Chapter 7. Energy – Low Carbon and Credible

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Section 7.1. General Overview

In the past, we have spoken of the four pillars of energy policy: reduction of carbon emissions; security of supply; competitive markets, and affordable heating. In the twenty-first century it has become clear that the need to reduce carbon emissions is not a pillar alongside the others, but the foundation upon which the other pillars rest. Without that foundation they will crumble. We know that the move to a low-carbon economy must be the overriding aim of any responsible government. Yet, we believe that this can be achieved while improving individuals' quality of life and standard of living.

In order to provide a framework for such a revolution, the Government must send a clear, unambiguous message that it is committed to turning the UK into a low-carbon economy. It must not shrink from the challenge and the message must be credible. Net carbon dioxide emissions fell from 592.1m tonnes in 1990 to 540.8m in 1999[246], primarily due to the switch to gas and a decline in manufacturing although the peaking of nuclear capacity in 1998 also had some impact. They have since been rising. By 2005, they were back up to 554.2m tonnes[247]. In the face of this disturbing trend, the time for reviews is over and the time for action is now.

Our core philosophy is that the market is the best determinant of the optimum outcome. Yet it is government's responsibility to set the framework within which the energy market can operate. It is facile to believe otherwise. The Stern Review provides justification, if any were needed, for government to intervene now to ensure that additional future costs are priced into the current market. We accept that the market has not so far been successful in costing in the price of environmental degradation. Stern's insight is that intervention now will pre-empt the need for much more extensive and expensive intervention later.

Our objective is to provide a framework that will ensure the market prices in environmental costs and provides incentives to drive forward environmental technologies. This framework has to be designed to empower businesses to invest and innovate; to provide consumers with the knowledge and price signals to encourage them to make environmentally responsible decisions; and to ensure that local government and agencies are incentivised to implement national policies on the ground. At the moment there is a huge gulf between central government rhetoric and local government delivery.

Although the need to reduce carbon emissions is of overriding importance, we must recognise that energy is vital to our way of life and our quality of life, and so we must ensure that security of supply is also supported by the market framework that we develop. To do that we will have to change the way our economy operates. We have to move from a model where lowest energy prices have precedence to one where the measure is lowest overall bills. Those lower bills will be achieved through energy efficiency measures and associated fiscal incentives.This will require real changes in the way the private sector operates. So, to mobilise the necessary finance, investors will need to have confidence in making reasonable returns for the long term.

Yet the UK cannot be in this alone. There must be a global level of engagement which includes the US. We cannot delay while every country uses another as an excuse not to take action. Nor must we institutionalise delay by yet more processes. The recent G8 meeting merely added an unnecessary programme of work instead of re-energising the UN and Gleneagles agreements. It is the momentum from Kyoto that must be strengthened and continued. Even though the EU ETS is, understandably, suffering from a lack of credibility, that should lead us to a real determination to improve its operation and effectiveness, not to undermine it. Indeed, it must become the bridgehead to a new and expanding global marketplace for carbon.

[246] Table of UK Greenhouse Gas Emissions 1990-2005, released by Defra, 31/1/07. Available at http://www.defra.gov.uk/news/2007/070131a.pdf
[247] As above

This would give a remarkable opportunity for the UK to drive the process forward. In so doing we would attract the investment that will foster innovation, strengthen our competitiveness, and benefit the UK economy overall. For too long, our incoherent and incredible policies have driven away potential investors. Instead, we should aim to provide the best possible access to the most advanced low-carbon economy in the developed world.

Reducing the absolute demand for energy will be critical to this mission. We need to set our standards for the built environment, for appliances, and for efficiency, so that they become the highest in the world. Enforcement of these standards has to be absolute in order to stimulate and drive the technological development and innovation that we need to enjoy a high quality of life, in a low-carbon environment.

We have a unique opportunity to innovate and diversify because of the age of our centralised generating stock and much of our network. That means that, as they come up for replacement, we can enable the necessary changes to be made in the most cost effective manner. Our measures will ensure that barriers to new, smaller generators are removed – encouraging the development of decentralised energy[248]. This will reduce dependency on a few large single sources of energy and will concurrently increase competition and create a more robust and secure supply of energy. More local generation based around CHP and microgen will also reduce emissions.

We must continue to place primary emphasis on developing renewables as the safest and most secure low-carbon source of energy. The necessity and urgency for low-carbon options means that nuclear power cannot be ruled out; and other options – such as carbon capture for coal and gas – should be encouraged .We will also address the woeful lack of attention given to the development of low-carbon heat.

Finally, the present institutional infrastructure, a product of the reforms of the early 1990s, is no longer fit for purpose. It will not support the new commitment to reducing carbon. Conflicting duties need to be reconciled so that the reform of our energy economy is matched by institutional reform.

We set out here, in broad terms, the ways in which we believe that these objectives can be achieved. We acknowledge that, in a number of areas, more work needs to be done on the detail. However, we have concluded that some strong, radical, and long-term policies are best able to ensure the substantial change that we need. It is coherence and consistency that is crucial. That is why we have not suggested that we tinker any further with the inchoate multitude of schemes, wheezes, and knee-jerk reactions that make up the current policy.

[248] Throughout this paper we will use the definition of Decentralised Energy taken from the Government's Energy Review which defined it as the "wide range of technologies that do not rely on the high-voltage electricity transmission network or the gas grid. This includes:
Distributed electricity generation including:
- All plant connected to a distribution network rather than the transmission network;
- Small-scale plant that supplies electricity to a building, industrial site or community, potentially selling surplus electricity back into a distribution network; and
- 'Microgeneration', i.e. small installations of solar panels, wind turbines or biomass/waste burners that supply one building or small community, again potentially selling any surplus; and
Combined Heat and Power (CHP) plants, including:
- Large CHP plants (where the electricity output feeds into the transmission network but the heat is used locally);
- Building or community level CHP plants;
- 'Micro-CHP' plants that effectively replace domestic boilers, generating both electricity and heat for the home; and
- Non-gas heat sources such as biomass, wood, solar thermal panels, geothermal energy or heat pumps, where the heat is used in just one household or is piped to a number of users in a building or community.

We see the issues of affordability and fuel poverty as being of the highest importance. However, neither energy policy nor the fuel poor have been well served by the incoherent duties imposed on regulators or by a series of ill-targeted budget measures. Specific fuel poverty measures are part of our social and benefit policy and will not specifically be addressed here. However, we believe that our measures will benefit the fuel poor as part of an overall improvement in energy policies. Schemes like Warm Front and EEC will easily fit alongside the new measures that we propose.

7.1.1. Key Energy Data[249]

Figure 7.1. Overall Energy

Million tonnes of oil equivalent

	1980	1990	2000	2003	2004	2005
Conversion losses	} 62.1	66.4 {	53.8	53.6	53.3	54.4
Distribution losses and energy industry use			20.7	20.1	20.0	20.3
Final consumption						
Industry	48.3	38.7	35.2	33.7	33.0	33.1
Domestic sector	39.8	40.8	46.9	48.2	48.6	47.0
Transport	35.5	48.6	55.6	56.5	58.2	59.2
Services[1]	18.7	19.2	21.5	19.7	20.2	20.2
Total final energy consumption	142.4	147.3	159.2	158.0	159.9	159.5
Total inland primary energy consumption[2]	204.5	213.6	233.7	232.0	233.4	234.3
Temperature corrected total	206.2	221.6	237.9	236.1	238.9	237.6

[1] Includes agriculture

[2] Excludes non-energy use

The total inland primary energy consumption of energy has risen by 15% since 1980, with a rise of 0.4% taking place between 2004 and 2005. Last year, losses by the energy industry from conversion and distribution accounted for 32% of total energy consumption.

Figure 7.2. Inland Energy Consumption

Million tonnes of oil equivalent

	1980	2005
Renewables and waste	*n/a*	3.9
Primary electricity (mainly nuclear)	10.2	19.7
Coal	73.3	40
Gas	44.8	93.4
Oil	76.2	77.3
Total	204.5	234.3

Renewables and waste accounted for less than 2% of inland energy consumption in 2005. The share of gas has risen from 22% to 40% – mainly at the expense of coal.

[249] UK Energy in Brief, DTI/National Statistics, July 2006

Section 7.2. Measures

7.2.1. Emissions, reductions, targets

In our Chapter on Climate Change it is our judgement that the stabilisation target range for CO_2 equivalent should be 400ppm–450ppm. We have, however, suggested that a final decision should be made by the Climate Change Committee. Our proposed figure is lower than the 450-550ppm, cited by the Stern Report, but we are concerned that only this lower figure will give us the best chance to contain temperature increases to 2°C – the level beyond which climate change may be irreversible. This equates to emissions reductions of 80% by 2050 and should be seen in the context of wishing to be ambitious enough to make the UK carbon-neutral. In any case the energy sector must be a major contributor to this reduction.

The speed at which this reduction can be achieved and the contribution that energy can make are related not only to the renewal of the generating assets but also the willingness of government to take strong action on the demand side. We believe that the measures we outline below will enable the fastest possible development of low-carbon generation, but, even so, this would not be enough to fill the forecast generation gap without strong action on the demand side.

Some of the measures we propose may not be seen as politically palatable but now is the time to start serious consideration of their implementation. The electorate is increasingly aware of the impact of global warming on their lives and trends in recycling and fair trade/organic purchases show that there is at least the beginning of an appetite for changing behaviour to something more ethical and sustainable. Of course, we seek to recommend how these necessary changes might be implemented in the most convenient manner. People would expect that of politicians. Yet, the electorate expects courage too, particularly in the face of a great threat like climate change. We would do well not to disappoint them.

There are many individual issues that are bound to be matters of contention. One of the sharpest is the debate over new nuclear capacity. The reality is that unless demand can be severely contained and carbon capture technology advanced very rapidly, it is unlikely that new low-carbon generation will be able to fill the gap without some recourse to nuclear generation. The degree to which a government is willing to change planning procedures to facilitate the development of non-nuclear low carbon generation and impose severe criteria for energy usage and energy efficiency will ultimately determine how much or indeed if, new nuclear is required. If the government is not willing to implement radical policies on the former, then the likelihood of there being a need for nuclear generation to fill a future gap is increased. Even those for whom nuclear energy poses few problems should be concerned when it is wrongly seen as a silver bullet avoiding the necessity for radical change. In that sense it is another add-on solution, at best inferior to making the fundamental changes which ought to be our first priority. Nuclear or not, those changes have to be made.

7.2.2. International

Ambitious detailed and clear international policies are necessary to address the concern that commitment to a low-carbon economy will undermine economic competitiveness. The international arena sets the framework within which the UK domestic policies have to be judged. We have considered the global implications of this in our Chapter on Climate Change.

7.2.2.1. The European Union

For many years the UK has fought, usually alongside the Commission, to liberalise the EU energy market. At the same time we have tried to preserve national control of UK Continental Shelf (UKCS)

resources. Concerns over Russian energy policy enhance the need for liberalisation and network transparency in order to encourage diversity and therefore enhanced security of supply. Efficient operation will only be achieved with more liberalised European energy markets and greater third party access. The UK must work closely with the rest of Europe rather than operating independently to ensure energy security as this gives us more leverage than acting alone.

European Directives have been the driving force behind many domestic policies on energy conservation and efficiency, but the UK has often failed to comply with its responsibilities. For example, member states had three years in which to comply with the requirements of the EU Energy Performance of Building Directive, which came into force in January 2003. The Building Regulation changes should have been in place in January 2003 but did not come into force until April 2006. The UK must ensure that it complies with the requirements of any Directive in a timely manner and should seek where possible to exceed them.

7.2.2.1.1. EU ETS

The EU ETS, as it is currently constructed, has neither encouraged investment in emission reducing technologies post 2005, nor caused much change in operating behaviour, although it has introduced the concept of pricing greenhouse gas emissions and increased investments in the developing world. Its credibility has been severely undermined by its limited scope, by over-allocation and the resultant windfall profits for many utilities alongside higher power prices for customers. The price of carbon fell to around a Euro as a result of this over-allocation. This undermines investment in low-carbon technologies as well as demonstrating an inability credibly to reduce emissions.

There are many reasons for these outcomes, which have been described elsewhere, but they serve to show how market based policy instruments require careful consideration before they are implemented. This was clearly lacking in the inauguration of the EU ETS and must be remedied in subsequent phases. None the less, it is a beginning and needs positive support rather than superior cynicism.

Phase I is due to be completed in December and Phase II will run from 2008-12 which coincides with the Kyoto Protocol commitment period. Phase II National Allocation Plans are in the process of being approved. The Commission does seem to have learnt some lessons from the over-allocation in Phase I and there is a high probability that Phase 2 of the EU ETS will be far more successful in getting the European facilities covered by the scheme to take definite action to reduce emissions. The UK must work at the EU level to ensure that tough allocations are set.

But after Phase 2, little is, as yet, defined. One of the major lessons from Phase 1 is that it was too short. We should press the Commission to try for a longer Phase 3 – perhaps even to 2025, so as to encourage investment. In addition, although we welcome the Council of the EU adopting the 20% by 2020 target, what is really required is early visibility of the requirements for the traded sector, i.e. those installations covered by the EU ETS. Once this is defined, the markets will start to be able to price the value of allowances post 2012. The question of the allocation of these associated allowances will not have an impact on their price but it will have on who pays for them.

For Phase III and beyond there should be defined targets with a clear trajectory for reduction. Whilst Joint Implementation and the Clean Development Mechanism assist in reducing emissions in developing countries and allow EU states to reduce the costs of emissions, they should not be used as a mechanism to avoid domestic reductions. There needs to be clarity on the validity of these mechanisms beyond 2012 and the proportion of national targets that can be satisfied through them.

On the question of allowances post 2012, we will start from the position that there should be 100% auctioning of allowances rather than free allowances. The UK must take the lead in this process. Free allocation effectively raises the price of carbon without allowing any recycling of revenues as costs are

passed on to the consumer. The case for applying this to installations that are not subject to competition from installations in non-capped regions such as the utility sector is overwhelming. The revenues from auctioning could be used to support additional measures to promote a low carbon economy. In particular, expenditure on low carbon R&D and emerging technologies could be offset against the action payment. Overall net proceeds should be utilised to reduce overall business taxes so that business suffers no increase in overall taxation.

For those subject to international competition, we will examine the magnitude of the relative competitive disadvantage they would suffer as compared to exchange rates or differential labour rates and would encourage our colleagues in the rest of Europe to adopt a similar approach. Only as a last resort would we consider free allocations and then only for a limited period. If this exception is given, then additional measures will be needed to drive energy efficiency, and the UK should push for all European countries to adopt a carbon duty or its national equivalent.

The reason for this caveat is that it is not sensible to penalise industries that are heavily energy intensive, but subject to international competition from companies that are not penalised. For example, the oft-cited aluminium industry should be encouraged to reduce energy intensity, but if over-regulated may simply move abroad to a less regulated market with an adverse effect to the UK economy and probably an increase in emissions due to the transfer.

If allowances are auctioned across Member States, then this will become a major source of revenue for the exchequers of these States. The auctions will need to be coordinated to reduce confusion and volatility and may require a new implementation institution to be created.

Finally, there needs to be more effective and consistent implementation across Europe with greater harmonisation of methods. This will include standard definitions and processes for monitoring and reporting. There should be an end to the practice of changing the baselines against which absolute targets are set and to reduce baseline inflation which was a feature of Phase I. Measurement is a complex area where the methods are likely to remain somewhat subjective. Any expansion of the scheme needs to be carefully managed and there should be clarity around rules for new entrants and closure rules. We need to move to as objective criteria as possible so as to maximise credibility without getting bogged down in too detailed an argument.

At this stage in our work we do not regard it as our role to propose particular annual, or other, targets for energy carbon emissions. We take it as a given that an incoming Conservative government will establish sharply decreasing targets to help us towards the 2050 target. The policies we recommend will enable the UK to optimise the energy contribution to those targets.

7.2.3. Domestic financial measures

7.2.3.1. EU ETS

Regardless of the action taken at European level, the UK should set its own utilities the requirement for 100% auctioning of allowances post-2012. Those utilities will also be subject to the carbon levy (see below). Sectors that face international competition, either within Europe (if this approach is not taken at a European level) or abroad that are not subject to restrictions on carbon, may be given free allowances to retain competitiveness for a short period as specified above. Trading of these would still provide an incentive to reduce usage.

7.2.3.2. Carbon Levy

Whilst most leading UK companies are starting to address the issue of climate change, many are not. There is an urgent need to introduce measures to encourage emissions reductions by companies outside the EU ETS.

The EU ETS will remain at the centre of measures to reduce emissions. However, experience to date suggests that the price signal it provides is not sufficient to encourage the required rate of investment in clean investments. We have seen that the price of allowances is likely to be driven by gas prices, coal prices, and the weather and to be compounded by political uncertainty. As such, investors may be wary of attributing much value to savings released by emitting less greenhouse gases. Similar behaviour is observed in the oil industry. Although oil prices recently touched $70/bbl, few oil companies are developing oil fields that required oil prices in excess of, say $40/bbl to be economic. Perhaps, with time, investors may become more comfortable with the volatility of carbon prices. But we do not have time. Over the next 15 years, we expect over 25GW[250] of new power stations to be replaced in the UK and, unless the 'carbon signal' is strong, the wrong type of generation may be built.

Measures to restrict greenhouse gas emissions need a carbon price signal that is sufficiently robust to encourage a substantial reduction in CO_2 emissions. It is only in this way that a minimal 'carbon penalty' can be established and private sector 'carbon cost-conscious' investments will be made. Otherwise investors will be prepared to live with volatile carbon costs and be reluctant to invest for the long term. A tax is an effective means of imposing this penalty as it enables firms to factor a floor cost into their decision making.

For this reason, the Climate Change Levy should be replaced with a Carbon Levy as discussed in the Conservative Party's consultation document on this issue.

> "*We support reforming the Climate Change Levy to make it a tax on carbon and not energy*[251]*. At present, the Climate Change Levy would tax energy from a carbon capture and storage plant by the same amount as that produced from the worst polluting coal powered station. Clean energy needs to be properly incentivised through a new Carbon Levy."*

When the Carbon Levy replaces the Climate Change Levy, its level needs to be set at the average of the last year's EUA price or a pre-announced and escalating amount, whichever is the higher. Such a 'hybrid' approach would provide an effective floor below which the price of carbon can not fall and we believe that this would help stimulate investments in less carbon intensive assets.

For installations within the UK that are covered by the EU ETS and which do not receive free allowances, the cost of purchasing ETS permits should be offset against the Levy.

The introduction of this hybrid levy would give plant operators confidence that the penalty for emitting greenhouse gases will not fall below the floor. They would therefore be willing to consider investment options, as well as changes in short-term operations, such as fuel switching, to reduce their emissions.

Plant operators in jurisdictions that do not incorporate a hybrid levy or its equivalent would continue to consider just short term options. This would give UK industry a competitive advantage over enterprises in other European countries without such a scheme, as long as the average EUA price exceeds the floor. The scheme would be able to operate alongside the EU ETS. It would also give the

[250] Indeed, the recent Energy White Paper published by the DTI in May 2007, states that: 'Energy companies will need to invest in around 30-35GW of new electricity generating capacity – as coal and nuclear plants retire – over the next two decades, with around two-thirds needed by 2020'.
[251] Conservative Party: *An effective Carbon Levy for the UK: A Consultation,* November 2006

Government some comfort that revenues raised by auctioning allowances will not collapse. As set out in the Conservative Party's consultation document, any reforms should be revenue neutral overall for business. These revenues should be ring-fenced to support low carbon measures.

A number of installations are currently covered by Climate Change Agreements, by which they agreed to achieve reductions in emissions in return for significant reductions in the Climate Change Levy. We believe that, rather than sustain the bureaucracy by which such agreements were negotiated, a far more effective measure would be to ensure that all installations are exposed to the price of carbon, either through the EU ETS or the Carbon Levy. This would be a matter for consideration as the CCAs come up for renewal and then we should enter into discussions with the installation owners with this objective in mind..

7.2.3.3. Personal Carbon Allowances (PCAs)

In theory the attraction of tradeable personal carbon allowances is clear. However, we believe that the complexities involved in such a scheme are huge. Issues such as accurate measurability; IT capability and cost; fraud; infrastructural support; equity across income levels and lifestyles make early introduction a practical impossibility even if it were judged to be politically desirable.

Most personal carbon emissions relate to domestic electricity and heating, car journeys and flights. We believe that individual measures to try and encourage individuals to reduce flights and petrol consumption, combined with stronger appliance standards, and improved property standards through the Low Carbon Zone approach, are a more effective way to reduce personal consumption than individual allowances.

Whilst we consider that from a cost-benefit perspective, the current environment is not suitable for the introduction of PCAs, we do not rule them out in the longer term as technological advance and improved consumer awareness may render them easier to implement at lower cost. The concept of PCAs is attractive; it is the current complexity of implementation that suggests that the funds would, at present, be better spent elsewhere.

7.2.4. Networks

The network infrastructure that supports generation in the UK is ageing and a sizeable proportion is due for renewal in the next 20 years. In June, Ofgem announced that it expected there to be more than £4 billion of investment in Britain's gas and electricity transmission networks alone in the next 5 years in order to connect renewables and gas import projects in addition to the necessary replacement of existing infrastructure[252]. With such massive expenditure forecast, it is essential that the necessary signals are sent to ensure that any investment in the transmission and distribution networks enables the development of a flexible infrastructure. This must be fully able to support decentralised energy and existing and future new technologies as well as the needs of existing generation.

The recent World Survey of Decentralised Energy showed that 24% of electricity output from newly installed power generation plants in 2005 was derived from decentralised energy systems. This share was up from 13% in 2002[253]. The UK needs to ensure that it has the flexibility to ensure that such trends are supported domestically.

[252] Ofgem press release: http://www.ofgem.gov.uk/Media/PressRel/Documents1/14441-r31_26june06.pdf
[253] World Survey of Decentralised Energy 2006, World Alliance for Decentralised Energy, May 2006

7.2.4.1. Performance-based regulation

Network operators provide facilities to allow the buying and selling of energy services. They are currently regulated by measuring the rate of return on capital consistent with the risks as judged by the Regulator. We believe that, beyond 2012, performance-based regulation should be introduced. This would reward operators for the quality of their services rather than relying primarily on the return of assets. Given the high level of existing investment, this form of regulation should impact on marginal investment, through requiring behavioural change, but with most drivers on the existing asset base.

Depending on the form of the measures adopted, Performance Based Regulation (PBR) could also have an impact on their operating behaviour. Networks could be set up either to respond to, or to anticipate, customer demand, whether from providers of energy or users. Investment ahead of demand may well be advantageous, in order to prevent new developments having to wait for many years before connection. Current examples of extended delays to our infrastructure include overhead lines from Scottish windfarms and connections from new Norwegian gas supply sources.

More work needs to be done on the form of performance measuring as it will determine the profitability of the network companies, but the measures might include:

- time taken to provide a connection;
- loss of supply (measured in terms of minutes lost, number of times lost);
- km of overhead lines and comparative cost of undergrounding;
- time taken to respond to queries;
- accidents;
- minimisation of energy losses;
- number of customers;
- energy transported;
- provision of a flexible, network that supports greater competition and encourages emerging technologies thus ensuring that the network is ‘future-proofed’;
- connection of more decentralised energy in a cost-effective manner;
- provision of facilities that would allow suppliers to reward customers for changing their pattern of demand and/or supply;
- stabilisation of the network (in terms of voltage, harmonics, flicker, etc);
- efficiency of the networks and reduction in distribution loss;
- improvement of network security through greater decentralised energy;
- enhanced safety; and
- locational signals for cost-effective connection.

This approach should encourage the networks to be run as providers of the means to allow people to trade energy services. It would reward them for doing it well, in much the same way as customers favour suppliers in competitive markets. It would allow network operators to reward both consumers and energy providers for changing their pattern of production or demand, where that helps to avoid reinforcement. It should also encourage the deployment of decentralised energy. Perhaps more importantly, such a scheme would allow companies to benefit from innovation. The current form of RPI-X regulation has been extremely successful in driving down operating costs, but provides little incentive to innovate. Companies are always at risk of losing the benefits from innovation at their next regulatory review. This was partially recognised when Ofgem introduced two measures in 2005 to encourage DNOs to be innovative in the way that they developed networks; to manage the renewal of network assets; and to increase the connection of decentralised energy. These two measures were the Innovation Funding Incentive (IFI) and the Registered Power Zones (RPZ).

At the highest level, the IFI provides funding for investments that improve the technical ability of the distribution networks to deliver benefits to customers such as supply quality and safety. The RPZ initiative is more focused on encouraging the connection of generation to the distribution network. The PBR approach outline above could be trialled in an RPZ zone. We believe that both the IFI and RPZ schemes need to be expanded.

In addition to PBR, the costs of connection for Decentralised Energy should be admissible in the Regulatory Asset Base for Distribution Network Operators, whereas business as usual expenditure around demand peaks should not be admissable.

These changes will assist in providing a more flexible, network that supports greater competition and allows new technologies to 'plug and play' without barriers to entry. In addition it will provide network companies with the incentive to anticipate changes in the demand for services from customers and thereby reduce connection times.

There is discussion at EU level as to whether owners of networks should be allowed to own energy production or supply. The EC's recent ruling stopped short of requiring ownership separation. Instead it went for legal unbundling as we have in the UK for Scottish and Southern Energy, Eon, and EDF. However, this approach implies a failure in regulation. If the regulation is working well then there is no need to separate ownership. Good regulation should allow customers to benefit from such things as shared workforces. Regulation should be so designed as to prevent disadvantageous practices such as network companies favouring its own generation business when awarding access to the network.

7.2.4.2 Connection charges

We support recent regulatory changes which will spread microgen connection charges across all providers. This will remove one barrier facing the smallest new generators.

7.2.4.3. Balancing charges

The New Electricity Trading Arrangements implemented in 2001, led to a decentralisation of the market. Previously each market participant had to manage their financial 'mark to market' position against the centrally despatched Electricity Pool. Under these new rules, which were subsequently continued under BETTA, everyone is free to self-dispatch but are responsible for differences between the physical position of their portfolio and their contracted position. The trading system favours the larger players with both large generation and demand portfolios which are easier to balance than small ones because more risks diversify and cancel out. We believe that a further detailed study of the advantages of changing the BETTA rules needs to be made so that decentralised small scale generation is not penalised.

7.2.4.4. Smart meters

The issue of smart meters and their introduction has been around for some time now and, despite myriad policy reviews, pilots, and consultations, little change in the existing meter market has been achieved. Provision of all new energy meters is becoming a competitive, non price-controlled activity. However, all the incentives for suppliers are to keep metering costs as low as possible and replacement – of about 5% a year – is done on a like-for-like non-smart basis. The existence of a number of regulatory barriers means that, apart from a small-scale, targeted basis, smart metering is unlikely to take off in the UK without intervention. Ofgem produced a decision document in May 2006 that essentially ruled out all but some minimal interventions, and DBERR and Defra are consulting on possible further action, particularly to comply with UK obligations under the EU End Use Energy Services Directive.

We believe that there should be no further vacillation. There should be a commitment to their universal roll-out as soon as possible. We believe that a target of fitting 90% of homes within 5 years is achievable. There should be a legal requirement for all homes to be fitted within 10 years. The Government has sponsored yet further trials, thus putting action off once again. These are flawed and will be unlikely to bring any benefit sufficient to offset the delay in overall implementation.

Smart metering would reduce costs, cut UK emissions by at least 8%, enable customers to chose lowest cost energy, reduce fraud and theft, and provide more accurate bills. Before all this can be achieved, there is a need for a precise definition of a smart meter. Ofnet (see Section on Governance below) should be given the responsibility of setting minimum standards for meter 'smartness' which encompass functionality and interoperability. We advocate a definition of smart meters that would include at least the following functionality. They should:

- measure the quantity of energy consumed;
- measure the time interval over which it was consumed;
- record 'billing-level' readings;
- support two-way communication;
- store interval-data and transfer it remotely to a data collector/utility;
- store and display consumption and tariff information[254];
- provide real-time displays;
- be capable of connection with future smart appliances;
- allow customers to select payment methods; and
- be capable of receiving and conveying information from water and gas meters on the same property.

The provision of smart meters that meet these functionality requirements would have significant benefits to both suppliers and consumers of electricity, whilst putting in a place a key component of the infrastructure necessary to support the technological advance that will accompany the shift to a low-carbon economy. In general such benefits would include:

- more innovative tariffs and services provided to customers by suppliers. This would also support future revisions to the suppliers obligations;
- enhanced information for customers including more accurate billing supporting more sustainable consumption;
- information necessary to support microgeneration exports and feed-in tariffs;
- facilitation of greater innovation and competition from different forms of distributed generation;
- better data to support more sustainable consumption in local areas through, for example, decentralised energy;
- greater efficiencies in energy supply through a reduction in peak-demand
- reduced fraud and theft;
- reduced the overall costs of metered billing including prepayment meters; and
- facilitation of the introduction of smart networks and appliances in the home.

An 8 year mass roll-out of smart meters would realise logistical and organisational efficiencies, deliver scale-economies, and provide a rapid upgrade of meter infrastructure. Cost savings for consumers have been shown in other countries and it has been estimated that the introduction of smart meters could facilitate energy savings in the UK of 1-3% where 1% would equate to 8% of the domestic emissions target.[255]

[254] Bullets up to this point taken from Smart Meters: Commercial, Policy and Regulatory Drivers, Gill Owen & Judith Ward for Sustainability First, March 2006
[255] As above

Italy has already provided a precedent for such scale economies with customers' meters being replaced by Enel. In the UK such an approach would not be as easy, as meters are the property and responsibility of suppliers. Furthermore, different customers in the same area might have different suppliers. After extensive consultation and deliberation we have therefore decided that the responsibility for this should be given to the distribution network operators (DNOs), who have greater control over local network areas.

In order to prevent a monopoly, which might lead to unnecessarily high installation costs, the DNOs would have an obligation to put meter provision out to transparent disclosable tender. The cost of new meters and installation would be included in the DNOs regulated asset base. In addition, a regulatory change that would remove the requirement for a visual inspection every 2 years would also facilitate further cost reductions.

We believe that transferring this responsibility to DNOs, would enhance competition, by freeing suppliers to focus on developing new tariff structures for domestic, commercial and industrial customers. We cannot foretell what such innovation will bring forward but it might include tariffs that:

- are ideally suited to customers who are out of the house most of the time;
- allow the customer to reduce some of their load when 'asked' by the supplier;
- are specially designed to allow for those who like many pensioners are at home all day;
- increase per unit as energy usage increases – thereby supporting future supplier obligations to reduce demand; and
- allow for charging of electric cars.

Such benefits in addition, to the wider benefits of outlined above, show conclusively that the universal implementation of smart meters must be achieved in the shortest time period possible as it is an essential step in supporting the transition to a technologically more advanced low-carbon economy.

7.2.5. Demand

Reduction of demand for energy is a critical component of reducing carbon emissions and countering concerns over security of supply. It is the most cost-effective means of doing both. Our top priority must, therefore, be to reduce the size of any future 'energy gap' and thus the need to develop generation capacity to fill it. Strong policies are necessary to cut energy consumption in domestic, commercial and industrial sectors.

In October 2006, the European Commission produced an action plan for energy efficiency which it estimated could save Europe some 20% in energy consumption by 2020 and slash its energy bill by more than 100 billion Euros every year[256]. Such a reduction in the UK would make a real contribution to achieving the 80% reduction needed by 2050.

7.2.5.1. Carbon emission reductions in buildings

Existing measures to promote energy efficiency and the uptake of low-carbon technologies in the domestic and business sectors are insufficient and have not led to a reduction in emissions in recent years. We need a radically new approach.

[256] Action Plan for Energy Efficiency: Realising the Potential, Communication from the Commission to the Council and the European Parliament, 19 October 2006

7.2.5.1.1. Low Carbon Zones

There needs to be a single, simple yet radical flagship policy that provides a definitive means by which low-carbon measures can be introduced rapidly. Such a policy would be the test-bed and the precursor of a national roll-out.

We therefore propose the introduction of a 'Low Carbon Zone' programme, whereby specific zones would be identified that would be seed-funded by central government to undertake low-carbon initiatives. They would primarily operate at the local authority level but could also work with a Primary Care Trust or university taking the lead. The zones could also be initiated by public/private joint venture energy services companies.

Within low-carbon zones radical measures to implement energy efficient upgrades to buildings and encourage decentralised energy would be introduced. The concentration on defined zones will sharply increase awareness and concentrate expertise in delivery. They would engage the enthusiasm of architects, engineers, construction companies, as well as planners. Increased volumes at the local level would reduce equipment and installation costs and enable the provision of low cost capital. Low Carbon Zones would be the necessary and practical precursor of a national scheme and would help build the skills and materials supply-chain necessary for nationwide delivery. The zones would also be amongst the first areas in the country in which smart meters would be installed in all properties.

7.2.5.1.2. Competitive bidding

Low Carbon Zones would be chosen through a national competition to take part in the initial pilots. Central government would outline the proposals and accept bids for participation from local authorities and consortia of local authorities and private ventures. Winning candidates would be likely to be those who have a good alignment of finance, environment, and planning functions. They would also prove capability of providing information, advice, and assistance to consumers. The winning 'bids' would be encouraged through the local government grant allocation system and would cover energy rating, street lighting, local CHP and district heating, and as wide a range of energy use as possible. Additionally, private sector investment could be offset against auction or power station waste heat levy payments. The bids could well incorporate existing or future fuel poverty initiatives. Within the zones all new domestic build would be required to be zero carbon emission.

7.2.5.1.3. Building carbon rating

Within these LCZs, the first priority will be to establish the status of the existing building stock. Under the EU Energy Performance in Buildings Directive, buildings will be rated according to their energy performance. All buildings will receive an asset rating, A-G according to the intrinsic energy efficiency of the building. Non-domestic buildings will also receive an annual operational rating based on the actual energy consumption. Asset certificates must be shown on the point of sale for all buildings and also at the point of lease or re-lease for non-domestic buildings. Asset ratings are required for some domestic buildings from August 2007 and for non-domestic buildings from January 2008. Operational ratings for non-domestic buildings will be mandatory from late 2008. The wider implementation of the Energy Performance of Buildings Directive would require all commercial buildings over 1,000m2, bought, let, or sold to have an EPC by 2009. The ratings would be valid for 10 years or until significant renovation is undertaken.

Domestic dwellings are resold on an average of every 7 years and the average lease length for non-domestic buildings is also 7 years, suggesting that 14% of buildings will receive an asset rating each year. Once the scheme is required universally, it can be assumed that one third of buildings in any LCZ will have an asset rating, which will be stored on a national register. All non-domestic buildings will have operational ratings. On each asset certificate, every cost effective energy efficiency improvement that can be undertaken is listed. These certificates will specify the maximum rating that the property could achieve and the measures needed to bring it up to this standard. The details will include information on lighting, heating, and insulation. The system is designed to recognise that some properties will not be able to achieve the highest ratings. So, whereas 1930s suburban developments should offer carbon reduction opportunities, Victorian terraces without wall cavities or 1960s tower blocks are much more difficult. Within LCZs, such certificates will be required for all properties that wish to benefit from low cost carbon reduction installation and consequential tax advantages.

7.2.5.1.4. Fiscal incentives: seed corn financing

Once properties have been rated, a series of incentives should be introduced to encourage property owners to bring their properties up to the maximum rating. We believe that the creation of the right fiscal regime will encourage the market to deliver drastic carbon cuts. The following incentives should be offered:

- Domestic occupants should be given discounts on council tax if their property has achieved all cost-effective energy efficiency improvements. Where improvements increase the value of the building, the occupants should not subsequently pay a higher rate of council tax or business rates to reflect this.

- For rented or leased domestic property, asset performance would be under the control of the freeholder or landlord and not the tenant. Incentives based on council tax would not impact the freeholder or landlord, and so they may have to be incentivised to make improvements to the entire building when the first premise lessee chooses to sell the lease. Domestic landlords should be required to make improvements under landlord and tenant legislation at the termination or surrender of a lease, so that no property could be leased or rented until it achieved the target rating standard.

- Non-domestic buildings should pay differing levels of business rates according to their annual operational rating. This should be designed so that the overall business rates burden is neutral. The operational ratings relate to the building operation rather than the industrial processes and so this approach should not penalise 'naturally' energy intensive SMEs. In addition, these operational ratings would be benchmarked against peer building types so that small hotels would be graded against similar establishments.

- For domestic properties, there should be discounts on stamp duty land tax (SDLT) rates based on whether the building has achieved its maximum asset rating.

- For non-domestic properties, SDLT should be applied in an absolute manner to asset ratings. Thus, regardless of whether all cost effective measures have been undertaken, the rate of SDLT is dependent on the final rating. This would open up a value differential between the best and worst performing stock, such that G rated buildings will never be of the same value as C rated.

- Discounts to council tax and business rates should also be allowed for the introduction of approved micro heat technologies such as biomass boilers, micro-CHP and ground source heat pumps. This would not apply to microgeneration of electricity which should be supported by feed-in tariffs as we detail below.

These fiscal incentives are designed so that they could be rolled out at a national level and not confined to LCZs.

7.2.5.1.5. Financial incentives

If property owners do not have the time, skills, or access to sufficient financing to make the necessary changes, incentives alone will not be enough. We must provide access to low-cost capital to provide the necessary upgrades.

Low-cost capital would be available from two main sources:

- **ESCO model** – under this model the energy supplier, financial intermediary, or other third party will estimate the cost of introducing the measures and the percentage of the energy bills that will be saved. The EPC will show what basic set of carbon reduction measures would bring the property up to the desired standard. If the owner agrees to proceed, the third party would upgrade the property and then would recoup the cost by adding the estimated annual savings percentage to the energy bills for that year. The lender will be able to take security as an energy reduction charge on the property which would rank after any first mortgage. The property owner will continue to pay this premium until the capital is paid back at a low disclosed interest rate. If the property owner does not change behaviour this should result in no net increase in bills assuming constant real energy prices. Most 'pay backs' should occur between five and fifteen years. If the owner sells the property before the 'carbon reduction' loan has been paid off, or changes supplier, then the loan should be paid off or converted into a mortgage as a charge on the property. We believe that the equipment and installation cost

reduction and high take up rates associated with the zonal approach will make ESCOs commercially attractive for the first time. Where funding is provided from suppliers, the resultant energy savings would count towards their EEC targets

- **Salix model** – Salix lends interest free funds to the public sector for energy efficiency improvements, which are paid back using energy savings. The Salix grant is matched by funding from the recipient, enabling the impact of a grant with the rigour of a market mechanism. Salix could be expanded to act as a 'fund of funds', lending funds to local authorities to lend out to private building owners on the same basis. LAs would administer the funds. Over time, Salix could recycle the funds from LCZ to LCZ. This measure could be introduced alongside or instead of the ESCO model.

The two models are not mutually exclusive. Experience of a pilot scheme has shown that for low-cost improvements – typically £250 of insulation – building owners who did not want to lock into a long-term energy contract but preferred to pay for improvements outright rather than incur a debt. Only 7% of respondents accepted lower cost financing. For high cost improvements of many thousands of pounds and with longer payback periods, only Salix has been used. As costs come down and feed-in tariffs make microgeneration more viable, such funding might also be used to provide low cost capital for purchase and installation.This would make the ESCO model providers more interested in larger loans.

LCZs operated at the local authority level should be set specific decarbonisation targets.

7.2.5.1.6. Local low carbon heating

To encourage the development of low carbon heating, local authorities would be mandated to develop a local energy strategy for heating. This should specify what type of energy distribution network is appropriate for a given district. In areas with sufficient heat density, this would be district heating which would use the heat demand in public sector buildings to underpin its development. Planners would be given the power to insist upon district heating, local CHP, and other forms of decentralised energy, including microgeneration, in granting permission for developments. Funding might well be provided in the early stages of the development of heat networks. This could be sourced from S.106 agreements or be offset against auction allowances or the power station waste heat levy. At the same time, any new build in the area should be designed and built to the new passive building standards introduced by the BSA that will significantly reduce the need for heating and cooling.

7.2.5.1.7. National roll-out

We anticipate that there will be strong competition for the establishment of the zones and believe that the early zones will act as exemplars of good practice. The capacity of the installation industry will, however, be limited. Nonetheless, as property owners' attitudes change, we expect considerable pressure to extend the zonal incentives nationwide. We hope that the scheme would be rolled nationally within 5 years of the evaluation of the first 3 schemes. In this way, these simple measures combined with an awareness/engagement programme and the clear programme for national roll-out should ensure that all buildings are brought up to a high standard of energy efficiency within the shortest time period. Again, the principle upon which this is based is one of engagement. By harnessing the interest and enthusiasm of a whole range of people locally, we can develop the kind of scheme that will change behaviour and expectation nationally.

7.2.5.2. Appliance standards

Absolute energy consumption for appliances is still on the increase although the energy efficiency of households and appliances has improved by about 2% a year since 1970[257]. Although gains in energy efficiency have been made for many individual appliances, the resulting energy savings have been more than offset by the increasing *numbers* of appliances. In fact, between 1972 and 2002, electricity consumed by household domestic appliances doubled from 44TWh to 89TWh and is forecast to rise by a further 12% by 2010[258].

Existing policies – such as the EU energy label (A to G); Government funded awareness and advice campaigns around the Energy Saving Recommended brand; and subsidies for high efficiency products by energy suppliers as part of the Energy Efficiency Commitment – have achieved significant gains but they have been limited to particular sectors. The most success has been with white goods where EU standards have removed from the market all cold appliances (refrigerators and freezers) labelled D or below. Ironically, as most cold appliances now achieve the highest standard, the lack of further differentiation reduces incentives on manufacturers to continue to innovate. It also makes it difficult for consumers to make a more sophisticated choice of the most efficient products.

Furthermore, these policy instruments do not generally cover other appliances such as computers and TVs, hobs, microwaves or vacuum cleaners. Although energy use per device is often small, total use is large and growing. Kettles alone account for 30% of total cooking energy consumption – some 4.5 % of household electricity usage[259]. However, no labelling scheme exists for them. The lack of standards represents a failure in the market to deliver and we need to ensure that high standards force technological innovation. This will transform the market so that only the most efficient of appliances are available in the future.

Standby power consumption currently accounts for 2.25% of electricity production and this wasteful usage is set to increase as it is introduced into an ever widening range of electronic equipment. Priority should be given to developing a standard that requires all new electrical items to include a function that switches them off. We do not believe that the current emphasis on developing standards for low consumption on standby go far enough e.g. the 'One Watt Initiative'[260]. The mobile phone charger averages around this 1W consumption, but if every one of the country's 25 million mobile phones chargers were left plugged in and switched on they would consume enough electricity (219GWh) to power 66,000 homes for one year[261].

The EU single market means that EU legislation is the main driver of product policy. Historically the process has been too slow and cumbersome to allow effective setting and updating of labels and standards. As a result, current standards are lower than other countries such as America and Japan. The UK should lobby for new EU standards that:

- are maintained in the top 3 in the developed world;
- cover all significant energy using appliances;
- ensure new labels contain two ratings – the first to define the appliances' performance in relation to its class e.g. all refrigerators; the second to its absolute level of average annual use. The latter will not differ by appliance class and will ensure that consumers are aware of the

[257] The Rise of the Machines: A review of energy using products in the home from the 1970s to today, Energy Saving Trust, June 2006
[258] As above
[259] As above
[260] The UK has pledged to support the International Energy Agency's One Watt initiative, which aims to reduce the amount of energy used by appliances on standby to below one watt by 2010
[261] The Rise of the Machines: A review of energy using products in the home from the 1970s to today, Energy Saving Trust, June 2006

contribution to energy bills of any appliance i.e. an 'A' rated appliance will consume x amount of energy per year assuming average usage patterns;
- set a date beyond which no appliance will be sold that does not meet a defined standard for its appliance type;
- set a date beyond which all new electrical items will be required to contain functionality that switches them off after a specified period rather than remaining on standby; and
- are constantly and rapidly revised to drive and reflect technical improvements and ensure that innovation continues.

In addition further work needs to be done to consider how soon major appliances should be required to have smart-meter interoperability.

These measures would ensure that consumers can make informed choices as labels that relate to actual energy consumption will make it clear where an appliance, though highly rated for its class, nevertheless consumes significant amounts of electricity. In addition, the standards would ensure that appliances with sub-standard efficiency levels will be phased out. These changes would also help to extend the voluntary initiatives announced by some major retailers by which they would seek to stock only the most efficient of products. Improving the energy efficiency of appliances can make a significant contribution to the reduction of demand, not only in the UK and Europe, but at a global level.

The same is true of lighting. In the UK, internal fixed lighting alone accounts for around 16% of household electricity consumption and is forecast to rise by around 17% to 2020, unless we take action[262]. A recent IEA report estimated that 19% of global generation was for lighting and that policy measures and individual action alone could reduce this by 38% by 2030[263]. It is not surprising that things are changing and changing fast. Even while we were developing these present proposals, the Australian Government announced that it was to phase out incandescent light bulbs over the next 3 years. This was swiftly followed by the European Commission announcing that it would be raising standards and improving labelling on a range of appliances. Gordon Brown subsequently produced his own proposals to phase out incandescent lightbulbs and standby. There is no doubt that the wind is with us but it is important to have a systematic aproach to energy efficiency and not just to grab headlines for relatively easy changes that cost governments little either financially or in electoral support.

That is why we want to proceed more rationally and comprehensively by setting a date beyond which no bulb can be sold that does not meet a defined standard for its type. We recognise that not all bulbs currently have a more energy efficient replacement – but that is why we need to define standards that will drive the technological advance needed to create them. This should also provide a challenge to manufacturers to innovate and produce new products such as energy efficient dimmers. We should not proceed with energy efficiency programmes that merely deny people choice. Instead we should force the technological innovation that retains choice while cutting emissions. Energy efficient bulbs already deliver savings over conventional bulbs over their lifetime but increased production will bring down the initial cost of these bulbs and generate still further savings. Wherever possible, people must be encouraged to choose them because they are efficient products rather than be forced to use them by the fact that there is no alternative.

The UK should continue to seek ways in which to forge ahead in the setting of its own national standards. If we are a leader in these matters we should seek to press every opportunity to lead by national action in order to get the rest of Europe to follow.

[262] The Rise of the Machines: A review of energy using products in the home from the 1970s to today, Energy Saving Trust, June 2006
[263] Light's Labour's Lost: Policies for Energy-efficient Lighting, International Energy Agency, 2006

Energy efficiency policy cannot address the fact that higher levels of disposable income continue to lead to growth in ownership and use of appliances. This is a particular concern where there are growth markets for products with unavoidably high carbon emissions. For the most part these are unnecessary and wasteful uses of energy. Government leadership is needed to make high energy usage products socially unacceptable and expensive. We must also continue to work towards restricting usage through the establishment of EU and national standards of efficiency.

7.2.5.3. Building standards

We support the introduction of the Code for Sustainable Homes launched last year, but it is essential that it becomes a mandatory rather than a voluntary standard, and that higher levels of the Code are enforced in future. We expand on this in our Chapter on the Built Environment, but we would add here that unless compliance is rigorously assessed and enforced its impact will be limited. There is a shortage of qualified inspectors and no effective self-certification which must be remedied as soon as possible.

7.2.6. Supply

7.2.6.1. Strategic approach to supply issues

There have always been arguments about the relative economic benefits of different generation sources, which have shown widely differing trends in recent years. The overriding need to curtail carbon emissions has led to the emergence of competitive renewable and small scale generation. By contrast, as the summer's White Paper highlighted, around 25GW[264] of coal and nuclear generation capacity is likely to be lost in the next 20 years due to ageing and inefficient plant closures, which would relate to around 30% of current electricity demand. Furthermore, UK production of oil and gas is likely to fall by around 7% per annum. However, without significant investment, this rate of decline could increase to 14% per annum. If current trends are allowed to continue, we are likely to be importing around ¾ of our primary energy by 2020.[265]

Nonetheless, it is not government's role to make choices between those generation options. Its job is to provide a clear framework within which choices can be made by the market. Government also has a responsibility to ensure diversity and security of supply.

Our view of the responsibilities of government is clear. That is why our proposed framework would:

- discriminate in favour of low-carbon sources;
- encourage low carbon emerging technologies;

reward installations that make efficient use of waste heat for industrial and domestic purposes;
remove the inbuilt assumption in network operation that centralised is best; and
encourage diverse sources of supply.

We believe that by 2020 these policies would provide a diversified and secure mix of generation with a much lower carbon footprint as long as they were implemented today. We are aware, however, that if the Conservatives were to win the next election then a number of key decisions may well already have been taken by the existing Government which cannot be altered retrospectively. There therefore needs to be a pragmatic recognition that the policies that we propose may be overtaken by events. In

[264] Indeed, the recent Energy White Paper published by the DTI in May 2007, states that: 'Energy companies will need to invest in around 30-35GW of new electricity generating capacity – as coal and nuclear plants retire – over the next two decades, with around two-thirds needed by 2020

[265] Our Energy Challenge: securing clean, affordable energy for the long-term, DTI, January 2006

particular, the choices that the current administration makes will have a significant impact upon our success in preventing an energy gap as aging nuclear and coal plants are shut down.

7.2.6.1.1. Security and diversity of supply

In our view, the best way to ensure security of supply is to ensure diversity of supply. As Liam Fox said in a speech last year, diversity of supply means ensuring diversity in the type of fuels we use; in the geographical sources of those fuels; and the security structures that will guarantee the safe transport of these fuels. In our view the best way to promote this diversity is to produce a framework within which the maximum number of sources of generation can thrive. We need therefore to support emerging technologies and to encourage more decentralised energy. If we get the framework right we will get diversity, and thus security.

We do not believe that there is a case for a statutory power for Ministers to dictate generation methods. That will merely undermine belief in the chosen framework and raise prices unnecessarily as uncertainty increases the effective cost of capital. We discuss below the sectors individually.

7.2.6.2. Developing low carbon generation

7.2.6.2.1. Research and development

In order to ensure that the UK is at the forefront of technological advance and innovation, we need a clear, long-term framework of support through all stages of new product development, including research, development, demonstration, and deployment. To date, there have been too many schemes and reviews and no certainty. Industry has therefore located R&D elsewhere. Yet, the seeds of new ideas are often sown in the universities and UK academic excellence is world-renowned. For this reason, companies making auction payments and paying the power station waste heat levy (see below) should be able fully to offset the cost of research grants to explore new technologies for low carbon generation, heat production, demand reduction, energy and fuel efficiency.

7.2.6.2.2. Emerging technologies

When new products have moved to the development stages there is sometimes need to support them through early trials until they become 'proven' technologies. This is best done through the private sector. Private investors need to be encouraged to support technologies in this way and bring them to market. In addition investment in emerging technologies should be offsetable against auction payments and the power station waste heat levy (see below). We could require the Climate Change Committee to encourage these technologies by allocating feed-in tariff bands.

7.2.6.2.3. Proven technologies

A 'proven' technology is one for which all testing and demonstration projects are complete and the technology is known to work but does not have the scale to be economically viable. At this stage, they often need to be given additional support through market development to ensure that they become cost-competitive. There is now considerable evidence from more mature markets that long-term market building programs do deliver consistent and significant price reductions over time. Solar PV costs in Japan for example fell by 75% between 1994 and 2004, during which time there was a 35-fold increase in installed capacity.

7.2.6.2.4. Proven technologies: competitive feed-in tariffs

The Renewables Obligation has built on the Non Fossil Fuels Obligation (NFFO) for some technologies such as onshore wind and landfill gas, but has failed to bring forward other low-carbon generation. Landfill gas in fact, dominates the current renewables market as a result of current policy – as Figure 7.3 shows. Co-firing has not been adequately covered and this is being reviewed as part of the proposals for banding the Renewables Obligation.

Figure 7.3. Total use of renewables

Total use of renewables Thousand tonnes of oil equivalent

	1990	2000	2003	2004	2005
Geothermal and active solar heating	7	12	21	25	30
Wind and wave	1	81	111	166	250
Hydro (small and large-scale)	448	437	278	424	427
Landfill gas	80	731	1088	1327	1421
Sewage gas	138	169	165	177	179
Wood (domestic and industrial)	174	503	400	400	285
Waste combustion	101	376	480	463	460
Other biofuels	72	216	574	710	1193
Total	**1021**	**2525**	**3115**	**3692**	**4246**

Source: DTI UK Energy in Brief, July 2006

Having reviewed the alternatives, we believe that the NFFO approach which is similar to feed-in tariffs was more successful in bringing forwards a range of technologies at competitive prices. New fast-track planning procedures, already announced by the Government and likely to be strengthened by a Conservative administration, should significantly reduce project delays and thus remove a weakness of the NFFO system.

We propose, therefore, a system of feed-in tariffs which would have separate bands for a range of low carbon technologies. Within bands, successful applications would be determined by competitive auctioning for allocations of fixed periods. The technology bands, amounts for each band and periods over which they operate will be decided by the new independent Climate Change Committee, already promised by the Conservatives. We would anticipate that they would allocate bands to wave and probably tidal sources. We would also expect the Committee to review the part to be played by co-firing and biofuels, ensuring that the maximum carbon savings were derived.

As part of our consultation we have discussed the Severn Barrage. We are not yet persuaded that the energy could be harnessed at an acceptable environmental cost but there is a need to monitor closely new developments here and in Morecombe Bay as advances in technology may well shift the balance of advantage. In the battle against climate change, it is not sensible to rule anything out.

Finally, there needs to be a mechanism by which support is withdrawn when either a particular technology reaches market competitiveness or, after a specified period, looks unlikely to reach it. The new Climate Change Committee will also need to make these decisions.

7.2.6.2.5. Proven technologies: onshore wind

Onshore wind is now at market competitiveness with internal rates of return (IRR) hitting 25%, and so should receive no further support through the proposed banded competitive feed-in tariffs. The EU ETS and carbon levy will continue to ensure that it has an advantage over carbon based forms of generation. Furthermore the planning procedures it has found so onerous will be speeded up under our planning proposals (see below).

The withdrawal of support for onshore wind excludes small scale wind turbines, including building integrated wind turbines which are not yet commercially viable, and which would also be supported by feed-in tariffs.

7.2.6.2.6. Proven technologies: microgeneration

It is difficult to obtain accurate data on the number of microgeneration installations in the United Kingdom, but the most widely quoted figures show that, as of 2005, there were just over 82,000 installations, of which some 78,000 were solar water heaters.

Figure 7.4. Installations

Technology	No. Installations
Micro-wind	650
Micro-hydro	90
Ground source heat pumps	546
Biomass boilers (pellets)	150
Solar water heating	78,470
Solar PV	1,301
Micro-CHP	990
Fuel Cells	5
Total	**82,202**

Source: Our Energy Challenge: Power from the People, Microgeneration Strategy, DTI, March 2006

What this highlights is the extremely small number of microgeneration installations in the UK – particularly when we note that those generating electricity account for less than 4,000 in total.

One of the main reasons for this is that small scale microgeneration systems are currently costly. At the end of 2005, the pivotal Energy Saving Trust/DTI study on Microgeneration[266] concluded that few technologies were cost effective, with the possible exception of biomass and GSHP for heating in comparison to electric heating. Small commercial scale CHP was seen to be at border-line competitiveness. The key to delivering a step-change in cost reductions over the next 5-15 years lies in achieving considerable economies of scale, which would take microgeneration in the UK beyond its current niche market status.

Britain's poor performance is especially lamentable when contrasted with that of other European countries – especially Germany, the European leader in solar PV. Germany's success is largely attributable to its '100,000 roofs programme' which used feed-in tariffs to kick-start the market and then continued support with its replacement – the Renewable Energy Law. During 2000 alone, more than 8,000 systems were approved with a capacity of 41.66MWp. That means twice the installations in one year than the total now existantin the UK. By 2003, 345.5MWp of capacity had been installed and the price of solar PV had fallen by 20%.[267] Germany, Japan, and the US are the top 3 countries in terms of installed solar PV. All have used market stimulation programmes to develop – Japan's '70,000 rooftop proposals' vying with the US 'million solar roofs programme'.

In Germany, however, there is a view that the main beneficiaries from the tariffs and tax breaks were financial intermediaries and individual investors. Any feed-in tariff structure in the UK must be set up so that it operates at the smaller end of the scale and benefits directly the domestic and small business consumer. Provision would, however, be made to enable intermediaries to bundle microgen contracts so that the cost of capital can be further reduced.

[266] Potential for Microgeneration Study and Analysis, Energy Saving Trust, Econnect, Elementenergy for the DTI, November 2005
[267] Solar Generation: Solar electricity for over one billion people and two million jobs by 2020, European Photovoltaic Industry Association, Greenpeace, September 2006

By contrast, the existing Government is relying for market stimulation primarily on suppliers voluntarily paying a 'fair price' for export; the ROC reward process; and pump-priming through the Low Carbon Buildings Programme. The figures show that these have so far failed. A typical export tariff of 7p will amount annually to around £15-16 for a standard 1 kWp PV or micro-wind turbines. Clearly, this would not provide sufficient incentive. Microgeneration at the domestic, small business level and community level is too small to be effectively supported through a bidding mechanism of competitive feed-in tariffs and replacement. Measures need to be kept simple if they are to be successful.

Capital grants programmes in general are finite and subject to the vagaries of spending reviews and policy changes as the recent farce over the Low Carbon Buildings Programme only too painfully showed. The Government had allocated £78.5m to the LCBP over 4 years which amounted to £18m a year shared between wind, biomass, solar hot water/PV, GSHP, micro-hydro and gas micro CHP – a mere £2.5m per technology. Grants are awarded monthly, but the householder fund was so small that it was running out on the first day of the month. As a consequence the Chancellor allocated an extra £6m to the fund in the Budget, but the DTI suspended the fund shortly afterwards in order to restructure it. Although this restructured fund is now opened again, the resultant confusion, uncertainty and delay has lead to many renewables firms having to lay off staff and has damaged the fledgling microgeneration industry. Total grants per project have also been reduced. There must be an end to such inconsistency and a more reliable method for supporting microgeneration is clearly needed.

The Government is introducing a number of other measures – such as the development of specific targets; including microgeneration in the EEC and the Code for Sustainable Homes; public sector leadership; and the development of technology route maps. They lack impact, often rely on voluntary compliance, and, in many cases, have been delayed for further consultation. We need to change the attitude and address microgeneration technologies as proven, and extend the focus of policy beyond 'new build' to retrofit.

For this reason, we propose the removal of existing measures and their replacement by the introduction of feed-in tariffs for small-scale microgeneration up to 50kWp. Larger microgeneration that can support a number of properties would be supported through the competitive bidding system.

Transparent feed-in tariffs would allow a generator to know in advance how much they would receive per unit of output. They would be set annually for each type of technology and once set will gradually reduce over a 15 year timetable, until termination of the scheme. This timescale would ensure that a product has sufficient time in which to become market competitive but should ensure that uncompetitive, inefficient products do not become a drain on public finance.

The costs would be borne by UK electricity consumers in the form of a new 'clean energy or renewable development premium' to existing bills. In Germany, this amounted to around 1.63 Euros a month for a typical household for all renewable technologies[268]. In the UK this is likely to be no more than a few pence at the outset. The cost would be transparent to consumers and much simpler to understand and cheaper to administer than the complicated ROC system.

Such tariff systems provide long-term security of income to investors with guaranteed rates of return. This would in turn facilitate the development of low interest credit and loans to pay upfront capital costs from a range of third parties. It would also remove market dependency on the stop-start nature of Government grants.

The relative simplicity of the fixed feed-in tariff and the success of the approach explain why it has been adopted by other European countries including Germany, France, Poland, the Czech and the

[268] German PV Market Report, Solarbuzz LLC, May 2006

Slovak Republics, Spain, Italy, Greece, Portugal, Bulgaria, Belgium, Hungary, Slovenia, Latvia, Lithuania, and Switzerland. There are of course national differences in the rates payable to generators. Greece, France, and Germany, however, all have tariffs between 30-50 Euro cents per kWh. Although further work is needed to determine the exact level that should be set in the UK, we envisage rates around those set by Germany from 2004, i.e. 45p per kWh.

The EST study concluded that microgeneration could provide 30-40% of the UK's electricity by 2050 and reduce domestic emissions by around 15%. Yet this study did not take into account the impact of introducing a European style feed-in tariff model. If these are introduced, then arguably the contribution might be still higher.

As a final measure, a recent study[269] showed how domestic consumers were disadvantaged over business consumers in terms of tax benefits. In order to level the playing field, we support its suggestion that:

- individuals investing in microgeneration technologies should have access to the same capital allowances as companies;
- enhanced capital allowances should be available for all micro-generation technologies; and
- capital expenditure within domestic energy service contracts should qualify for capital allowances.

7.2.6.2.7. Proven technologies: nuclear

The issue of new nuclear power is very emotive for many individuals. It is an issue that divides political parties. Its proponents argue that it is the leading form of low-carbon generation and the only technology that can meet our energy requirements at the scale required. Its opponents' reasons have moved far beyond the initial opposition of the 'green' movement which focused primarily on the issues of safety and nuclear proliferation.

There is not space in this Report to go into each and every argument but there are two general observations that should be made.

- Firstly, that there is no doubt that there are concerns surrounding nuclear that do not exist with other forms of low-carbon generation. Of these, the primary fears are about safety and nuclear proliferation – fears exacerbated by the recent rise in international terrorism. It is for politicians and the public to decide how real these risks are and whether or not they outweigh the benefits of nuclear generation. The current Government has failed to deliver a full public consultation on these issues and that failure resulted in its recent defeat by Greenpeace. By contrast, we support the fullest public disclosure of these issues so that the discussion can be conducted at a national level in an open and transparent manner with full access to evidence for all.
- Secondly, there is a range of issues that are often raised but are not specific to nuclear generation. These must be addressed but in the proper context as issues not confined to nuclear power but involved with low carbon generation and/or power stations in general. These include questions of planning permission, costs of grid access and upgrades, and enhanced security. After all, concerns about the site security apply to gas interconnectors and other strategic energy sources just as they would to Sizewell C.

If government and Parliament, after proper consultation, is convinced in principle, the final decision on new nuclear power stations should still reside with the private sector and will primarily be based on economics. As such, the private sector requires a clear message from a future government as to the regime under which it would operate. Under our proposals:

[269] Unlocking the Power House: Policy and system change for domestic micro-generation in the UK, SPRU/Southampton University/Imperial College, October 2006

- nuclear would receive comparative competitive benefit from the EUETS and the carbon levy to recognise its contribution to carbon reduction;
- government would not underwrite the risk of building a new nuclear power station. The utility companies believe that new nuclear stations can be competitive and they should build on that basis;
- all risks and costs of nuclear commissioning should be borne by the private sector;
- the only exception is the insurance in the event of a catastrophic nuclear accident where, in compliance with international treaties, government must underwrite the insurance of nuclear stations beyond a defined amount;
- the Nuclear Decommissioning Authority should negotiate with the industry arms-length fixed charges for waste disposal contracts. These contracts will be set up to ensure that they do not operate as a subsidy but transfer the cost to the private sector. The changes should include a government risk premium element;
- government should bear the risk of any government changes in disposal strategy, whereas the industry should take the risk of any increase in quantity or specification change in the waste;
- the owner of the station should be fully responsible for decommissioning costs.The government and the owner should conduct a full estimate of those costs. A ring-fenced station-specific decommissioning fund should then be set up, and the owners required to pay fixed amounts into the fund according to the future decommissioning costs. Owners should be able to carry out their own decommissioning so long as it is subject to rigorous independent inspection;
- the private sector should pay for any pre-construction safety analysis currently covered by the Nuclear Installations Inspectorate, including any costs for the HSE, wherever these are identifiably above non-nuclear centralised generation costs;
- nuclear generation would also be affected by the introduction of a power station waste heat levy (see subsequent Section) on centralised generation. Although it might be argued that waste heat from nuclear is relatively carbon free, the purpose of this levy would not just be to reduce emissions but to prevent wastage. The likely location of any nuclear new build means that it may well be located far from existing demand. Such a levy would serve to encourage innovation in finding uses for this waste heat. This may well lead to new partnerships with industry; and
- finally, we are not persuaded of the case for any government funding for research into new generation from nuclear power – in particular, for nuclear fusion.

7.2.6.3. Heat

For too long, heat has been the poor cousin of low-carbon technological advance. This is of particular concern since heating is the dominant end use for energy outside of the transport sector and the vast majority of energy consumed in homes. An Energy Saving Trust study found that in 2000, 83% of energy usage in the home was for space and water heating. This excludes electric water heating and still represents about 24% of total UK energy consumption. Most current generation capacity is located too far from the consumer for the waste heat to be used and since it cannot be easily stored and transported represents a huge wastage. Such inefficiency must be urgently addressed.

An effective heat policy is needed to encourage the reduction in heat use, reward the use of waste heat, and encourage the use of a wider range of fuels to enhance security of supply and reduce the carbon footprint. Unlike mainland Europe, the UK market for low carbon and renewable heat remains underdeveloped owing to a lack of a coherent strategy. There is, for example, no policy in place to promote the use of renewable heat.

We must put that right and set clear targets aimed at the efficient use of heat. We should give incentives for the use of waste heat and for the development of low carbon and renewable heat

solutions across the economy as a whole. Targets should be ambitious and verifiable and reward carbon reduction.

To meet them, we need a long-term stable framework that encourages sustainable investment and avoids the vagaries of short-term government funding rounds. As such, our proposals to strengthen the EU ETS, to introduce a floor price for carbon via the carbon levy, and to phase out CCAs should provide sufficient incentive for investment in low carbon heat generation at the larger end of the power sector. To date, CCAs have reduced the effectiveness of the Climate Change Levy and, combined with the low carbon price, have resulted in little incentive to invest in such generation. Our proposals should result in renewed stimulation to the CHP market.

At an early stage in our deliberations we argued that consideration should be given to the introduction of a power station waste heat levy payable by large centralised generators who do not include combined heat and power off their generation systems. During our consultation process we heard extensive opinion on the merits of imposing such a levy. It was suggested by some that this should only be an option for the longer term as waste heat could only be effectively used when demand was smoothed. This smoothed demand would take some time to achieve, requiring the introduction of smart metering, new tariffs and changed behaviour amongst many other things.

However, whilst the issue of smoothing demand is relevant for the domestic, commercial and small business sector, this is less true for the energy intensive industries such as chemicals. We are therefore recommending the immediate introduction of a power station waste heat levy to encourage innovation in finding uses for this waste heat. The loss of waste heat is too significant to continue unaddressed and a strong incentive is needed to motivate generators to stop the waste. Such a levy would encourage power generating capacity to locate near to outlets for heat and would facilitate the move towards community level generation. Its introduction is urgent so to have maximum influence in the development of the necessary replacements for our aging generators over the next few years.

The introduction of the power station waste heat levy should not result in an increase in the overall tax burden on industry. Payments should be fully offsettable against low carbon R&D grants and investment in low carbon emerging technologies.

Local authorities have a key role to play in encouraging the development of community heating. Within our LCZs, local authorities will be expected to develop a local energy strategy for heating. This should specify what type of energy distribution network is appropriate for a given district. In areas with sufficient heat density, this should be district heating using heat demand in public sector buildings to underpin development. Changes in planning and building standards will result in powers to insist upon district heating, local CHP and other forms of decentralised energy, including microgeneration.

At the domestic level, the first priority is to call a halt on the source of the problem. The Government has set a target that all new homes are zero carbon by 2016. Questions remain about how this is to be delivered and indeed a recent Environmental Audit Committee report noted that "the PBR refers to this as an "ambition", and that the building regulations which are to make it happen will only be "progressively strengthened".[270] We propose that new homes should be built to new passive building standards that require as little heating and cooling as possible. These would be enshrined in the new Building Standards and would prevent replication of the problems that we have with existing stock. Such standards would be an immediate requirement within our LCZs. We further develop this proposal in our Chapter on the Built Environment.

The housing stock as a whole has an average SAP rating of 42. The 83% of energy that this typical home consumes is taken up by 59% for heating and 24% for hot water. A newly built house, with good

[270] Pre-Budget 2006 and the Stern Review, House of Commons, Environmental Audit Committee, 13 March 2007

standards of insulation and a SAP of 80, can reduce heating requirements by about 75%[271]. Insulation should be raised to the highest standard possible in existing stock through the LCZ approach. The aim of the current Government to ensure that every home is insulated by 2010 is an admirable goal but it lacks the sound policies to make it a reality.

New electric heating should not be permitted and existing electric heating phased out through the LCZ approach (unless powered by zero-carbon sources). A perverse incentive has been created by current energy efficiency standards where energy consumption may have been reduced but CO_2 emissions increased through the use of high carbon grid electric heating, both on peak and off peak. It is important that, in future, measures are carbon led and not energy led.

To encourage the development of low carbon heat generation at the 'micro' end of the market, such as biomass heating and ground source heat pumps together with micro-CHP, a fundamental shift is required. We have to move away from the present, bureaucratic framework of insufficient capital grants. We therefore propose reduced council tax and business rates for domestic and business consumers that use 'micro' heat technologies. Such reductions would not apply to microgeneration of electricity which will be addressed through the feed-in tariff approach outlined above. We anticipate that the reduction might be set at a level which provides 40% of standard implementation costs in line with EU rules.

We did consider the concept of renewable heat certificates with an associated obligation on suppliers, however, we agree with the arguments that since the supplier has no control over the many users and producers of heat, the process would be extremely complex and a financial incentive is therefore preferred.

7.2.6.3.1. Cooling

In line with the policy on new electric heating, new electric air conditioning and refrigeration should not be permitted in commercial buildings. This might be done through the LCZ approach or measures such as the EU Directive on Energy Performance in Buildings. Not only do these systems consume high carbon grid electricity they also use very powerful greenhouse gas refrigerants where, for example, 1 tonne of HFC 134a emitted into the atmosphere is equivalent to 3,400 tonnes of CO2 emissions HFCs, the most popular gases used in refrigeration, are a growing source of emissions and that's why it was already Conservative policy at the last election that they should be phased out. We should announce a ban on new use from 2010 and insist on a total phase-out by 2015.

The policies outlined to date and the incentives given to local authorities should see electric air conditioning and refrigeration being replaced by CHP, heat fired absorption and trigeneration, and natural ventilation systems such as passive stack ventilation. Alternatives to HFCs have already been pioneered by some of the world's largest users so that they can easily be introduced to replace equipment using this potent global warmer.

Trigeneration is particularly important as it would replace usage of high carbon grid electricity with more low carbon electricity from the 'heat to cool' process. In addition, electric systems use greenhouse gas refrigerants whereas Trigeneration uses refrigerants that have zero Ozone Depletion Potential and zero Global Warming Potential. Increased use of trigeneration should also increase the capacity for electricity generation in the summer and reduce the high electricity consumption associated with electric air conditioning and refrigeration. The latter is especially important as temperatures are forecast to rise as a result of climate change.

[271] The Rise of the Machines: A review of energy using products in the home form the 1970's to today, Energy Saving Trust, June 2006

7.2.6.4. Fossil fuels

7.2.6.4.1. Coal

To date, coal has been the least efficient means of generating electricity in terms of carbon emissions and yet it accounts for around 41% of primary fuel and 34% of electricity production (both expressed in million tonnes of oil equivalent, 2005[272]). In addition, the rises in gas prices and issues around gas supply have made coal more competitive. As a consequence, coal use rose by 3.4% in 2005 and this upwards trend continued in 2006 with demand from electricity generators rising by 23.1% in the third quarter[273].

With substantial world coal reserves and greater competitiveness increasing their usage, it is essential that cleaner coal technologies, such as Integrated Gasification and Combined Cycle (IGCC) and super-critical boilers, are introduced. Scottish & Southern and PowerGen are already moving towards introducing cleaner coal stations at Ferrybridge in West Yorkshire and KingsNorth in Kent.

100% auctioning of allowances for EU ETS should ensure that cleaner coal technologies with lower emissions are implemented, including lower carbon alternatives such as co-firing with biomass. It should also ensure that the dirtiest technologies are phased out.

However, even the cleaner coal stations (CCS) still have efficiencies of around 40%. Whilst they may be required in the short term, the main technological development that could ensure a future for coal in a low carbon world is carbon capture and storage, which can significantly increase efficiencies. We recognise that the scaled up technology is not yet fully proved, however in order to ensure commitment to this new technology, we propose that no new coal station should be built that does not have the capacity to capture carbon in the future. In addition, evidence of available land for building new facilities will be needed so that any existing technology can be retrofitted within three years of it becoming commercially available. Beyond 2020 no coal station should be allowed to be built without carbon capture. Beyond 2025 no existing station should be allowed to continue to operate without carbon capture in place. In recommending this route, we recognise that unless there are major CCS technology changes we will be reinforcing centralised generation inflexibility as the CCS stations will be base load only.

This commitment together with the carbon levy should ensure that the private sector can have confidence that there will be a sustained market for large scale carbon capture and so ensure that urgent investments are made to scale the technology. This policy ties in with that of the EU which is pushing for all new coal-fired power stations to offer CCS by 2020. It also wants to see 10-12 demonstration projects in operation across the EU by 2015, to prove technical viability in order to assist in meeting the 2020 deadline. International rules that allow the burial of greenhouse gases beneath the seabed recently came into force and will facilitate this development.

BP and Scottish & Southern were looking to construct a CCS plant at Petershead in Scotland. At the site, natural gas would have been split into hydrogen and CO_2. The hydrogen would have been used to generate power whilst the CO_2 would be injected into the North Sea Miller field and used to aid recovery of oil and gas. BP have called for Government funding to assist in developing this project and others have demanded that the Government to take the lead in providing funds for CCS as part of the EU policy. BP have now announced their withdrawal from the plan, ostensibly because of the failure of the Government to commit.

[272] UK Energy in Brief July 2006, DTI/National Statistics
[273] Quarterly Energy Trends, DTI, December 2006

We are not persuaded of the need to fund demonstration projects for CCS and feel that such funds should come primarily from the private sector. However, in order to initiate the market we propose that a single CCS project is funded through the existing Renewables Obligation until our proposed competitive feed-in tariffs come into effect. This project should, however be a coal-fired CCS plant. That would tackle the highest carbon emissions. We do not support exceptional Government funding for the Petershead project unless coal is being partially burnt. In the recent Budget the Government announced that it would launch a competition to develop the UK's first full-scale CCS demonstration and that the result would be announced next year. We support such competitive bidding for the demonstration project, with bidders specifying the subsidy required, the carbon capture to be achieved, and the technology replicability in the rest of Europe and other markets beyond. Under our proposals the cost of the subsidy would be offset against auction payments or the power station waste heat levy.

Such demonstration would be needed to prove the technology can operate at the commercial level. In addition, concerns remain about the costs of CCS which a recent study for the DTI estimated at just above £20/tonne CO_2 for retrofitted coal-fired plant, and just above £30/tonne CO_2 for gas-fired plant[274]. The difference is accounted for by the higher volume of CO_2 emitted from a coal fired plant which enables unit cost savings. Our proposals to introduce an effective floor price for carbon will assist in making such ventures commercially viable and minimising any subsidy from the end consumer.

Finally, Carbon and CO_2 products are already used in industry and consideration should also be given to the utilisation of CCS for these. The energy industry should seek to work in conjunction with the industries that use these products. Carbon is lighter and stronger than steel and does not rust and if increasing uses can be found for such products this may divert some of the need for storage. This could make a small but nevertheless useful contribution to reducing emissions.

Development of this technology is particularly important given the current expansion of coal generation overseas – particularly in China where a new coal station is being commissioned almost every 4 days. This represents a significant export opportunity for these developments if the technology can be refined and suitable sequestration sites can be found.

There are significant quantities of identified domestic open cast mineable coal which could be developed at competitive prices. Modern remediation methods make environmental gain a real possibility in some of these areas. If coal is to be burnt, transport distances should be minimised and this again makes UK exploitation environmentally valuable. However, planning delays and refusals mean that the UK may lose open cast mining expertise as existing sites run out in about 5 years. The Coal Authority estimates that established reserves amount to 222 million tonnes with a further known potential of 380 million tonnes, but that currently un-accessed deep mine and open cast resources could provide many years of future production at present levels[275]. In order to access this potential, planning issues need to be resolved. Planning guidelines need to be reconsidered in the light of the national need to encourage security of supply.

7.2.6.4.2. Gas

As the most carbon efficient of the fossil fuels, gas will continue to play a predominant part during the transition to a low-carbon economy. The construction of additional pipelines and LNG regasification terminals has and should contribute significantly to ensuring diversity in gas supplies to the UK.

[274] Analysis of Carbon Capture and Storage Cost-Supply Curves for the UK, Pöyry Energy Consulting, January 2007
[275] The Coal Authority Evidence, The House of Lords Select Committee on the European Union: Sub Committee B (Energy, Industry and Transport), Hearing Monday 12 November 2001. http://www.coal.gov.uk/news/newsnov2001houseoflordssummarypaper.cfm?jHighlights=open%20cast%20mining

To ensure the UK is at the forefront of implementing CCS techniques as they become available, the same rules should apply as to new coal stations. No new gas power station should be built that does not have the capacity to capture carbon in future. Evidence of available land for building new facilities will be needed so that any existing technology can be retrofitted within three years of it becoming commercially available. Beyond 2020 no gas station should be allowed to continue to operate without carbon capture in place.

Gas storage should be increased as a backstop to any interruptions in supply. There is not a strong enough case for the Government to intervene to provide gas storage. The main barrier to private development is the difficulty of obtaining planning consent. Barriers to planning approval would be reduced under our planning proposals. Proper regulation would remove any risks from disruption and serious infrastructure failure.

In North America, coal bed methane has become a major source of gas supply often aided by federal tax breaks. It is probable that modern technology should make it possible to exploit UK coal bed methane sources without tax advantages or subsidy; however, planning issues mean that permissions to drill are slow to be given and costs subsequently unnecessarily high. Planning guidelines need to be reconsidered as part of addressing security of supply issues.

Furthermore, trials in the US have shown that extraction of coal bed methane can be combined with carbon sequestration. If this can work in the UK, then between 2 and 10 molecules of CO_2 can be injected for every molecule of methane that is extracted. Many of the UK's coal fired power plants are either on top of or near unmined coals and so are well placed to use this technology to deal with many years of emissions.

7.2.6.4.3. Offshore oil and gas

UKCS oil and gas production has peaked and production and oil company behaviour exhibit all the characteristics of a mature province. The UK national interest is served by maximising recovery from existing fields and doing everything possible to ensure exploration for all prospects while the infrastructure is in place. The constant tinkering and raising of tax levels that has characterised the Chancellor's approach has acted as a significant disincentive to investment. We do not, of course, advocate subsidy but the industry deserves a clear, consistent and transparent fiscal approach.

Producing fields

The tax regime in the UKCS has been built up over the past 40 years and is highly complex with differing and often irrational impacts on companies and fields. In addition the interaction between PRT and decommissioning liabilities means that transfer of existing production fields and facilities is being impeded. This reduces the effective exploration of the nation's natural resources. The absence of decommissioning sinking funds and the wish to ensure major companies remain liable for decommissioning means that, if oil prices were to fall significantly, we will face premature abandonment of fields. There is also a significant risk that any period of low oil prices will lead to a reduction in tax receipts coupled with a government obligation to pay for decommissioning on PRT paying fields.

The overriding national interest must be to maximise the life of existing fields and infrastructure. The present tax regime is simply not suited to this objective. We see little alternative to extending the current stewardship approach to tax matters. There would need to be field by field discussions between the companies, including those who have no current ownership but still maintain ultimate liability for decommissioning, and the government. The objective would be to agree on the establishment of field decommissioning funds and so to prolong the field to the ultimate benefit both of the companies and the nation. In some cases this would involve tradeoffs and should lead to the abolition of PRT. We

recognise that this will mean an unusual element of discretionary judgement in matters of taxation. However it has long been the case that companies in the UKCS have been prepared to reach voluntary agreements rather than await specific legislative powers.

It is possible that this voluntary approach would not work effectively in some fields. In that case, we think government should be willing to take the power to open up the continued ownership of such fields. The existing owner could be required to put a value on the field on specified tax and decommissioning assumptions. Other groups would be asked to value the field on the same transparent basis. If the existing owners were outbid they would receive the amount they had bid from the winning bidder with the difference going to the Treasury and ownership would be transferred.

Infrastructure

There has been an improvement in the cost of access to offshore infrastructure but there is still a lack of transparency and lengthy delays. The time has come to apply the same approach to offshore as to onshore infrastructure. The new regulator would be expected to take account of investment and return history when setting tariffs and it would be expected that there would be more price differential between, for example, pipelines than one finds onshore.

Exploration acreage

Too much acreage is still in the hands of companies who are not working it hard enough for exploration opportunities despite efforts over the past 15 years. In the absence of voluntary action, powers may have to be taken to ensure that undrilled acreage is returned to the government.

We believe that the tax regime for new exploration needs to be moved to an acreage specific auction system. 5 year exploration licences with automatic right to move to production on discovery should be put up for auction. The auction should be carried out, not for up front payment, but by the completion of a standard form production sharing agreement with no more than 5 variable figures to be completed. Production would not of course be taken as oil and gas but rather as its monetary equivalent.

7.2.7. Institutional infrastructure

7.2.7.1. Governance

The abolition of the Department of Energy in 1992 has resulted in the progressive reduction of central government's energy expertise. In addition the formation of Ofgem, EST, Carbon Trust, Energy Watch etc has created internal interfaces and conflicting duties which have worked against clear decision-taking. The increased power of the Treasury and No. 10 has also meant that the intellectual rigour and knowledge behind the Energy White Papers has been seriously lacking. There has also been the usual confusion over the respective roles of DBERR and Defra.

The policies we recommend need to be implemented by a Secretary of State and a department combining policy responsibility for carbon emission reduction and energy policy. The formation of the Department of Energy (DE) would resolve the present confusion of responsibility. The political leadership would have to come from the very top but leadership at every level would be critical. It is clear that, as some of the key implementation would be done through the new carbon reduction zones, local authorities, too, must be encouraged and incentivised to give leadership and priority to this area. There would have to be the closest relationship, too, with the DSG.

Ofgem's present remit was designed in the early 1990s and other duties have been added to it. Ofgem should be reformed and renamed Ofnet. Ofnet's responsibility would be to regulate the networks with an emphasis on enabling access and improving quality. We are not persuaded that there is any longer a need for regulation of generation supply – this should, in future, be done through the normal competition authorities.

We support the Conservative Party's proposal to create a Climate Change Committee. The Committee would be responsible for setting the interim targets against the 2050 end goal. It would report transparently on the progress towards achievement of those targets and the government would have to give transparent responses. It would also recommend the technology NFFO bands, the allocation of carbon allowances, and be free to initiate discussion of any strategic issue it feels important. It would take over some of the current roles of the EST and Carbon Trust, including raising awareness and providing advice and support functions. Given the other policy changes we are recommending, we doubt whether there will be a continuing role for those organisations as currently constituted, and every effort should be made to simplify and clarify the structure of policy-making in this area without losing the valuable work they have done.

We believe that there is a continuing role for a somewhat reconstituted Carbon Trust in the extension of carbon measurement. The fact that it is an arms-length organisation enables it to oversee the production of protocols for carbon labelling that could form the basis of a European and then a global system.

7.2.7.2. The public sector

The public sector is in a position to lead carbon emissions reduction, not only by setting a behavioural and strategic example to the private sector, but by its very significant purchasing power. Sadly, current governance, funding, and incentives are not aligned to the procurement or operation of low-carbon buildings. In 2004, the sector accounted for 34% of new non-domestic building construction and 37% of non-domestic refurbishment and maintenance work. That totals 1.45% of UK GDP[276]. Up to now, the opportunity has largely been lost but in the future, by driving the highest standards of energy efficiency and carbon emissions reduction, the public sector's impact on the construction

[276] BSRIA Statistics Bulletin, June 2005

industry should have a very strong knock-on effect to the private sector. From developers, to architects, engineers, construction companies and facilities managers, the skills and mentality to deliver and operate low carbon buildings should then develop quickly across both public and private sectors.

The Sustainable Development Framework for the Government Estate (published 2002-2004) has a target of reducing carbon emissions across the public sector by 12.5% from 2000 to 2010 and improving energy efficiency by 15%. This is of no value if we do not know whether the targets are being met. There is no effective governance to ensure proper monitoring. At present, no-one has effective overall responsibility or even direct accountability within individual departments for either the tracking or policing of performance. There is uncertainty over the baseline[277] against which to quantify the 12.5% reduction, and targets are not currently enforced. There is little transparency, no identifiable accountability by department, incomplete measurement, and no sanction for failure to meet targets. Here are all the hallmarks of a headline-led government that has no capacity for delivery.

It is therefore not surprising that expertise in building and energy management is inadequate. This prevents buildings being operated or changed in the manner best suited to reducing emissions. Financial incentives do not encourage energy efficiency. Funds cannot be ring-fenced or carried forward from one fiscal year to the next. Necessary investment is therefore impossible. Savings generated by reduced energy bills merely lead to reduced budgets for next year.

Procurement systems are not well designed to support energy efficiency. Although there was a commitment to procuring 'Top Quartile' energy performance buildings in the government Energy Action Plan, April 2004, the quartiles have not been defined and beyond Building Regulations, so no 'enforceable' energy efficiency standard exists.

To address this woeful state of affairs, we recommend the following measures:

- Proper baselines must be established and transparent annual targets, metrics and reporting put in place. We therefore, recommend that for local authorities (17% of public sector emissions) objective performance should be measured annually on a number of issues and compared to other LAs. This would improve by competition and would force transparent measurement and reporting.

- Central government (18% of emissions), health (20% of emissions) and education (45% of emissions), must provide transparent reporting of emissions. Specific individuals must be made responsible for delivering carbon reduction within each department and meaningful sanctions imposed for any failure to reach targets.

- Energy managers should be appointed for entities with energy expenditure exceeding £2million to give focus and knowledge within these organisations. They could be expected to reduce energy consumption by at least 5% at an associated maximum cost of approximately £200m per year, but with savings of nearly £280m and 200ktC per year. The experience of those organisations within the public sector that already have energy managers would be of great value here.

- A fund equivalent to SALIX should be made available across the public sector. SALIX is a revolving, interest free loan fund, used to pay for minor capital expenditures for emissions reduction. The loans are repaid with savings from reduced energy bills within three years. The repaid funds are then lent out on a revolving basis. These funds should empower the energy

[277] The UK Climate Change Programme: Potential evolution for business and the public sector, The Carbon Trust, November 2005. Emissions for the public sector differed from 3.7 - 5.5 MTC for 2002, depending on the source

managers to save an additional 10%. (£415m total funds to save 390 ktC pa and £124m of energy per year, based on existing SALIX performance. This would take the form of a 'working capital float' of £210m recycled every three years and eventually recovered).

- A Code for Sustainable Buildings should be set to drive the public sector leadership, by defining the quartile performance for new buildings and refurbishment standards. Top quartile performing buildings should be mandatory for all public sector new build and refurbishment. The quartiles must be defined to avoid the present confusion. Since the public sector accounts for one third of UK construction and refurbishment, such procurement provides the opportunity to lead the buildings market into carbon reduction. Based on 2003 construction data[278], 4.3 million m^2 of new public sector buildings are built per year, creating 116ktC or an additional 700ktC pa by 2010. This does not factor in any increase in intensity. Compliance with Building Regulations Part L2A would reduce emissions by 25% or 29ktC per year, with compliance for refurbishment adding an additional 15% or 10ktC. Much more could be achieved with the higher standards set under our proposals.

- No building below asset energy performance certificate rating of A should be procured.

- For the greatest impact on influencing the construction industry, a single minimum standard of energy efficiency should be implemented across the public sector. The scale of the sector's purchasing means that architects, engineers, construction companies and facilities managers will quickly develop the skills and capacity to deliver and operate low carbon buildings.

[278] BSRIA Statistics Bulletin, June 2005