s and the closure figures used by the DETR in its negotiations surrounding the design of the EU's Large Combustion Plant Directive.
New IGCC capacity	To maintain security of supply and fuel diversity it would be undesirable to phase out coal use completely – this parameter allows us to examine the effect of uptake of the clean coal technology Integrated Gasification Combined Cycle technologies. Gasifiers produce virtually no local and regional pollutants and produce less CO2 per unit of electricity than conventional incinerators. Mixed fuels (eg biomass) can be used to reduce the net carbon emissions still further. Finally, as CO2 is effectively separated in the flue gas, IGCCT offers the possibility of developing capture and storage options in the future.
Coal: % decrease in CO2 per TWh	CO2 emissions per TWh from coal differ according to the efficiency of the plant used and load of that plant. Nearly all coal plants currently in use are old and of low efficiency. and many operate at low loads. This parameter examines the effect of decreasing the average carbon coefficient ($MtCO_2$/TWh) for conventional coal plants (plant efficiencies) year on year either through engineering fixes, or decommissioning dirtier plants and increasing loading at more efficient plant. In the model, this parameter is reflected in the calculations of CO_2 emissions from conventional coal.
Renewables	**There is expected to be an increased deployment of renewable technologies thanks to the incentive created by the Renewable Energy Obligation and to a lesser degree the Climate Change Levy. Deployment rates of these technologies will be dependent on a healthy market for renewables in the long term, effective capital grant schemes and R&D support being maintained.**
New wind capacity, MW per year	Wind technologies will able to compete with traditional forms of electricity generation over the life of the model and this parameter examines the effect of different averaged-out annual build rates to 2020.
New biomass capacity, MW per year	A new capital grant scheme for biomass generation has been announced and it is expected that there will be an expansion in the rate of new build across a range of biomass technologies.
New landfill gas capacity, MW per year	There are already a number of landfill gas generators. The resource is more limited than wind or biomass, but up to 2010 there is capacity for more from this source.
New hydroelectric capacity	Hydroelectric technologies are well established and there is remaining capacity in the UK. The industry estimates that between 150-200MW of new small – medium sized schemes could be installed by 2020. This does not include potential new capacity from pumped storage schemes.
New renewables	New renewable technologies are likely to be commercially available by the beginning of the next decade. These include off-shore wave generators and tidal stream and tidal lagoon generators. The UK is currently at the forefront of these technologies. This parameter examines the effect of differing deployment rates from 2010 onwards.

2.3 Calculating emission reductions

The output of the model shows emission level achieved from different levels of demand and fuel mixes. Emissions reductions from the electricity sector are also shown as a percentage increase or decease compared to 1990 levels.

The contribution this makes to the total level of emissions from all sectors is also shown. In calculating these figures a fixed figure has been used for direct emissions of greenhouse gases from other sectors (eg transport, domestic, public, industry and commercial). Further modelling would be necessary to properly assess the overall likelihood of reaching targets for emissions from all sectors. The Friends of the Earth model seeks to show that a 29 per cent reduction in CO2 by 2010 as outlined in the UK's Climate Change strategy is possible. This is an important plank of the UK's strategy as changes in the electricity sector that have already occurred, including the 'dash for gas' in the 1990s, represent our best hope of meeting our reduction targets.

We have continued trends to beyond the 2010 target date to 2020 to take into account the significant loss of nuclear capacity in the next decade.

Additional policies not considered in this paper will be needed to ensure emissions reductions also occur in other sectors (eg transport) in order that we meet our legally binding Kyoto target.

3. The Friends of the Earth energy scenario to 2020

Using this model we have selected a scenario that enables CO2 reduction targets for the electricity sector to be met without the need for new nuclear capacity and with realistic increases in electricity from renewable sources. This is possible thanks to a reduction in overall demand, more deployment of Combined Heat and Power (CHP) stations and continued clean-up of emissions from the coal-fired electricity sector.

The Friends of the Earth energy scenario is depicted overleaf and the reasoning behind the different values chosen for the variable parameters is described in Section 4 of this report.

This is one possible scenario, chosen to illustrate that emissions targets can be met and security of supply maintained.

Changes in policy would need to be introduced to make this scenario a reality but we believe that the predictions made, although challenging, are entirely feasible.

We are happy to make the FOE model available for others to devise their own scenarios.

FOE Scenario: Reducing rate of demand, cautious renewables targets, ambitious clean-up of coal

CARBON EMISSIONS FROM POWER GENERATION

Adjustable parameters

Electricity demand, % growth 2003 - 2005	0.6
Electricity demand, % growth 2005 - 2010	-0.1
Electricity demand, % growth 2010- 2020	-0.6
High Quality CHP capacity, MW per year to 2010	500
Coal (conventional) phaseout, % reduction per year	9.0
Coal (IGCC) plant MW per year to 2010	400
Coal (conv.): % decrease in CO2 per TWh to 2010	1
New wind capacity, MW per year	950
New biomass capacity, MW per year	150
New landfill gas capacity, MW per year ti 2010	25.00
New hydroelectric capacity	10
New renewable technology from 2010	500

Projected demand

	2000	2001	2002	2005	2010	2015	2020
Total demand (TWh)	389	394	396	404	402	390	378
CHP	0	0	0	9	24	24	24
Grid supply required	389	394	396	395	378	366	354

Electricity generated, by fuel

								Supply		MW capacity
								2001	2020	2020
Nuclear	78	82	75	73	63	27	27	20.8%	7.3%	3688
Gas	144	139	171	183	179	202	182	35.4%	48.1%	31961
Coal (conventional)	115	125	114	86	54	33	21	31.8%	5.5%	3670
Coal (IGCC)	0	0	0	7	18	18	18	0.0%	4.8%	3200
								0.0%	0.0%	
Wind	1	1	3	11	23	36	48	0.2%	12.8%	18608
Biomass	0	0	0	2	6	10	14	0.0%	3.8%	2700
Landfill	2	3	3	3	4	4	4	0.6%	1.0%	702
Hydro	5	4	5	5	5	5	5	1.0%	1.4%	1892
New renewable tech.	0	0	0	0	0	4	9	0.0%	2.3%	5000
Other	25	25	25	25	25	25	25	6.3%	13.0%	

CO2 emissions, MtC	**41.29**	**43.56**	**43.46**	**38.36**	**32.10**	**29.48**	**24.97**
% below 1990 power	-9.05%	-4.06%	-4.27%	-15.50%	-29.30%	-35.08%	-45.00%
% below 1990 total	**-2.57%**	**-1.15%**	**-1.21%**	**-4.41%**	**-8.33%**	**-9.97%**	**-12.79%**
% from Renewable	2.11%	1.91%	2.72%	5.38%	10.23%	16.29%	22.74%
Renewables (TWh)	8.22	7.53	10.77	21.21	38.61	59.56	80.51

4. Description and rationale

This Friends of the Earth energy scenario to 2020 is predicated on the following:

4.1 Electricity demand

The rate of increase of total demand for electricity is already slowing and becoming decoupled from economic growth. The National Grid in its 2001 Seven Year Statement estimates a growth rate of 0.6 per cent (less than the industry's predictions of between 1.4 and 1.7 per cent). We predict the rate of growth will continue to slow, but actual demand will continue rising to 2005; post 2005 demand will start to decrease as energy efficiency measures are taken up and post 2010 demand will decline more steeply.

The work of the Carbon Trust and Energy Savings Trust will encourage increased energy efficiency within industry and the domestic sector. Embedded generation from CHP, PV and other micro-technologies, including wind, will increase steadily throughout the period as Government policies and regulatory changes increase the market for these technologies.

Increased emphasis on energy efficiency within the domestic and industry sectors might be expected to reduce demand more significantly than this; however, savings will be offset by increased use of electrical goods in the home and the office and a shift towards use of electricity in transport vehicles.

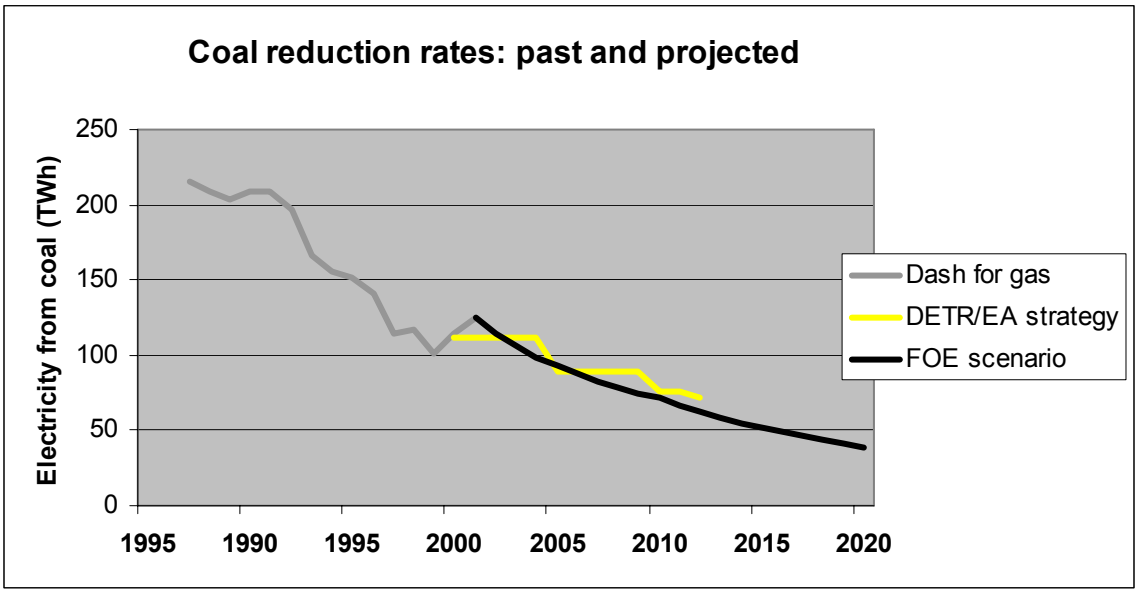
Wholesale prices for electricity will rise again as nuclear and coal plant are decommissioned, and the Government's CHP strategy will provide a premium in the marketplace for CHP. Build rates of CHP can therefore be expected to recover from their all time low in 2001. 500 MW pa is more than the average build rate from 1997 to 2001 but still falls short of the Government's own target of 10,000MW by 2010.

4.2 Coal

The proportion of electricity generated from coal has a significant impact on CO2 emissions. Per TWh, the worst coal stations produce three times more CO2 than does gas. Coal plant without abatement equipment will be forced to close by, at the latest, 2015 by the Large Combustion Plant Directive. Stricter emission restrictions on the power sector to enable us to meet 2010 targets for the National Emissions Ceiling Directive will also come into force. It is difficult to predict exactly how the generating industry will respond – early indications suggest that the favoured options will be to operate increased numbers of plant at constrained load factors and using imported low-sulphur coal. Some retro-fitting of flue gas desulphurisation equipment is also expected but this will reduce overall efficiency of the plant, making emissions of CO2 per unit of electricity even higher. None of these options will do anything to reduce emissions of carbon dioxide.

A key element of the Friends of the Earth energy scenario is achieving a reduction in emissions of CO2 from coal-powered generators. This can be achieved by reducing the amount of electricity generated from coal and at the same time improving operational efficiency.

Although challenging, the suggested phase-out rate of 9 per cent per annum from 2002 to 2020 can be beneficially compared against the phase-out rate in the 1990s and the closure figures used by the DETR/EA in its negotiations surrounding the design of the EU's Large Combustion Plant Directive. The chart below illustrates this.



By factoring in a steady reduction in the proportion of demand that is met from coal, and replacing old coal stations with new gasifiers – large reductions in CO2 are possible. Over 2000MW[2] of new cleaner coal fired power stations (IGCCTs) have already been proposed by a range of companies but increased support will be needed to ensure they become operational.

In addition, by ensuring coal is used in newer, more efficient power stations with increased loads, an improvement in the average carbon coefficient (CO2/TWh) for coal plants is possible. This has been illustrated as a percentage increase in average plant efficiency. This net gain in carbon efficiency accounts for losses in thermal efficiency due to the fitting of flue gas desulphurisation equipment (approximately 1 per cent).

By 2020 these predictions lead to just over 10 per cent of supply being generated from IGCCT and conventional coal plant – this is the equivalent of 6,850 MW of capacity operating at a 65 per cent load factor. Energy Paper 68, in the low gas price scenario predicts a similar reduction to 10 per cent from coal by 2020. Additional back-up capacity could still be maintained on the system as a further insurance against security of supply failure; however, this is not illustrated in the model.

[2] Consultation response by UK Coal plc, September 2001 lists the following:
Dowlais Valley, S. Wales, Progressive Energy, 400 MW
Kellingley, Yorks., UK Coal / Texaco, 420 MW
Wansbeck, N. East, Progressive Energy, 450 MW IGCC
Westfield, Scotland, Global Energy, 120 MW IGCC (CCGT operational 2001)
Westfield, Scotland, Global Energy, 400 MW IGCC
Hatfield, Coalpower, 500 MW IGCC

These predictions, more than any others, are dependent on Government action (see section 5 below).

4.3 Renewables

Predictions about the growth rates in renewables are made on the basis that the renewable obligation will continue to incentivise investment in these technologies to 2020. Increased R&D to bring less close-to-market technologies into the frame by 2010 is the only additional economic measure required.

Renewables will grow in capacity thanks to the incentive created by the Renewable Energy Obligation (REO), targeted capital grant schemes and the Climate Change Levy. The following technologies are already deployed in the market and realistic assessments have been made about their rate of deployment:

4.3.1 Wind Power

Wind will increase at a much higher rate than previously, resulting in 18,265 MW additional wind capacity by 2020. By 2020 13 per cent of electricity generated is provided by wind power. Improvements in planning regimes and the strengthening of the industry's infrastructure will speed rates of deployment throughout the decade – 1000 MW per year is an average figure. A large portion of this capacity will be offshore.

4.3.2 Landfill gas

Landfill gas installations will continue to be deployed but reach saturation point at around 700 MW, giving an average build rate of 25 MW per year for the remainder of the decade tailing to zero beyond 2010.

4.3.3 Biomass

New capital grant schemes for designated biomass plant and the use of co-firing in existing plant will stimulate the market for biomass. The industry is predicting by 2010 realistic new capacity figures of:

100MW dedicated biomass incineration/gasification,
900MW from co-firing in existing coal plant,
150MW from anaerobic digestion and
50 MW from farm waste

This leads to an average build rate of 150 MW per year to 2010 and total of 6TWh by 2010. In the model this build rate is maintained to 2020.

If all 14 TWh by 2020 were to be supplied by specially grown energy crops it would require approximately 900,000 hectares of land, roughly 5 per cent of the 18.5 million ha of land used in agriculture in the UK.

4.3.4 Hydropower

Refitted hydro: The change in the regulations for the REO making refurbishing of existing hydro stations eligible will improve efficiency, producing 6 per cent more electricity from the same plant by 2010, increasing output by 0.6 TWh by 2020. In addition the incentive

created by the REO is likely to stimulate investment in increased numbers of small-scale hydro installations.

New capacity: There is technological capacity for up to 3GW of new hydropower in the UK; however, this is unlikely ever to be realised and the most realistic estimate is the installation of up to 200MW of new hydro capacity in the form of numerous small- to medium-sized installations over the next decade.

4.4 New renewables

The UK is at the forefront of the development of wave and tidal power technologies and by 2010 commercially competitive projects will be coming on line. 500 MW of new capacity per year from 2010 is a conservative estimate and could be made up of 350 MW of wave and 150MW of tidal.

4.5 Limitations of the study

The net impact of decommissioning and commissioning on the capacity of the grid is not included in the model. It is assumed that extra capacity of at least 10 per cent will be maintained for system balancing purposes.

The model is a supply and demand model not an economic model – use of tax and spend measures and regulation allows Government to create the economic environment of its choosing.

Losses of electricity in the transmission and distribution process are included as a fixed percentage throughout the model. Reductions in these losses might be expected as embedded generation increased and generators become more distributed. Transmission loss payment schemes should also incentivise location of plant near centres of demand. However, these may be offset by increased development in remote areas of the country and offshore. No parameter has been included to allow the net effect of these trends to be incorporated.

Demand increase and reduction estimates are aggregate and do not illustrate the effects individually of energy efficiency improvements, deployment of micro renewables and increased demand.

We have not made an assessment of the full life cycle analysis of the scenario – it will require energy to build new plant and there will be an energy cost involved in the decommissioning of existing plant. That said, the stations to be closed in the Friends of the Earth scenario will all have reached or exceeded the end of their projected lifetime.

5. Policy measures needed to bring about scenario

Good policies already exist that should ensure improvements in efficiency and stimulate increased deployment of renewables. There is, however, a market failure and policy vacuum concerning the choices generators make about which fuels to burn to generate electricity (which has led to the shift back to coal). There are also few interventions that help incentivise increased resource productivity over the sunk capital costs of old plant. A combination of these factors is leading to continued and increasing use of ageing inefficient coal plant.

It is this area of policy that most urgently needs addressing through the introduction of new policy measures. This will help ensure security of supply by creating a controlled and certain environment within which generators can make decisions about plant closures, capital expenditure and investment in new capacity which will help make sure we meet our emissions reductions targets.

5.1 Friends of the Earth recommendations

1. Fully internalise costs of nuclear and provide no new subsidies to nuclear — necessary to protect emerging market for sustainable energy technologies (eg renewables, CHP and clean coal technologies).

2. Introduce a mechanism to stagger the closure dates of old inefficient plant, encouraging investment in new plant. Suggestions include:

- introduce tough domestic regulations that ensure older less efficient plant close in a staggered way from 2002 until 2015;
- subsidise the building of more efficient IGCCT plant to displace the older plant on the system;
- introduce a differentiated carbon fuel tax applied at generator level rather than just on users of electricity;
- introduce tough limits on CO2 emissions from power stations that could be met through a domestic carbon trading mechanism between generators.

3. **NO** introduction of rate relief for part-loaded plant as this will perpetuate the lives of older plant leading to instability in the longer term.

4. Careful management of implementation of CHP strategy to ensure build rates return to previous levels.

5. Presumption in favour of renewables included in national planning policy guidance (PPG22), integration of climate change issues, including need for renewables into PPG1. Best practice guidelines on climate change and planning accompanied by Ministerial Statement issued to Local Authorities.

6. Full and rapid implementation of findings of Embedded Generation Working Group Report (2001).

7. Integration of energy policy within domestic agricultural policy to encourage diversification into renewables (eg wind, hydro, anaerobic digestion and energy crops).

8. Review of success of biomass grant scheme and potential revisions to improve efficacy.

9. 2008 extension for co-firing with biomass in existing coal plant.

10. Continued investment and expansion of energy efficiency obligations on suppliers to further reduce demand in the domestic sector.

11. Introduction of area losses charging scheme to stimulate location of developments closer to demand — reducing inefficiencies in supply network.

12. Instead of energy efficiency targets (which do nothing to ensure total use of energy declines) set energy demand reduction targets or CO2 reduction targets at national, regional and local level that allow emissions targets to be met in a flexible cost-efficient way.

13. Increase energy efficiency commitment on suppliers to encourage development of energy service business model.

6. Implications for price and security

The Friends of the Earth scenario for 2020 maintains a balance between fuels and technologies which have positive benefits for security of supply. Gas makes up over half of the fuel mix for the power sectors by 2020 but has begun to decline after its peak in 2015. It is estimated that up to 80 per cent of this could need to be imported. As with oil, imports from multiple sources will reduce the risk of overdependence.

Intermittency of wind at only 13 per cent of overall supply by 2020 will not present a problem. Loss of capacity in nuclear and old coal is compensated for by increased renewables and CHP together with cleaner, more efficient gasification plant. Gasification technology also allows ‘dirtier’ forms of coal to be used, meaning domestic coal can once again compete with imported low-sulphur coal with positive benefits for security of supply.

Price implications for the consumer will depend on the mechanisms chosen by the Government to incentivise investment in new plant. If a capital grant or capital allowances approach is adopted this will have little effect on electricity prices but will of course affect the tax payer. The impacts of increased regulation to force closures to shorten supply, or obligations on supply companies to incentivise a broader range of technologies, will result in higher wholesale prices which will be spread across the supply sector. As supply shortens some increase in prices will be inevitable and this will help to dampen demand. However, if the Government’s policy to ensure healthy competition in the supply industry is successful the result will be reduced profit margins for supply companies, thereby lessening the impact on consumers.

Consumers’ bills would be most directly affected by the introduction of a carbon tax applying to all sectors. Disclosure of the sources of fuel used to generate the electricity sold to a customer should be introduced and could pave the way for a tax differentiated according to the carbon co-efficient of the electricity supplied.

A tax further upstream on the fuel used by the generator would be less directly felt by the consumer as some of the costs would be absorbed by the supply industry assuming competition is working effectively.

7. Conclusion

It is possible to achieve greenhouse gas reduction targets without needing to replace nuclear capacity but this will require clear direction and leadership from Government.

To achieve this scenario the energy review must include:

- a commitment to reduce greenhouse gas emissions by at least 60 per cent by 2050

- no new subsidies for nuclear power and no support for new nuclear reactors

- no subsidies for existing inefficient fossil fuel power stations

- a mechanism to increase the resource efficiency of power plants and reduce CO2 emissions

- incentives for innovation (eg the building of new more efficient power stations, new renewable technologies, alternately powered and more efficient vehicles)

- increased support for renewables including longer-term targets, changes in planning guidance and increased R&D

- tough energy-efficiency targets for supply companies to encourage them to offer energy services

- internalisation of costs of carbon through a carbon tax or carbon trading with tight emissions limits.

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Friends of the Earth inspires solutions to environmental problems, making life better for people

Friends of the Earth is:

- **the UK's most influential national environmental campaigning organisation**
- **the most extensive environmental network in the world, with almost one million supporters across five continents and 68 national organisations worldwide**
- **a unique network of campaigning local groups, working in over 200 communities throughout England, Wales and Northern Ireland**
- **dependent on individuals for over 90 per cent of its income.**

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