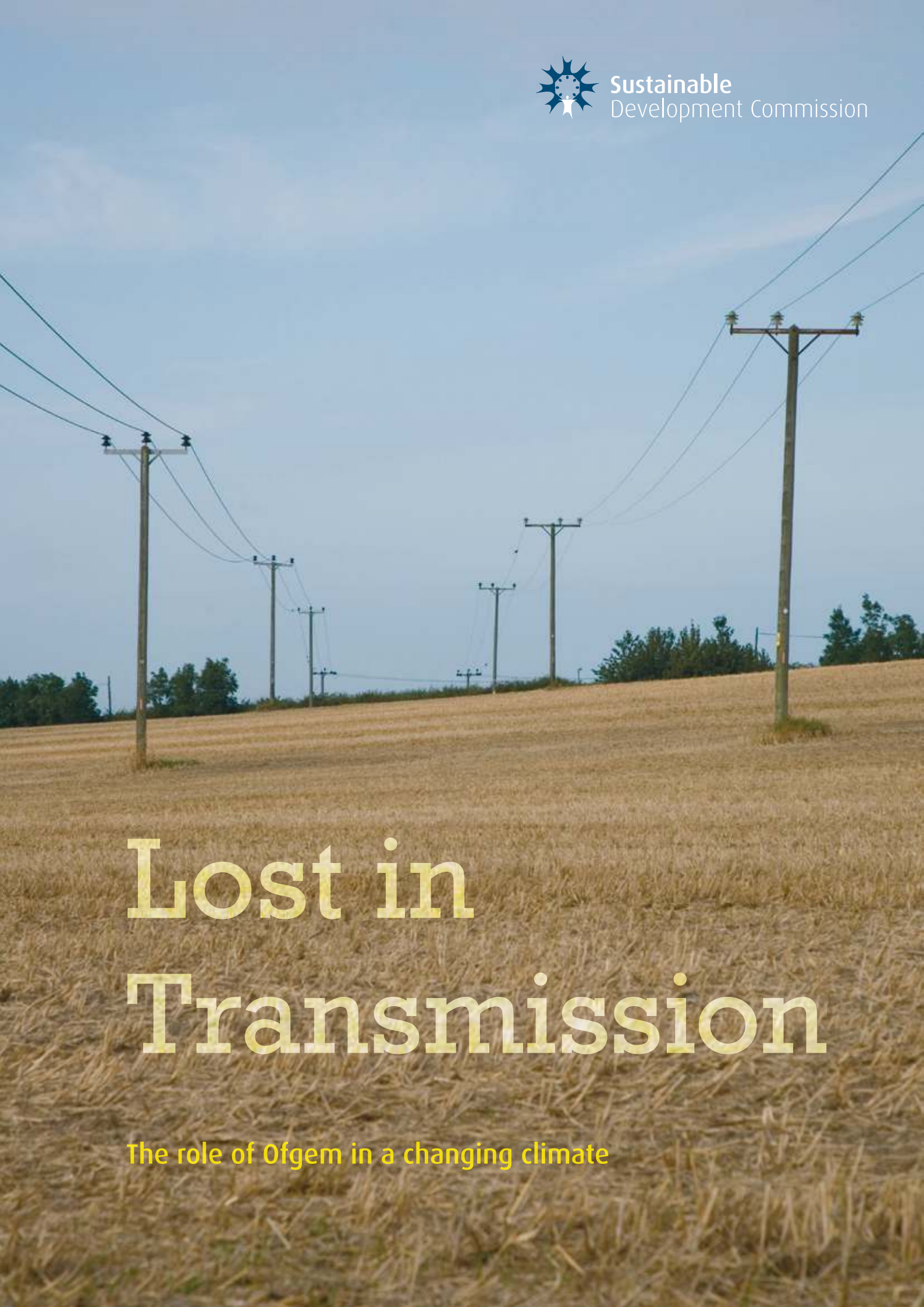

Sustainable Development Commission

Lost in Transmission

The role of Ofgem in a changing climate

SDC in-depth review

Lost in Transmission?

The role of Ofgem in a changing climate

Sustainable Development Commission

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Summary of recommendations

Good governance

Getting the institutional framework right for a low carbon economy

The policy landscape for energy is complex, with a responsibility for energy and environment policy split between two Secretaries of State. There is also a lack of alignment between Ofgem's goals and government's goals and there is no regulatory framework for the provision of heat. Ofgem's institutional culture and approach do not reflect the imperative of sustainable development, particularly climate change.

The SDC recommends that:

- **Energy and environment policy is brought together under one Secretary of State**
- **A regulatory framework for the provision of heat is established**
- **Ofgem's primary duty is changed to align Ofgem's goals with the goals of government energy and environment policy**
- **An interpretation document is published to set out how the new duty will be interpreted and the factors that constitute the consumer interest**
- **The existing social and environmental guidance to Ofgem is clarified**
- **Ofgem's guidance on regulatory impact assessments is updated:**
  - **to ensure that an appropriate social cost of carbon is used consistently**
  - **to be explicit about the assessment of environmental impacts**
- **Ofgem undertakes a capability-building programme for its staff on sustainable development.**

Environmental limits

How is Ofgem addressing the environmental impacts of the UK energy system?

Combined heat and power and renewable generators face a number of barriers to participating in the energy markets and connecting to the transmission and distribution grids. The UK's ageing electricity distribution networks need strengthening to cope with increased levels of distributed generation.

The SDC recommends that:

- **A greenhouse gas incentive package is used in the Price Control Reviews. For the distribution Price Control Review, this would include:**
  - **strengthening of the distribution losses incentive**
  - **revision of the distributed generation incentive and support to improve the ability of the distribution networks to handle two-way power flows**
  - **increasing the Innovation Funding Incentive**
  - **widening the scope of Registered Power Zones and support for the deployment of innovative technologies**
- **A 'connect then manage' approach is adopted to help connection of new generation to the transmission network**

- **Government and Ofgem review the transmission charging arrangements for combined heat and power or provide further support for combined heat and power**
- **Ofgem ensures that any proposals to change transmission charges do not disadvantage generators connected to the distribution network**
- **Ofgem ensures that the network charging arrangements, and the process for reviewing these charges, fully reflect the interests of smaller generators**
- **Ofgem works with National Grid to develop a web-based tool that allows generators to understand the costs of connecting to the networks**
- **Sustainable development is included as an objective in the industry codes and Ofgem supports the industry in developing modifications to reflect the change**
- **The code modification process is simplified so that the interests of smaller participants are fully represented.**

Strong society and sustainable economy

How is Ofgem addressing social concerns?

Consumers need to receive accurate and informative bills in order to engage with their energy use but the existing approach to metering and billing prevents this. Reductions in energy prices have helped to alleviate fuel poverty but this has been partially reversed by recent price rises. There needs to be a greater focus on managing energy use through better information and energy efficiency measures.

The SDC recommends that:

- **Ofgem responds rapidly once the billing and metering trials are complete to improve the accuracy of bills and facilitate a roll-out of smart meters**
- **Ofgem mandates that pre-payment meters are smart meters capable of two-way communication to give consumers a better understanding of their energy use**
- **Greater focus is placed on a wider range of payment options, including using post-office deductions and fuel direct services as a means of paying outstanding fuel bills**
- **Ofgem requires energy companies to provide tariffs for pre-payment meter customers that are not excessive compared to direct debit and standard credit tariffs**
- **Ofgem ensures that wholesale price reductions are passed on to all customers, especially low income and vulnerable customers.**

1 Executive summary

The Sustainable Development Commission (SDC) is the UK Government's independent advisor on sustainable development, reporting to the Prime Minister and the First Ministers of Scotland, Wales and Northern Ireland. This is our second thematic review and it assesses whether Ofgem could take a more proactive role in helping the UK to move to a low carbon energy system.

This review examines Ofgem's performance, as the regulator of the gas and electricity markets, against its sustainable development duty. We also consider Ofgem's duties and powers, its interpretation of these duties, and how these could be changed in the future. We have examined the current barriers to a more sustainable energy system, and we present a series of recommendations, and some ideas for further development, on ways in which those barriers could be overcome.

Review Methodology

This Review has been carried out through:

- A series of interviews with experts in the energy field, including energy suppliers generators, network companies, industry commentators, NGOs and academics
- Consultation with an Expert Advisory Group from industry, academia and government
- Interviews with Ofgem staff, managing directors and the Sustainable Development Sub-committee of the Ofgem Authority
- Desk-based research into the options for change to the energy system[1]
- Desk-based research into international comparisons of energy markets in Denmark, California and the Netherlands[2]
- Desk-based research into consumer attitudes to energy.[3]

Structure of this Report

In this project we have assessed Ofgem's performance against the Government's five sustainable development principles, with particular emphasis on 'living within environmental limits', achieving a 'strong, healthy and just society', 'good governance' and 'achieving a sustainable economy'.[4]

Our findings and recommendations cover

- Longer term, strategic issues about the extent to which the UK energy system, including Ofgem's role, are fit for purpose given the new context of the Stern Review and the Climate Change Bill
- Shorter term, practical issues that can be implemented soon. These include institutional issues within Ofgem, improvement of the conditions for low carbon energy generators, and better incentive structures for the network companies.

We note, however, that even the long term issues require key decisions to be taken soon if the nation is to have an electricity system that is fit for purpose for the 21st century.

Our Overall Assessment

Ofgem's role so far

Ofgem was created in the 1990s to ensure the efficient operation of the gas and electricity markets. In fulfilling this remit, it has operated as an extremely efficient regulator, facilitating improved competition between energy suppliers, and leading to consumer price reductions. However, during recent years there has been a dramatic change in the energy landscape, with a focus on climate change, energy security, and the need to accelerate the UK's move to a low carbon economy becoming of crucial important.

Ofgem's remit has been refined as the challenges facing the energy system have changed. In 2000, it was given a duty to protect the environment and to have regard to the social and environmental guidance issued by the Secretary of State and in 2004, it was given the duty to contribute to the achievement of sustainable development.

These changes are welcome but have been piecemeal. The question now is whether Ofgem has

kept pace with the climate change imperative and whether the government framework within which it operates is fit for the challenge of moving to a completely decarbonised electricity system by 2050. The fundamental issue is **should Ofgem be making a low-cost system as sustainable as possible, or should it be making a sustainable energy system at the lowest possible cost?**

Ofgem has had successes in:

- Driving down the price of energy
- Improving the efficiency of the formerly nationalised industries, to create more competitive energy companies
- Providing a stable business framework, in which the regulated industries can predict Ofgem's approach, maintaining levels of investment in both networks and generation at a reasonable cost of capital
- Introducing some new measures since the introduction of its sustainable development duty in 2004, particularly in the 2005 Distribution and 2007 Transmission Price Control Reviews.

Ofgem influences the energy market, networks and consumers, but has a particularly direct influence on the networks, through its regulation of the transmission and distribution network operators in gas and electricity. Ofgem also created the electricity trading arrangements and the generator connection arrangements, which impact significantly on low carbon generating companies.

Existing constraints in the energy system

Given the increasing need for all parts of the UK economy to reduce greenhouse gas emissions, there are notable difficulties in the Ofgem regulated energy sector, including:

In the energy markets:

- Intermittent and small-scale energy generation is penalised by the electricity trading arrangements
- New entrants are less able to influence changes in the market structure because the process for industry code modifications (i.e. the way changes are made to the rules governing the detailed market operation) tends to support the interests of the large, incumbent market participants. Smaller businesses, which are usually new entrants, do not have the staff to participate adequately in code modification discussions.

The energy networks:

- Capacity constraints are delaying the connection of renewable generation. This is particularly acute in parts of northern England and Scotland, where the Beauly–Denny line has been awaiting planning permission for some time, and where decisions on undergrounding of transmission lines are particularly important as the lines would pass through designated landscapes
- Generators of remote, clean energy are penalised by the Connection and Use of System Charging arrangements, which weigh against generators located at points distant from the major sources of demand in the south east of England
- There has been a serious under-investment in systems and technologies that facilitate the reduction of greenhouse gas emissions due to the dramatic fall in innovation spending by the network operators since privatisation
- Losses from the networks account for around 7% of the total GB generating mix (equal to the entire generating output of Drax).

Ofgem has already recognised both the innovation and losses problems, and went some way to address these in the 2005 Distribution Price Control Review (DPCR) and in the 2007 Transmission Price Control Review (TPCR). However, our view is that much more needs to be done.

Engaging the consumer with the energy system:

- Consumers are unable to take full responsibility for their energy use because information on bills is difficult to understand, and there is little incentive beyond the energy efficiency measures offered through the Energy Efficiency Commitment. Levels of billing complaints remain high (around six times higher than the level of complaints in both water and fixed line telecommunications).

The availability of low carbon heat:

- The system as a whole is wasteful of heat because heat as a commodity is unregulated. The regulatory focus is on meeting demands for gas as a proxy for meeting heat demand.

Recommendations – Strategic Issues

The **policy context** has changed markedly since Ofgem was established. By 2050 it is likely that the UK electricity system will need to be almost completely decarbonised. Radical development of climate policy that establishes a price of carbon through tax, trading or regulation, as well as policies to promote innovation and consumer behaviour change, is urgently needed.

But we perceive two elements of the current policy framework that undermine a strong approach to tackling climate change through energy policy. These are that:

- The carbon price is too low to drive change. There is over-reliance by government and Ofgem on the EU Emissions Trading Scheme (EU ETS) to set a carbon price to drive the market towards low carbon generation. At present, this policy is not delivering emissions reduction, as the overall cap is not tight enough and so the market price has been too low to incentivise low carbon options. This policy cannot be relied upon to deliver our climate goals, and strengthening the EU ETS itself, while absolutely necessary, is a slow process as it requires negotiation with all EU Member States.

- The business model for energy companies is still driven by the need to sell more units of energy, for example through increasing market share, rather than provide energy services that reduce consumption. Although the Energy Efficiency Commitment (EEC) has become a more central part of the supply companies' business model, this fundamental conflict can only be tackled through a comprehensive policy reappraisal by government.

The approach to energy supply and demand in California is an interesting model, although we recognise that it could not be comprehensively transferred to the UK within our current system. But it is worth exploring how the regulatory system could be transformed to enable energy companies to secure as good a return for shareholders from selling fewer units of energy as they do by selling more units. We hope that the development of the Supplier Obligation for 2011 will provide that opportunity.

Government policy introducing new banding of the Renewables Obligation to provide targeted support for renewable energy technologies, as well as the continued tightening of the EU ETS cap, will stimulate a stronger carbon price in the market. Both these measures are important for supporting a low carbon energy system. Regulatory measures to ensure easier access to the electricity grid for low carbon generation will also be critical.

In view of the recently agreed EU target for renewables to contribute at least 20% of EU energy supply (with the UK share of this currently unclear), a much more proactive programme encouraging renewable energy generation and connection to the grid will be needed in the UK. The EU Renewables Directive 2001 also requires Member States to provide priority access for renewable generation, and our recommendations for near-term interventions are therefore central to ensuring compliance with our EU responsibilities.

Given the overwhelming need for better alignment of the government's energy goals through the delivery and regulatory bodies, the SDC believes that fundamental changes are needed. The opportunity to bring energy and environment policy together under one Secretary of State was rejected within the 2007 machinery of government changes. We **recommend** that this change be made at the next opportunity.

We are also recommending a change to Ofgem's primary duty (see below). We think that this is an essential short-term change which is needed to align Ofgem's goals with government's goals. In the longer term, we **recommend** that a regulatory framework is established for the provision of heat and that this could come within Ofgem's remit. We are recommending this only if Ofgem's duties are changed to strongly reflect the climate change imperative.

Recommendations for shorter-term implementation

The SDC has analysed the institutional arrangements in Ofgem to identify how effectively it carries out its sustainable development and other environmental and social duties. Our recommendations are given below.

Change Ofgem's primary duty:
The SDC **recommends** that Ofgem's primary duty be changed to reflect the compelling need to move to a decarbonised energy system. This report sets out three options for how this might be done.

The most important driver for Ofgem has been the delivery of its primary duty (also referred to as its 'principal objective'). This has been interpreted as 'the affordability, availability, security and quality of gas and electricity supplies'. In practice, it is the affordability and availability of energy for present consumers that has been given the most weight to the detriment of the interests of future consumers.

We are therefore recommending a new primary duty for Ofgem to include the reduction of greenhouse gases. This would align Ofgem's goals with the goals of government energy and environment policy. Box 1 sets out our options for wording in relation to Ofgem's duties in relation to electricity. Similar wording would need to be developed for Ofgem's duties in relation to gas and for any future duties in relation to heat.

Box 1 Options for change to Ofgem's primary duty

Option A1

The principal objectives of the Secretary of State and the Gas and Electricity Markets Authority (in this Act referred to as 'the Authority') in carrying out their respective functions under this Part are as follows:

a) to reduce the emission of greenhouse gasses in accordance with [targets notified by the Secretary of State to the Authority/National Policy Statements on greenhouse gas emissions reductions/Government targets for greenhouse gas emissions reductions].

b) subject to such measures as the Authority considers appropriate in the performance of its objectives set out in a) above, to protect the interests of consumers in relation to electricity conveyed by distribution systems or transmission systems, wherever appropriate, by promoting effective competition between persons engaged in, or in commercial activities connected with, the generation transmission or supply of electricity or the provision or use of electricity interconnectors.

Option A2

The principal objectives of the Secretary of State and the Gas and Electricity Markets Authority (in this Act referred to as 'the Authority') in carrying out their respective functions under this Part are as follows:

a) to protect the interests of consumers in relation to electricity conveyed by distribution systems or transmission systems wherever appropriate, by promoting effective competition between persons engaged in, or in commercial activities connected with, the generation, transmission, distribution or supply of electricity or the provision or use of electricity interconnectors; and

b) subject to such measures as the Authority considers appropriate in the performance of its objectives set out in (a) above, to reduce the emissions of greenhouse gasses in accordance with targets notified by the Secretary of State to the Authority.

Option B

The principal objectives of the Secretary of State and the Gas and Electricity Markets Authority (in this Act referred to as 'the Authority') in carrying out their respective functions under this Part are to protect the interests of consumer in relation to electricity conveyed by distribution systems or transmission systems, wherever appropriate, by promoting effective competition between persons engaged in, or in commercial activities connected with, the generation, transmission, distribution or supply of electricity or the provision or use of electricity interconnectors, **while reducing the emissions of greenhouse gasses in accordance with [targets notified by the Secretary of State to the Authority/ National Policy Statements on greenhouse gas emissions reductions/ Government targets for greenhouse gas emissions reductions.**

Publish an interpretation document

The change in primary duty should be supported by an Interpretation Document to set out for the energy generators, network operators and suppliers how Ofgem will interpret its new duties. Experience in the energy and other markets shows that it is the interpretation of a duty that is most important for participants. We recommend that the interpretation document sets out the factors that constitute the interests of present and future consumers, including allowing for defensive investments in low-carbon technologies.

Ofgem's existing social and environmental guidance should also be revised as the existing wording severely limits Ofgem's ability to implement social and environmental measures. We recommend that guidance is clarified and that it states what level of impact on bills is considered excessive.

Reflect the social cost of carbon and strengthen assessment of social impacts

Ofgem has largely been using low values for the social cost of carbon in its cost benefit analysis. During the 2005 Distribution Price Control Review (PCR), a cost of £29/tonne of carbon (tC) appears to have been used, even though government was using a cost of £80/tC for its policy cost benefit analysis for the Climate Change Programme Review.

In all its cost benefit calculations, Ofgem should make consistent use of the price range for the social cost of carbon as set out in the Government Economic Service's advice to Departments. This advice sets out a central value of £70/tC with a range for sensitivity analysis of £35 – 140/tC (in 2000 prices). We welcome the recent change in approach to use the appropriate range, as in the 2007 RIA on transmission losses charging, although we have seen no specific evidence that Ofgem has asked its economists to do this.

We **recommend** that Ofgem's guidance on impact assessments is updated, to ensure that an appropriate social cost of carbon is consistently used.

On social impacts, the guidance gives an example of distributional impacts between rural and urban customers. However, it does not clearly articulate how the impact on different consumer groups should be assessed which makes it difficult for these impacts to be incorporated into policy development.

We **recommend** that Ofgem's RIA guidance is updated to be explicit about assessment of social impacts.

Embedding sustainable development in the organisational culture

A comprehensive capacity-building programme should be instigated within Ofgem. This will improve understanding of sustainable development at all levels, focusing in particular on the social and environmental aspects.

At present, we do not believe the organisational culture within Ofgem reflects the imperative of sustainable development in general, and climate change in particular, strongly enough. The majority of staff do not appear to take sufficient account of social and environmental issues in their work. The social and environmental teams appear severely under-resourced and unable to input to the breadth of policy issues, which is compounded by departmental structures.

We **recommend** that Ofgem undertakes a capability-building programme for its staff on sustainable development.

In the next section, we look in more detail at Ofgem's role in delivering sustainable development.

Living within environmental limits

For Ofgem, the importance of the strategic policy context is in implementation. In carrying out its regulatory responsibilities Ofgem must, in our view:

- improve access to the electricity markets for combined heat and power (CHP) and renewable generation
- improve access to the grid for renewable generation from remote locations, which is currently heavily penalised, and
- strengthen the electricity networks to cope with distributed generation (beyond like-for-like technology replacements).

In view of the approaching Price Control Reviews, we **recommend** a Greenhouse Gas Incentive Package is created for use in the Price Control Reviews. (In part, this is a strengthening of incentives already introduced by Ofgem in the 2005 Distribution Price Control Reviews.) Our specific recommendations are:

- The distribution losses incentive should be strengthened and set at a level consistent with the current social cost of carbon. We recommend using the current social cost of carbon of £80/tC, which would raise the losses incentive to £85/MWh.

- The distributed generation incentive should be reviewed in the light of the work being undertaken by United Utilities and the University of Sussex. The ability of the distribution networks to handle increasing two-way power flows through active management should be also supported.

- Investment should be stimulated by raising the Innovation Funding Incentive (IFI) closer to the level of the UK average expenditure on innovation (2% of turnover). Privatisation of the electricity system has led to a significant deficit in knowledge, with little opportunity for more innovation over the past decade.

- Innovation should be supported further by:

  - Widening the scope of the Registered Power Zones (RPZs) – the areas where innovative solutions can be tested. This means changing from a focus solely on the connection of distributed generation to one which includes any innovative means of reducing greenhouse gas emissions.

  - Ensuring that further support is available for innovative solutions to be trialled by other operators by allowing some IFI support. Existing Ofgem rules on RPZs severely limit wider deployment of innovative technologies as it is assumed the technologies become commercially viable once demonstrated and are then not eligible for further funding.

We have examined an additional range of options for change (see AEA research supporting this report), but we conclude that a greenhouse gas incentive package as outlined above would be the most compatible in the short-term with the existing framework introduced by Ofgem. It also would be effective in supporting an increase in access by renewables to the network.

On the transmission network, connection of renewables is being severely delayed due to capacity constraints. We **recommend** that a 'connect then manage' approach is adopted to facilitate renewables entry from whatever location, with management of the balance between high and low carbon energy generation once connected. This will enable the network companies to progress with connections onto the grid, even while awaiting planning approval, particularly for the Beauly-Denny transmission line.

Generators are charged for connection and use of the transmission and distribution network. Generators in the north of the country tend to pay higher charges than those in the south but this creates particular problems for CHP generators which need to be located close to centres of heat demand, and clean generation that is connected to the distribution network. We recommend that government and Ofgem should review the charging arrangements for CHP, or provide additional support to CHP, and that Ofgem should ensure that any proposals to change transmission charges do not disadvantage generators connected to the distribution network. The charging system is very complex, both in terms of the change in costs as different projects connect to the grid, and in terms of the industry process for modifying the charging arrangements. We **recommend** that Ofgem ensures that the charging system and review process fully includes the interests of smaller generators and that Ofgem works with National Grid to develop a web tool that allows generators to understand the costs of connecting to the network.

In the energy markets, the industry codes (the detailed rules governing the functioning of the markets) do not include objectives on sustainable development. Code modifications (proposals for changes to the industry codes) must be assessed against how well they contribute to achieving the code objectives so industry participants are not able to include sustainability considerations in their assessment of proposals. The modification

process also tends to favour incumbents, as smaller participants, which tend to be new entrants, do not have the resources to fully participate. We **recommend** that sustainable development is included in the code objectives and Ofgem supports industry in developing modifications to reflect this change. We also **recommend** that the process is simplified to ensure that the interests of smaller participants are fully represented.

Ensuring a strong, healthy and just society

Ofgem's interpretation of its primary duty has led to significant cuts in the price of energy to the consumer, both for industry and for households. This temporarily reduces levels of fuel poverty but does nothing to reduce the exposure of vulnerable consumers to higher energy prices in the future. The overall price for energy is heavily dependent on global supplies and prices, and recent energy price rises have demonstrated that levels of fuel poverty have increased and will continue to do so unless a strong emphasis is placed on improving the energy efficiency of homes. Ofgem is responsible for administering the Energy Efficiency Commitment (half of which is focused on fuel poor homes), but it is not responsible for the policy.

Ofgem has direct responsibility for some issues where important improvements could be made, including:

- requiring understandable information on bills which could influence changes in energy consumption behaviour
- improving the quality of metering, so that consumers obtain accurate and relevant information about their energy use
- mandating standards for green supply tariffs, to overcome confusion about what 'green' energy is and requiring an independent audit of companies' green tariffs to give consumers' confidence that they are receiving low carbon electricity
- improving the treatment of low income customers, particularly in relation to the high tariff for pre-payment meters
- reducing the reliance on supplier switching and corporate social responsibility by energy companies as a means of protecting the interests of low income and vulnerable consumers, although ensuring that wholesale price reductions are being passed on to low income consumers will continue to be important.

A coherent approach to reducing the number of estimated bills is needed. This should include putting a clear plan in place for the roll out of smart metering, which will not only provide suppliers with accurate monthly consumption data, but also stimulate consumer interest in saving energy. Ofgem is participating in the government funded trials on metering and billing which is very welcome. We **recommend** that Ofgem responds rapidly once the billing and metering trials are complete though a combination of improving the frequency and accuracy of bills and a roll-out of smart meters.

A number of policy measures are aimed at reducing the energy bills of low income consumers (including EEC, Warm Front, Warm Deal etc) but there remain significant difficulties for these consumers to cover their fuel costs. Ofgem has focused heavily on encouraging consumers to switch energy suppliers when their fuel bills rise, but this option is least available to low-income consumers who often have poor access to internet and other comparison services. Prepayment meters are the favoured means of controlling the demand from households that struggle to pay high fuel bills. However, prepayment tariffs with some energy suppliers are significantly more expensive than tariffs for households who pay by direct debit. This has been exacerbated in recent years with an increase in the difference between direct debit and prepayment tariffs. Therefore the households least able to pay are paying more for equivalent levels of warmth and power than higher income households. We **recommend** that Ofgem mandates that pre-payment meters should be smart meters capable of two-way communication so consumers have a better understanding of their energy bills. We also **recommend** that greater focus is placed on using post-office deductions and fuel direct services. We **recommend** that Ofgem should require suppliers to introduce tariffs for pre-payment customers that are comparable to the tariffs paid by direct debit customers and ensure that wholesale price reductions are being passed on to all consumers, especially low income and vulnerable consumers.

Conclusions

Our review of the role of Ofgem and its impact on achieving a sustainable energy system has revealed a number of key opportunities for government to achieve a significant shift in its efforts to reduce UK carbon emissions through electricity and heat generation, transmission, distribution and use. We believe the next few years are critical for ensuring the infrastructure is put in place to support the progressive decarbonisation of the energy system. Without investment, such infrastructure will not be established, and without the right regulatory framework, such investment will not be forthcoming.

In our view, the regulatory framework provided by Ofgem requires significant change, and our conclusion is that this can be achieved most effectively through a change to Ofgem's primary duty. This would enable Ofgem to fully integrate greenhouse gas emission reductions into its business and would provide a clear and stable framework within which all energy generators, suppliers and network operators would operate. We believe such a change would secure greater consistency in the delivery of the government's energy policy, and would alleviate the tensions that currently exist between Ofgem's current approach of strengthening competition, and government's climate change goals.

Our detailed recommendations on improvements to be made through the Price Control Reviews align closely with our recommendation on the primary duty change. Similarly, we believe that our recommendations on the cultural and practical changes required within Ofgem as an institution, align closely to a change to the primary duty. Ofgem is a highly efficient institution for delivering against its existing goals, but these goals are no longer compatible with aims of government energy policy. Unless Ofgem's goals are aligned with those of government, the scale of change that is required to meet the government's climate change and wider environmental targets will not be achieved.

2

Introduction

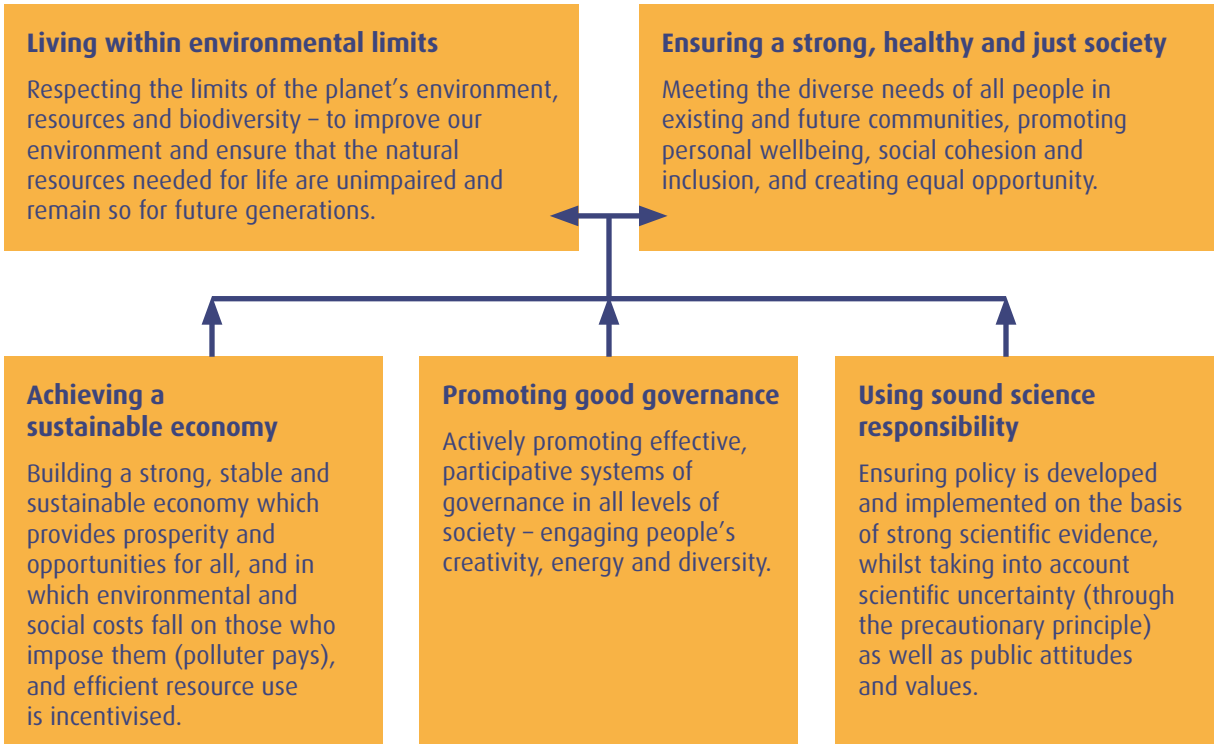
The energy system is an extremely important part of our lives. We use energy to heat and light our homes and power our businesses. In recent years there has been considerable attention paid to the way the energy system operates, and how we can gradually reduce the emissions of greenhouse gases created by burning fossil fuels for electricity, heat and transport.

The Government's 2003 Energy White Paper[5] set out a major shift in UK energy policy, with its acceptance of the recommendation of the Royal Commission for Environmental Pollution of the need for a 60% cut in greenhouse gas emissions by 2050, to avoid dangerous climate change. The White Paper also set out four goals of energy policy:

- To put ourselves on a path to cut the UK's CO_2 emissions by some 60% by 2050, with real progress by 2020
- To maintain reliability of energy supplies
- To promote competitive markets in the UK and beyond
- To ensure that every home is adequately and affordably heated.

These goals have been reinforced in the 2006 Climate Change Programme Review[6] and the 2007 Energy White Paper.[7]

In 2005, the Government published its Sustainable Development Strategy *Securing the Future* and outlined the five principles of sustainable development, within which government policy is to be developed and implemented. The five principles are:



'We want to achieve our goals of living within environmental limits and a just society, and we will do it by means of a sustainable economy, good governance and sound science.'[8]

Scientific evidence from the 4th Assessment report of the Inter-governmental Panel on Climate Change (IPCC)[9] now indicates that the UK will need to cut its carbon emissions below the current target of a 60% by 2050. There is also emerging a broad consensus that the only way to do this will be for the electricity system to be almost completely decarbonised. This, then, is the background to the SDC's review of the role of Ofgem.

The Review Process

This Review has been carried out through:

- A series of interviews with experts in the energy field, including energy suppliers, generators, network companies, industry commentators, NGOs and academics
- Consultation with an Expert Advisory Group
- Interviews with Ofgem staff, managing directors and the Sustainable Development Sub Committee of the Ofgem Authority
- Desk based research into the options for change to the energy system[10]
- Desk based research into international comparisons of energy markets in Denmark, California and the Netherlands[11]
- Desk based research into consumer attitudes to energy.[12]

We have approached this project analysing Ofgem's role in the energy system, against the government's five sustainable development principles. Our analysis of the institution of Ofgem therefore reflects government's desire for good governance to support the two key goals of 'living within environmental limits' and achieving a 'strong, healthy and just society'. We have also tested our recommendations against government's goal of 'achieving a sustainable economy', to evaluate the economic impacts of improving Ofgem's performance in relation to environmental and social measures.

Our findings and recommendations cover:

- Long term, strategic issues about the UK energy system and Ofgem's role in that. These elements are framed around policy goals, the lessons of the Stern report[13] and the implications for Ofgem; and
- Shorter term, practical issues that can be implemented soon. These cover both institutional issues within Ofgem, improved conditions for low carbon energy generators, and incentive structures for the distribution companies.

3

How does the current energy system work?

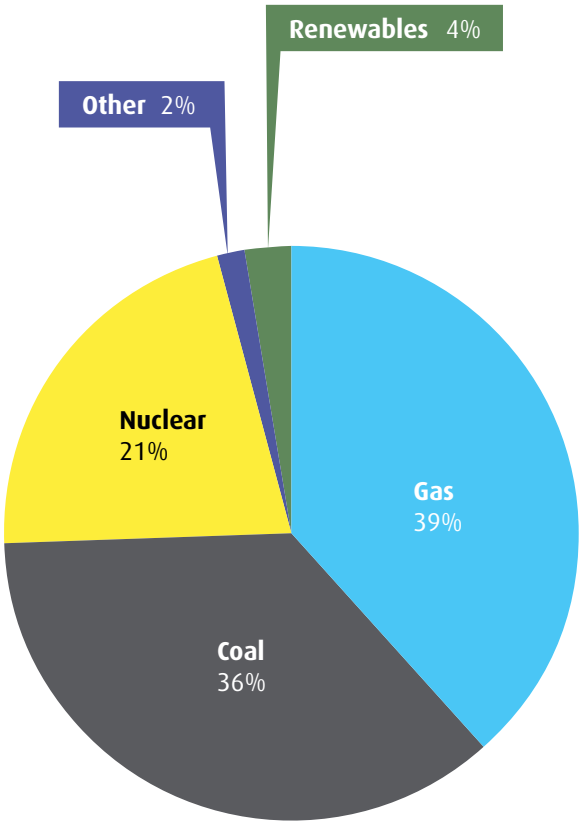
3.1 The Energy System: a snapshot

The energy system is complex and far reaching but can be summarised as the provision of light, heat and power to our homes and businesses. The means by which light, heat and power are provided varies but typically they can be broken down into five sections of the supply chain: generation, transmission, distribution, supply and use.

3.1.1 Electricity generation

The provision of light and power comes primarily from electricity. Electricity can be generated from a number of sources. At present, Great Britain's electricity generation mix is gas 39%, coal 36%, nuclear 21%, renewables 4% and other sources 2%[14] as figure 1 shows.[15]

Figure 1 Generation Mix (2005)



Source: Dukes (2006)

3.1.2 Electricity and gas transmission

The electricity generated is then transmitted through the GB transmission system. The transmission system for England is owned and managed by National Grid Electricity Transmission plc whilst the transmission system in Scotland is owned and managed by SP Transmission Ltd and Scottish Hydro Electric Transmission Ltd (SHETL). Whilst the ownership of the transmission system is split between different companies, the operation is carried out by National Grid in its role as the GB System Operator (GBSO).

The gas transmission system, shown in Figure 3, ensures the flow of gas from supply points, such as pipelines and liquefied natural gas terminals, to the distribution networks. The gas transmission system is owned and operated by National Grid.

3.1.3 Electricity and gas distribution

The distribution networks carry electricity and gas from the transmission systems into our homes and businesses. In moving electricity and gas from the transmission to the distribution system the voltage and pressure have to be changed. In electricity, the voltage drops from 400kV on the transmission line to a maximum of 132kV on the distribution networks. In the same way the pressure of the gas pipeline on the transmission system is 85 bar and is reduced to 7 bar on the distribution network. The process of changing voltage is called transformation.

There are 14 electricity distribution networks owned and operated by seven different companies. These are Scottish Hydro Electric Power Distribution PLC, SP Distribution Ltd, United Utilities, Central Networks, CE Electric, Western Power Distribution and EDF Energy Networks, as shown in Figure 4.

In the past, the eight gas distribution networks were owned by National Grid Transco. However in 2005, four were sold off and these are now owned by Scotia Gas, Northern Gas Networks and Wales and Western Utilities.

Figure 2 Technical flow of electricity

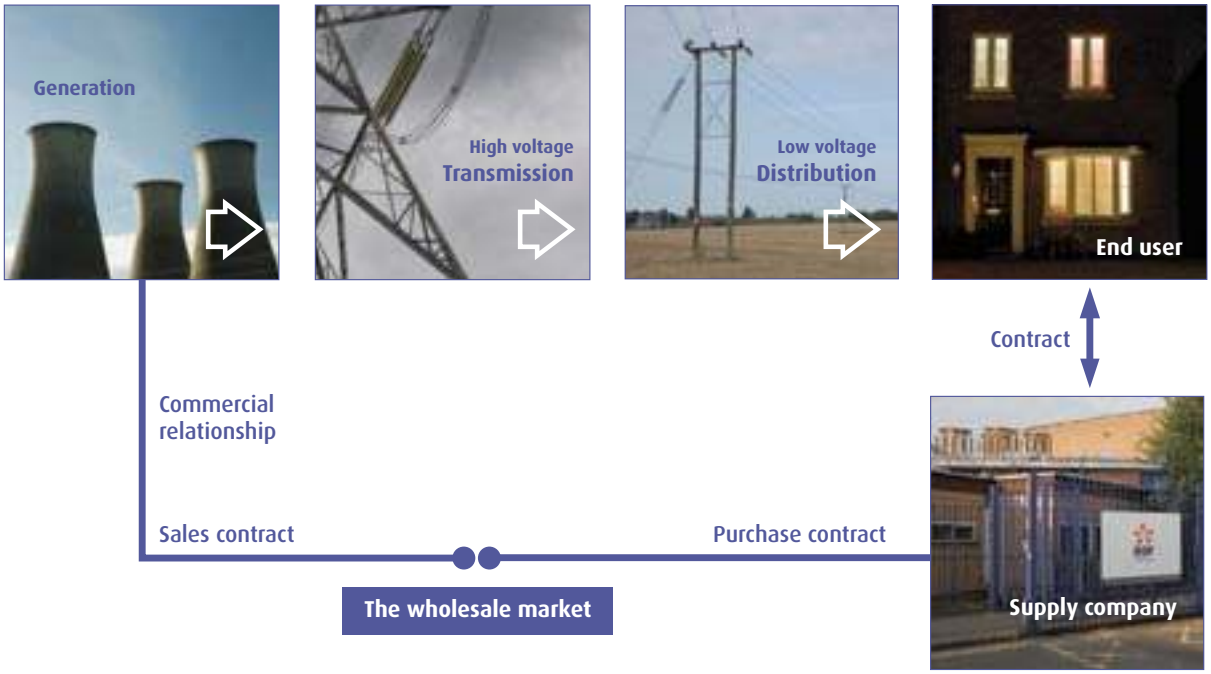


Figure 3 Gas Transmission System

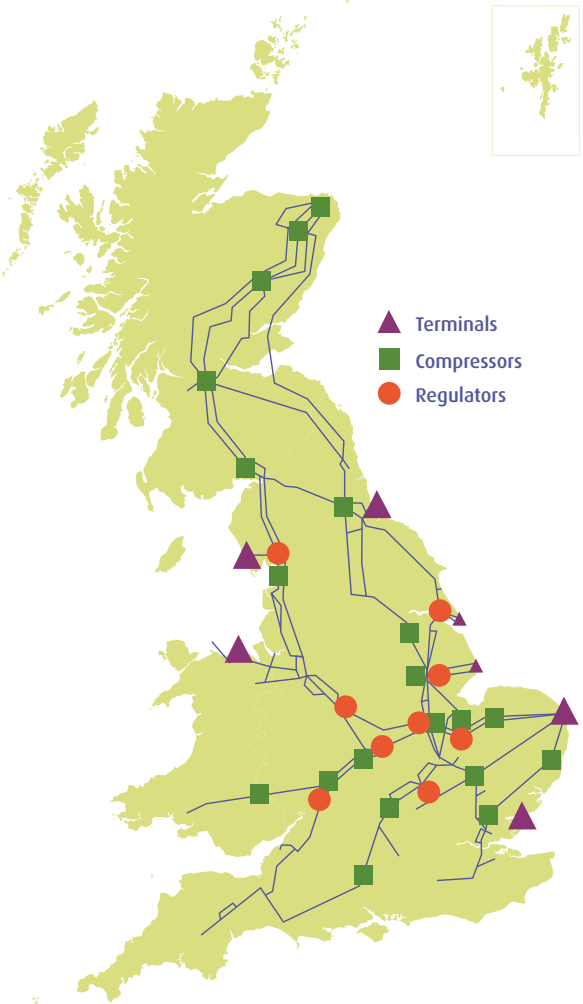


Figure 4 Electricity Distribution Areas

3.1.4 Electricity and gas supply

Whilst the distribution networks feed energy directly into our homes and businesses, the consumer or business buys electricity or gas from the energy supply companies. At present the market is dominated by the 'big six' supply companies: E.On (Powergen), Centrica (British Gas), EDF Energy, Scottish and Southern Energy, RWE (npower) and ScottishPower. There are also some smaller suppliers such as Good Energy and Ecotricity which are serving a smaller proportion of consumers and specialist suppliers serving particular markets such as businesses.

3.1.5 Electricity and gas use

The electricity and gas used in our homes and businesses represents 46% of the UK's greenhouse gas emissions.[16] As part of the government's strategy for combating climate change there will need to be a significant change in the behaviour of consumers to reverse the present trend of increasing energy demand. Since 2000, a series of government policies have improved energy efficiency and contributed to reducing energy demand. The Energy Efficiency Commitment (EEC) is a regulation obliging energy supply companies to offer energy efficiency measures to households, and it has reduced energy demand by 86.8 TWh in the first phase.[17] The Building Regulations standards have also been raised, and in 2005 achieved particular success in reducing household energy use through the requirement for all household boiler installations to be high efficiency, condensing boilers. This alone is expected to reduce emissions by 0.6MtC by 2010.[18] Advice to consumers on energy efficiency is provided by the network of Energy Efficiency Advice Centres, as well as from energy suppliers. The Low Carbon Building Programme has grant aided household and community renewables installations.

The EU Emissions Trading Scheme (EU ETS) is targeted at improving the energy efficiency of more energy intensive installations and the recently announced Carbon Reduction Commitment will see emissions trading extended to some smaller, less energy intensive sites. The government has also used taxation policy to reduce energy use, through the Climate Change Levy and the Climate Change Agreements (with Carbon Trust advice and support for business to reduce their energy use). In addition, there are grants available for the purchase of micro-generation technologies that allow households to produce their own energy.

3.1.6 Heat use

The provision of heat can come from a number of places, but at present most heat is generated in homes from central heating systems that run on gas. In the same way, the majority of the heat used for industrial processes, e.g. distillation, baking and drying, is generated from gas. Before arriving in the home or business, this gas is transmitted and distributed through vast pipe networks before it is sold to the end user by a supply company.

However there is another model for heat provision which uses the waste heat produced through the electricity generation process. This is known as CHP generation. This heat is then transmitted via heat networks to communities. Successful examples include the community heating scheme in Tower Hamlets, which utilises a 1.4MWe gas-fired CHP plant and provides heat and electricity at 20% below the cheapest supplier, saving 2,500 tonnes of CO_2 a year.[19]

4

Good governance

Getting the institutional framework right for a low carbon energy system

Good governance is one of the five principles of sustainable development, and the institutional framework for the governance of energy policy is a critical element of the successful delivery of two of the other sustainable development principles: 'ensuring a strong healthy and just society', and 'living within environmental limits'. The governance of energy policy applies to policy development, delivery and implementation.

In this section we examine:

- the institutional landscape for energy policy
- Ofgem's place in that landscape and where this could change
- Ofgem's delivery of its functions to date, where and how these could change
- Ofgem's delivery of its sustainable development duty, and how this could change.

Sections 5 and 6 of this report develop the reasons why there is a need for this change in Ofgem's institutional focus.

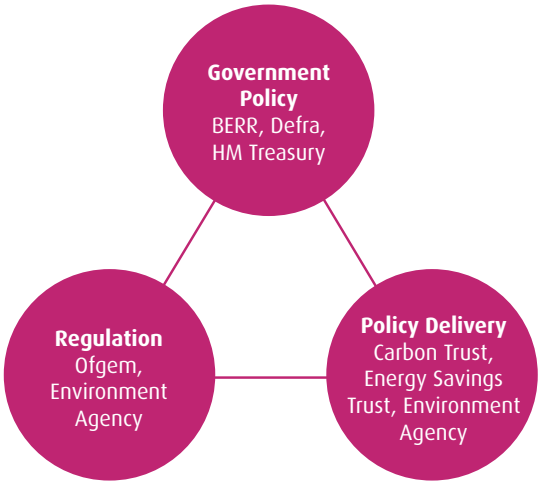
4.1 The current situation – institutional complexity

The development and delivery of energy policy is divided between different institutions. For Great Britain, policy development is shared between the Department for Business, Enterprise and Regulatory Reform (BERR) on energy supply specifically, and the Department for the Environment, Food and Rural Affairs (Defra) on energy efficiency and policies relating to climate change. Policies relating to energy end use, such as housing policy, are developed between Defra and the Department for Communities and Local Government (CLG). In relation to the devolved administrations (DAs), energy policy is reserved to Whitehall but delivery and climate change policy is devolved to the nations; tensions can exist between central government policy development and the DAs' approaches.[20]

In addition to this split in policy development within Whitehall, much of the delivery is now placed in separate bodies:

- the Carbon Trust is funded by government to stimulate and support energy efficiency in business and to support low carbon technological deployment
- the Energy Saving Trust is funded to stimulate energy efficiency and uptake of renewable energy technologies in the household sector
- the Environment Agency implements the Integrated Pollution Prevention and Control (IPPC) regulations with major energy users, and implements the EU ETS with energy generators and other industries
- Ofgem is the independent regulator of the energy markets and networks, and its powers and duties are shared with that Secretary of State
- The Office of Climate Change provides cross-Departmental analytical support on climate change policies, reporting equally to all Departments.

Figure 5 Current split of responsibility for energy policy and delivery



The soon to be established Climate Change Committee is an additional institution whose role will have a significant impact on the functions of these bodies. The Climate Change Committee will set the trajectory for carbon emissions reduction over the following 15 years, with five yearly milestones, and annual reporting by government to parliament on progress to achieving these goals. It is likely that proposals from the Climate Change Committee could impact on Ofgem; therefore it would be unhelpful if Ofgem were to act as a barrier with its primary duty unchanged.

This is a complex institutional landscape, and in SDC's view could be simplified. As an initial move we would strongly recommend that energy and environmental policy is brought entirely under the control of one Secretary of State.

4.1.1 International comparisons – planning for a low carbon future

Our analysis of the operation of energy markets in California, Denmark and the Netherlands, which have achieved improved implementation of lower carbon energy supply solutions, (published as background research to this report), reveals very different institutional structures to those in the UK:

- California and Denmark made significant structural policy decisions some decades ago through centralised energy bodies, which also had control of planning policy at the local level; this was achieved in California through an energy commission and in Denmark through an energy agency. This effectively means the energy markets were highly regulated
- Netherlands on the other hand has a model closer to the UK where markets are competitive and policies are decided by the Ministry for Economic Affairs. However delivery is carried out through Senter Novem which has responsibility for implementing policy on innovation, energy and climate change, environment and spatial planning. The role of heat in the energy market is also a key difference between the UK and Denmark and the Netherlands
- All three have very powerful energy agencies linking the delivery of energy policy with spatial planning powers
- The role of the economic regulator is relatively new in many of these countries but prior to their establishment, their roles were carried out by the energy agency which tied together regulation, environmental and planning issues.

What is clear from the international evidence is the importance of a centralised agency responsible for delivering government policy. These findings also highlight the difficulties that the current UK energy market has in achieving a significant shift to a low carbon energy system:

- UK energy policy since the 1990s has been to ensure a competitive energy market with specific and regulated conditions, and the regulator, Ofgem, was created in this context. Within that liberalised energy market, interventions occurring over the past decade to improve environmental performance have been instituted as market corrections. As such, the Renewables Obligation (RO) and the EEC have been effective in improving progress towards a low carbon energy system. But because Ofgem sees itself as an economic regulator, it views policy interventions like the RO and EEC as interventions distorting the functioning of the market. Institutionally, because it regards such policies as interventions it consequently does not embed the core objective of these policies, carbon reduction, into its mainstream thinking. In addition, Ofgem considers the carbon price achieved through the EU ETS to be the sole policy instrument needed to move to a low carbon energy system. This is optimistic and inconsistent with the conclusions of the Stern review where a combination of a price of carbon, taxation, regulation, innovation and behaviour change is clearly identified.

- The creation of Energy Agencies in Denmark, the Netherlands and California with responsibility for energy policy from development through to delivery contrasts strongly with the UK's institutional structure. In Denmark and the Netherlands, this is coupled with planning policy that supports the systematic development of heat networks to reduce the waste heat and greenhouse gas emissions associated with the centralised electricity supply system typical of the UK energy infrastructure (discussed separately under section 5.2). The SDC recognises the approach in this country must be consistent with a liberalised energy system.

Nonetheless, in view of the complexity of the institutional landscape in the UK, we think it is important for energy policy to be retained within the responsibility of Whitehall as now (with devolved issues as now), and that decisions on such an important part of government policy should be retained around the Cabinet table, with one Secretary of State having overall responsibility.

The changes proposed by the SDC to the institutional structure would include a change to the function of Ofgem, and, in our view, such a change urgently requires a re-examination of Ofgem's duties, and its interpretation of these duties. We have undertaken this examination, and our findings are outlined below. Whatever institutional structure is adopted – either an Energy Delivery Agency, or a preservation of the existing demarcation of responsibilities – Ofgem's primary duty has to be changed to avoid the current misalignment with energy policy objectives, and to better facilitate the move to a sustainable energy system.

Recommendation

- The opportunity to bring energy and environment policy together under one Secretary of State was rejected within the 2007 machinery of government changes. We recommend that this change be made at the next opportunity.

4.2 Ofgem's duties and powers

Ofgem's duties and powers were established at its founding in the 1990s, to promote effective competition in the newly liberalised markets and improve the efficiency with which the monopoly companies operate. As a result of Ofgem's activities, wholesale and retail energy prices fell substantially in the years after privatisation, whilst operating efficiencies increased. There is no doubt that Ofgem successfully streamlined the former energy companies, and this success should not be under-estimated.

Since Ofgem's creation, the challenges for the energy system have changed. In 2000, Ofgem was given new duties to contribute to government's social and environmental objectives and in 2004 it was given a duty to contribute towards sustainable development. All these new duties were additional to Ofgem's primary duty, which did not change. In addition to its single primary objective, Ofgem has a series of 11 secondary duties.

4.2.1 Ofgem's primary duty

The duties and powers of Ofgem are endowed on the Gas and Electricity Markets Authority (GEMA) and in this context we refer to the Board of Ofgem as the Authority. The Authority's primary duty when carrying out its functions is **to protect the interests of consumers, present and future, wherever appropriate, by promoting effective competition between persons engaged in, or in commercial activities connected with, the shipping, transportation or supply of gas conveyed through pipes and the generation, transmission, distribution or supply of electricity or the provisions or use of electricity interconnectors.**

The Authority must when carrying out its functions have regard to:

- The need to secure that so far as it is economic to meet them, all reasonable demands in Great Britain for gas conveyed through pipes are met
- The need to secure that all reasonable demands for electricity are met
- The need to secure that licence holders are able to finance the activities which are the subject of obligation on them
- The interest of individuals who are disabled or chronically sick, of pensionable age, with low incomes, or residing in rural areas

Subject to the above, the Authority is required to carry out the functions referred to in the manner which it considers is best calculated to:

- Promote efficiency and economy on the part of those licensed under the relevant Act and the efficient use of gas conveyed through pipes and electricity conveyed by distribution system or transmission systems
- Protect the public from dangers arising from the conveyance of gas through pipes or the use of gas conveyed through pipes and from the generation, transmission, distribution or supply of electricity
- Contribute to the achievement of sustainable development; and
- Secure a diverse and viable long-term energy supply.

In carrying out the functions referred to, the Authority must also have regard to:

- The effect on the environment of activities connected with the conveyance of gas through pipes or with the generation, transmission, distribution or supply of electricity
- The principles under which regulatory activities should be transparent, accountable, proportionate, consistent and targeted only at cases in which action is needed and any other principles that appear to it to represent the best regulatory practice.
- Certain statutory guidance on social and environmental matters issued by the Secretary of State for Trade and Industry.

4.2.2 Ofgem's interpretation of its Duties

In taking a decision, the Authority must consider how each of the secondary duties might be relevant. So the duty to have regard to environmental and social guidance (as issued by the Secretary of State) is just one factor influencing a final decision. The influence this secondary duty has on the decision could be considerable, but only so long as the final decision is considered to be still in line with the primary duty. Therefore Ofgem's interpretation of its primary duty is of paramount importance in assessing its perceived ability, or willingness, to actively contribute to the UK's energy policy goal of cutting CO_2 emissions by 60% by 2050.

In evaluating the relative importance of the secondary duties against the primary duty, the Authority gives a value to the social cost of environmental damage and incorporates this into its economic calculations. Ofgem has been routinely undervaluing carbon in its calculations. Decisions that enable environmental improvements are effectively only those with minimal economic impact, and therefore the scope to implement environmental improvements is severely restricted.

The Authority has a secondary duty to pay particular attention to the interests of consumers on low incomes.[21] This is reinforced by the sustainable development duty and the Social and Environmental Guidance, both of which include social issues within their scope. However, the interpretation of the duty effectively means the primary duty sets the upper limit on the Authority's discretion to act. This has resulted in the Authority being extremely unwilling to implement additional support for low income consumers, as it perceives the interests of all consumers to be adversely affected, perhaps through a small increase in energy bills.

The interests of present consumers

The Authority's primary duty[22] is to protect the interest of 'consumers, present and future, wherever appropriate by promoting effective competition...' This objective relates to the interests of GB consumers **only when they are acting in their capacity as consumers of electricity and gas**. It does not relate to consumers' interests as consumers of any other goods or services, as citizens more generally or as members of the general public.

The interests of consumers, defined in this way, have been **interpreted by the Authority as relating mainly to price, availability, quality of service and security**.[23] The Authority is free to decide what constitutes the consumer interest, and can take account of the views of consumer groups, surveys, focus groups or any other sources it considers relevant. This interpretation of the consumer interest covers industrial, commercial and domestic consumers, and applies equally to rural and urban consumers.

Ofgem has recently announced the Consumer First programme which aims to improve the way Ofgem takes consumers' interests into account. As part of this, Ofgem has recently published the findings from a series of deliberative events investigating consumers' attitudes to energy and the environment. We welcome this research by Ofgem to explore the range of factors that could make-up the interest of consumers.

The application of the interpretation will differ, depending on the scope of the decision in question. For example, large industrial companies would generally be considered better able to negotiate the price of their electricity and gas supply on equal terms with a supply company than domestic consumers. Domestic consumers therefore require a greater level of protection in this respect. Large industrial companies would be expected to have a different view from domestic consumers on the value of a reliable and predictable energy supply.

The interests of future consumers

The 'interests of future consumers' are also defined by the Authority as the interests of future consumers in their capacity as consumers of electricity and gas. This is again interpreted as relating mainly to price, availability and security. While present consumers may be willing to pay for environmental improvements for future consumers, the Authority, before committing additional expenditure, needs to be confident that present consumers should and are willing to pay for these through their electricity and gas bills, rather than through general taxation.

The Authority would generally be looking at the near-term future, usually defined as the lifetime of network investments (around 40 years), although most of its considerations relate to much shorter time scales. It has been suggested by contributors to this review that Ofgem may not be delivering the sort of medium to long-term thinking needed for ensuring security of supply, particularly in the context of an expected fall in electricity generation capacity in 10-15 years time.

Low Income Consumers

Ofgem has a duty to protect the interests of vulnerable and low-income households. The price of electricity and gas is especially important to low income consumers. Therefore the Authority's interpretation of the interests of consumers as relating mainly to price, availability, quality of service and security, extends to the interests of low income consumers.

However, the problem with this approach is that in many instances the interests of different groups of consumers may, and often do, differ. Therefore, many of the Authority's decisions involve making implicit value judgements. However there is little transparency over how these judgements are made, and the Authority rarely assesses the impact of a policy across the different income deciles. The SDC believes the Authority should be testing policy options against these different income deciles. Where an additional cost is proposed, this should be looked at in terms of the proportion it represents of consumers' total income. Where a proposed policy is likely to have significant redistributive effects or particular impacts on certain groups, more detailed, quantitative analysis should be undertaken to inform the Authority's decisions, and should be published, for example, in the Impact Assessment.

The need to take balanced decisions also extends to those instances in which measures to protect the environment might impose costs on low income consumers. In these instances, the Authority should make explicit its reasoning for deciding which path to follow. The sustainable development duty further underlines the need for transparency in balancing economic, social and environmental factors. In practice, the Authority needs to pay particular attention to mitigating any negative effects that a particular decision may have on the interests of low income consumers.

Environmental Objectives

The Social and Environmental Guidance was re-issued by government in 2004 to help Ofgem in its interpretation of social and environmental issues. However, there is a sentence in the Guidance which we think undermines empowerment of Ofgem to be more ambitious in its implementation of social and environmental measures. This is:

> **'Where the Government wishes to implement social and environmental measures which could have significant financial implications for consumers or for regulated companies, these will be implemented by Ministers, rather than the Authority, by means of specific primary or secondary legislation.'**[24]

Our understanding from contributors who were engaged in the Energy White Paper 2003 is that Ofgem asked for this sentence to be included in the Guidance, because they considered their duties to be incompatible with this issue.

This sentence in the Guidance is being interpreted by Ofgem as a strong limitation on their ability to implement solutions going beyond the current interpretation of their primary duty. It is also restricting their ability to act to reduce greenhouse gas emissions or eradicate fuel poverty. However it is worth noting that the term 'significant' is subject to the Authority's discretion, as is the fact that even when there is Guidance from Ministers, the Authority is only obliged to consider the relevance of the Guidance, and may take a different view from the view in the Guidance. Such an interpretation has not been made, to our knowledge, in the case of environmental and social decisions that go beyond Ofgem's current interpretation of their primary duty.

4.3 Shaping Ofgem's duties for the UK's low carbon energy future

The evidence from both this section of this review, on Ofgem's practical interpretation of its duties, and evidence elsewhere of the impacts Ofgem's decisions have had on the development of the electricity networks and the energy markets, has convinced the SDC that there is a need for Ofgem's primary duty to be changed to align more closely to the need for the UK to limit greenhouse gas emissions across the energy system.

SDC's recommendation to government is for Ofgem to remain an independent regulator, but with a broader interpretation of the interests of consumers. As such, the means by which it achieves its primary duty would no longer be solely through promoting competition but also through reducing greenhouse gas emissions, thereby giving more weight to the interests of future consumers. In addition it would not only be responsible for regulating monopoly networks in electricity and gas, but also in heat.

The inclusion of heat in the primary objective would however need to be accompanied by new powers for Ofgem. The SDC proposals for licensing heat network development through the existing network operators or third parties would require the creation of legislation to give Ofgem specific powers for the licensing of heat provision. An alternative would be to grant Ofgem a broader power to pursue policies to promote the use of lower carbon heat sources.

With greenhouse gas reduction included, the new primary duty in relation to electricity could then read either:

Option A1
The principal objectives of the Secretary of State and the Gas and Electricity Markets Authority (in this Act referred to as 'the Authority') in carrying out their respective functions under this Part are as follows:

a) **to reduce the emission of greenhouse gasses in accordance with [targets notified by the Secretary of State to the Authority/ National Policy Statements on greenhouse gas emissions reductions/Government targets for greenhouse gas emissions reductions].**
b) **subject to such measures as the Authority considers appropriate in the performance of its objectives set out in a) above**, to protect the interests of consumers in relation to electricity conveyed by distribution systems or transmission systems, wherever appropriate, by promoting effective competition between persons engaged in, or in commercial activities connected with, the generation transmission or supply of electricity or the provision or use of electricity interconnectors.

Option A2
The principal objectives of the Secretary of State and the Gas and Electricity Markets Authority (in this Act referred to as 'the Authority') in carrying out their respective functions under this Part are as follows:

a) to protect the interests of consumers in relation to electricity conveyed by distribution systems or transmission systems wherever appropriate by promoting effective competition between persons engaged in, or in commercial activities connected with, the generation, transmission, distribution or supply of electricity or the provision or use of electricity interconnectors; and
b) **subject to such measures as the Authority considers appropriate in the performance of its objectives set out in (a) above, to reduce the emissions of greenhouse gasses in accordance with targets notified by the Secretary of State to the Authority.**

Option B
The principal objectives of the Secretary of State and the Gas and Electricity Markets Authority (in this Act referred to as 'the Authority') in carrying out their respective functions under this Part is to protect the interests of consumers in relation to electricity conveyed by distribution systems or transmission systems, wherever appropriate by promoting effective competition between persons engaged in, or in commercial activities connected with, the generation, transmission, distribution or supply of electricity or the provision or use of electricity interconnectors, **while reducing the emissions of greenhouse gasses in accordance with [targets notified by the Secretary of State to the Authority/ National policy Statements on greenhouse gas emissions reductions/Government targets for greenhouse gas emissions reductions].**

Under option A, greater emphasis is placed on the obligation in part (a) but the obligation in part (b) is still part of the principal objective. Under option B, equal weight is given to the two obligations. Similar wording would need to be included in Ofgem's duties in relation to gas and any future duties in relation to heat.

It is interesting to examine the primary duties for other regulatory bodies. As many of the regulators were created during the 1990s there are strong similarities between them. However, the Office of Rail Regulation (ORR) is relevant here. The ORR is subject to a duty to contribute to sustainable development, which ranks alongside the duty to promote competition and the interest of railway users. There is no reason why the predictability or transparency of Ofgem's decision making should be compromised by the need to balance consumer/competition consideration with a policy of reducing greenhouse gasses. It is always open to Ofgem to ensure that its policies are communicated as openly and transparently as possible, e.g. through publishing guidance, consultation, etc. This is a far more effective guarantee of predictability and transparency than the current wording of the Ofgem's principal objective which is, in any event, open to interpretation.

While there is no particular common thread in the statutory duties of other utility regulators, it is apparent that (i) not all regulators are required to focus on consumer interest and competition as their principal duty (as Ofgem is), and (ii) it is often the case that the regulator has to balance a range of distinct and potentially conflicting factors when interpreting its primary duty. We conclude from this that there is no fundamental conflict in proposing a greenhouse gas emissions reductions element to Ofgem's current primary duty.

The SDC recommends the inclusion of both greenhouse gas emissions and heat in Ofgem's primary duty. We feel this new wording would explicitly empower Ofgem to take a more proactive approach to the delivery of the government's environmental objectives within the context of their broader regulatory duties. Government would also need to update its guidance to Ofgem to clarify interpretation of the new primary duty.

However, we would caution government against simply updating guidance to Ofgem without making the necessary changes to the primary duty as we have outlined above, as we believe this would have minimal impact. Ofgem is obliged only to 'have regard to' government's Guidance, and therefore government must not rely on this means of influencing Ofgem's delivery functions. We are also not convinced that increased Guidance from government is necessarily the best way to influence an independent regulator to meet its objectives; rather the objective needs to be more clearly focused on the goals government is aiming to achieve. We believe clarity in the primary duty will help maintain investor confidence and understanding of what Ofgem will have to deliver, and how this will impact on existing processes such as the Price Control Reviews.

Some contributors have suggested that a change to the primary duty would create uncertainty in the energy markets and undermine investor confidence. However, our view is that frequent revision of government guidance is more likely to threaten the political independence of an economic regulator and hence create uncertainty in the market. A clear change to the primary duty, an option which requires primary legislation, is less likely to cause uncertainty in the market because the duty will not change as frequently as guidance could.

Recommendations

- To revise Ofgem's primary duty to incorporate reduction of greenhouse gas emissions and the supply of heat
- In line with our recommendations on a new primary duty for Ofgem, that the interests of present and future consumers are explicitly articulated to allow for defensive investment in technologies that can contribute to wider, global environmental challenges, such as climate change
- That the sentence in Ofgem's guidance restricting Ofgem's implementation of environmental or social measures that might impose 'significant financial implications for consumers or for regulated companies' be amended to clarify the meaning of 'significant financial implications', and to state what level of impact on bills is considered excessive.

4.3.1 Issues taken into consideration

In undertaking this review, and coming to this conclusion, SDC recognises that there are many issues to be taken into account when a change in duties is proposed, including that:

- Investor confidence in the energy sector, both in the energy markets and networks, needs to be maintained
- Government's stated policy is to support liberalised energy markets; that intervention needs to be clearly articulated as a public good, and that regulatory burden is not unduly increased
- Long term issues must receive due weight alongside shorter-term issues, and impacts on energy prices are recognised
- Democratic accountability needs to be maintained on energy policy decision-making.

Investor confidence

In our discussions with energy suppliers and network operators, confidence in the way in which the energy system is managed was mentioned as a key issue. However, with a clear new primary duty, the energy sector can still be secure in understanding the direction of Ofgem and government's goals. In fact, the tension between government's stated energy and climate change policy goals, against Ofgem's interpretation of its primary duty, was identified as a source of conflict, with complex relationship-building engaged in by the energy companies, to ensure they influenced the multiple players.

In many ways the most important issue for energy companies is a **secure framework for both energy policy and the regulatory process that discharges that policy**, as this creates certainty and leads to a reasonable cost of capital for the players. So a carbon market framework is essential for low carbon investment to be secure in the long term, but a guaranteed carbon price is not essential, and indeed is impossible for government to achieve alone. Thus the creation and maintenance of the EU ETS, and the strengthening of that market through progressively tighter national allocation plans (achieved across 27 Member States) is vital for energy suppliers to gain investor support for investments in low carbon energy generating technologies. Although this is outside Ofgem's remit, a move to align Ofgem's primary duty behind this structure would strengthen investor confidence that government is serious about the long-term future for low carbon energy systems.

Market liberalisation vs public good

Energy market liberalisation was the goal in the 1990s when the markets were privatised, and this was the context in which Ofgem was created. However, there has been a consistent recognition in government that a completely liberalised energy market cannot of itself deliver government's low carbon objectives. Hence, the Non Fossil Fuel Obligation was introduced in the 1990s followed by the RO for electricity generation. On the demand side, the Energy Efficiency Standards of Performance (EESOP) was followed by the EEC for energy end users, and the Climate Change Levy for business energy users. We do not therefore believe there is a fundamental contradiction in aligning energy policy **delivery** behind a policy that protects a public good. Realigning Ofgem's primary duty, to support the delivery of the public good is consistent with this approach.

The realignment we propose does not add to regulatory burden; it will make energy policy implementation better aligned with a range of government objectives, requiring fewer adjustments to correct unintended consequences, as has characterised the implementation of electricity trading arrangements (covered elsewhere in this review).

Long-term vs short-term

Ofgem arguably takes a short-term view of energy supply issues, in the main concentrating on keeping the lights on, which is a reasonable goal. It does take a slightly longer-term view in the Price Control Review process (where a 20 year timeframe is considered), but the major focus remains on the following five years, so network investments are planned in line with anticipated demand. Longer term security of supply issues are addressed by ensuring clear price signals that will allow increased demand to be met with increased supply. Today, the long-term objective is not around ensuring a low

carbon outcome but towards ensuring a competitive one. The much longer term development of the energy system – for example, planning a network investment programme to align with government's 2050 carbon emission reduction goals – is not sufficiently on Ofgem's agenda, particularly in its regulation of the networks.

A longer-term view is needed around the framework for regulating the network companies. As has been emphasised in the Stern Review, infrastructure investment decisions made now and over the next five to ten years are particularly critical in setting the UK on the right path to a low carbon economy, and this is particularly true in the electricity supply networks. The UK's centralised electricity supply system was developed post war, with much of the 1960s technology now coming to the end of its natural life of around 40 years. Investment in electricity networks now will need to be aligned with the 2050 carbon emission reduction target, to set the UK on an emission reduction path.

While Ofgem has boosted network operators' ability to invest, to £10bn over the next five years, replacing like with like may well mean that new technology options looking to connect to the system in the future may find it more difficult than if the networks were allowed to develop in a way that made them flexible enough to connect new generation in a variety of ways. This means developing distribution systems so that they are more actively managed and capable of carrying electricity in two directions whilst also managing voltage. It is likely that tomorrow's technologies will require a grid that is more advanced than the technology available in the 1960s.

Democratic accountability

Our proposal maintains accountability for energy policy within the democratic process, so the Secretary of State would have overall responsibility. Our proposal for reforming Ofgem's primary duty in no way undermines this; rather it reinforces delivery behind the goals defined through the democratic process.

4.4 Ofgem's organisational structure for sustainable development

Ofgem is organised over four divisions: Operations, Corporate Affairs, Networks and Markets. At the top of the organisation is the Authority made up of eight non-executive directors and four executive directors. The Energy Act 2004 gave Ofgem a new secondary duty to carry out its functions in the manner it considers is best calculated to contribute to sustainable development. Internal structures were reviewed at around the same time.

Ofgem's organisational structure has proved exceptionally effective at enabling it to deliver against its primary duty in a coherent, professional and efficient manner and the processes in place for decision making were designed to reflect this (see below). At around the same time as the introduction of the sustainable development duty, senior staff changes led to a reorganisation of social and environmental functions and fragmentation of the team.

In 2005, Ofgem reorganised its internal structures into four divisions with the Environmental Policy team brought into the Markets division and Social Policy included in the Corporate Affairs Division. Environmental programmes such as the RO, EEC and Levy Exemption Certificates became the responsibility of the Environmental Programmes Unit, which is housed in the operations division. Subsequently, environment policy has been merged with the European team to create a European Strategy and Environment directorate and the social policy team has been restructured to focus on social policy development and delivery. Ofgem has recently advertised for a new director post to give greater focus to social policy in decision making discussions.

In addition, Ofgem set up a sustainable development sub-committee to the Authority to ensure that the issues were understood at the non-executive level. This sub-committee oversaw the production of Ofgem's sustainable development report in 2006[25] which outlined how the organisation contributes to sustainable development and would look to contribute further over the coming year.

The limited resource of the environmental and social policy teams means that there are constraints on the extent to which their expertise can be drawn upon by other policy teams in the organisation. Relying on small teams of expertise is insufficient for embedding sustainable development across an organisation, and holistic training, management and guidance are needed throughout the organisation.

4.4.1 Internal processes for sustainable development

There are two different processes for decisions in Ofgem:

- Either through an industry code panel, for a code modification proposal, or
- Through an internal process such as the network Price Control Reviews.

Code modifications are the process by which changes are made to the detailed set of rules governing the energy markets. The modifications are taken through an industry-based panel; proposals are developed and consulted on, and Ofgem then takes a view on whether the proposal should be accepted or not. Whilst this process does enable all industry to participate, smaller players complained to us, in the course of this Review, that they did not always have the resources to participate fully in these multiple panels. The bias is often therefore in favour of large players' proposals. In addition sustainable development is not included as an objective against which any proposal can be proposed or assessed.

Within Ofgem, once the code modification has been through this process, a policy lead drafts a response, and invites comments across Ofgem on the proposal, which then requires the appropriate teams, including the resource-constrained social and environmental divisions if appropriate, to contribute to the draft response. If a decision is considered to be 'important' a Regulatory Impact Assessment (RIA) will be carried out, and the final decision will be made by the Authority, taking the policy advice and the RIA into account. Ofgem's decision, when published, would be the evidence for any judicial review, should it occur at a later date.

For any major project originating with Ofgem, such as a transmission or distribution price control, the decision making process is different. The price controls operate through project teams with a project board. The project team under the project lead develops the proposals and the project board comments on and guides the work before any papers are passed to the Executive and Authority for decision making. As such, the project board has a very important role.

Sustainable development is represented in this process through the project board which will be attended from time to time by a member of the environmental and/or social policy units, depending on the issue being discussed. For example project team discussions on extending the gas network will include a representative from the social policy unit.

The project board is responsible for guiding the direction of the project to ensure that all issues are covered by the policy proposals. The project board however does not draft and propose the policies; this is done by the project team. The extent to which a project will include an environmental and social perspective is as much to do with the direction given from the project board as it is to do with the skill set of the more junior members of staff developing the policy papers, and the willingness of the project lead. For sustainable development to be fully delivered, it is important for expertise to be available across the organisation (via the project board) as well as vertically, through all grades of staff. One of the most important ways in which this vertical integration occurs is through the production of RIAs.

Ofgem undertakes an impact assessment in cases where it considers the decision to be 'important', i.e. where its implementation would be likely to do one or more of the following:

- Involve a major change in the activities carried out by the Authority
- Have a significant impact on the market participants in the gas or electricity sectors
- Have a significant impact upon a person engaged in commercial activities connected to the gas or electricity sectors
- Have a significant impact on the general public in Great Britain or in a part of Great Britain, or
- Have significant effects on the environment.

An RIA will be undertaken if a policy is proposed by the Authority and before any final decision is taken.

However, for those policies which the Authority is not minded to propose, and which are not code modifications, an RIA is not completed. In these cases the Authority takes a view through the lens of its duty set, as to whether it is a policy they would consider proposing. There are however a number of policy documents which are circulated internally to determine whether or not the Authority should propose a course of action. These documents do not always include a full RIA until the Authority has decided on whether it is something which the organisation should propose.

Even then there are policies which have not had a full RIA, such as the incentive mechanism aimed at reducing emissions of sulphur hexafluoride, a strong greenhouse gas, from the transmission system. In other cases, an RIA may not be completed and even when it is, the point at which the social and environmental impacts of a proposed policy are fully taken into account is late in the day, well after any real qualitative or quantitative assessment could actually shape the policy.

4.4.2 Ofgem's social cost of carbon

In 2002, government introduced the Social Cost of Carbon, an agreed figure that was to be incorporated into policy impact assessments, such as RIAs, to evaluate the potential impacts of the policy in relation to greenhouse gas emissions. The Government Economics Service recommends using a central value of the social cost of carbon of £70/tC in 2000 prices rising at £1 per year, with a range of £35-140/tC. The analysis for the UK Climate Change Programme was based on around £80/tC (including inflation). The use of a social cost of carbon in calculations was a positive move by Ofgem to fulfil its environmental and sustainable development duties. However the review has uncovered only one instance where the full range has been used in cost-benefit analysis (the 2007 transmission losses charging RIA) whilst in the majority of cases, a much lower figure has been used. For example, examination of the losses incentive in the 2005 Distribution Price Control RIA suggests a figure of around £29/tC was used. The 2007 transmission losses calculations show that Ofgem is moving towards using a cost of carbon which is in line with government guidance, and we welcome this move. We recommend that Ofgem's guidance on impact assessments is updated, to ensure that an appropriate social cost of carbon is consistently used.

Box 2 Distribution Price Control 2005

Privatisation of the electricity sector led to the use of RPI-X in the Price Control Reviews, for setting the level of spend that companies were allowed over the following five year period (i.e. authorised funding was based on an increase related to the Retail Price Index (RPI) less a deduction for efficiency savings (X)). As a result of aggressive efficiency savings, investment in innovation plummeted. The 2005 Distribution Price Control Review set three incentives: to reduce losses, to connect distributed generation and to stimulate improved innovation. These incentives are a move in the right direction, but their impact has been limited by the cautious level at which the incentives are set:

Losses incentive

- set at £48 per MWh saved, and a 50% increase in the incentive since the previous price control. The Distribution Network Operators (DNOs) are showing little interest in responding to this incentive, as they argue that it is too low to finance new technological or system options, and they are therefore favouring 'like for like' replacements. Such replacements will not minimise the level of losses from the distribution system. Our analysis shows that the incentive was based on a cost of carbon of around £29/tC.[26]

Innovation Funding Incentive (IFI)

- The Innovation Funding Incentive promotes the demonstration of new technologies in Registered Power Zones (RPZ)
- When this idea was first suggested within the organisation it was rejected on the basis that 'innovation spending does not always lead to increased value to the consumer as many innovative projects fail' and there was reluctance to micro-manage network operators' activities. However, this barrier was overcome in time, which demonstrates a change in attitude within Ofgem
- The level at which the incentives were set is low, with network operators able to spend 0.5% of their turnover on innovation. The UK average for innovation expenditure is around 2% of turnover. As such the IFI is set at a low level, although in view of the skills shortage facing the industry, it would take some time to spend more money on innovation. Incentives for innovation need to be sufficiently strong to stimulate an industry that has largely been driven by cutting costs and maintaining tight margins
- Registered Power Zones were allowed to be created as areas where innovative solutions could be tested. This trebled the Distributed Generation (DG) incentive for DNOs if the connection was made and was innovative. The main problem with the IFI and RPZs is that they are limited in scope (only focused on connecting DG) and do not incentivise the use of innovative solutions beyond the power zone itself. Innovative solutions are often not commercially viable immediately, but they are not allowed to receive incentive support for further testing

The use of a low cost of carbon is very significant. Ofgem's RIA guidance states that intervention should only occur when the cost of the policy proposal is proportionate to the outcome. So, if the outcome of a policy is to reduce carbon emissions then the higher the cost of carbon the greater the ability of the organisation to intervene, and similarly, assuming a low cost of carbon will reduce Ofgem's willingness to intervene.

The Stern Review suggests that a much higher cost of carbon should be used in calculations. Government is re-examining the social cost of carbon and Ofgem will need to update its value for impact assessments. Ofgem has committed to review its RIA guidance (to be published in the third quarter of 07/08).

4.4.3 Ofgem's RIA Guidance and social impacts issues

Ofgem's RIA guidance requires an assessment of whether a policy proposal gives rise to any material issues relating to unequal distribution of benefits or costs between groups or within a group. The guidance gives an example of distributional impacts between rural and urban customers. An understanding of the different householder groups throughout the UK is evident at Ofgem's management executive level and within the social policy unit. However as the RIA guidance does not clearly articulate how the impact on different consumer groups should be assessed, it is difficult for many policy officers within Ofgem to integrate the diverse range of issues into their policy impact assessments.

4.4.4 Ofgem's capacity to deliver sustainable development

Understanding of the implications of sustainable development on Ofgem's day-to-day activities appears to be lacking throughout the Ofgem structure. There is an over-reliance on the role of the RIA Guidance, presumably reflecting a view that the RIA process is the appropriate point for considering social and environmental impacts. The problem with this approach is:

- An RIA is only undertaken for major policy changes, and is done on an ad hoc basis where the Authority believes it to be important, and is carried out late in the policy development process, usually once a decision is either made, or about to be made
- The Ofgem Guidance is insufficiently detailed on social impacts
- It does not include a formal assessment of the social and environmental impacts where the Authority is not minded to make a proposal.

Capacity within the organisation to understand the implications of its work for sustainable development is not being developed, and those officials in the specialist social and environmental divisions are over-loaded with requests for advice. In addition, Ofgem's interpretation of its primary duty works against achieving real progress on sustainable development.

Ofgem has recognised that the level of sustainable development training needs attention. It has recently completed an organisational restructuring and HR policies (such as employment, induction and training) are being re-examined. Ofgem openly admits that it does not currently have training courses and induction programmes designed to train new and junior staff in how sustainable development applies to their day-to-day work. The new HR team is looking at how to embed sustainable development into performance management systems, and into Ofgem's core values. Ofgem is also developing a new leadership and management development programme that will include an SD component. This is a positive step by Ofgem to improve its capacity to deliver on sustainable development and we would welcome the opportunity to work with Ofgem in developing these programmes.

4.4.5 Ofgem's Monitoring and Reporting on its SD Duty

Ofgem produced separate environmental and social action plans, and in 2006 it published an annual report on delivery against its sustainable development duty. This report presented Ofgem's contribution in five themes and fourteen indicators. Ofgem also reports on its sustainable development activities through its corporate strategy which outlines its commitment to environmental and social objectives.

Ofgem's duties require it to contribute to government social and environmental policy objectives. However, we found that the 2006 sustainable development report provides no insight into **how much** Ofgem is contributing and **how effective** its policy interventions have been in terms of outcomes. Such analysis is needed to know whether Ofgem is fulfilling its duty.

The industry codes do not contain sustainable development as a criterion against which modifications can be assessed and the publication of RIAs seems to be done on an ad-hoc basis, late in the decision making process. As such there is no formal process to ensure that social and environmental issues are addressed in a systematic way for every decision

Summary

During our examination of Ofgem's organisation structure and decision making process we identified four main problems:

- concern about the risk of a judicial review has made Ofgem cautious about its decisions, using this as a reason for a conservative interpretation of its primary duty. This leads us to conclude that a revision of the primary duty, as outlined above, is the most appropriate means of ensuring real change in Ofgem's organisational behaviour
- over-reliance on Ofgem's part on input from under-resourced teams within the organisation, and under-resourced industry externally, means that the status quo is more often maintained
- Ofgem systematically under-values carbon in its quantitative processes
- Consideration of social and environmental issues often occurs late in the process.

Recommendations

- Ofgem's duties to be changed to include strong reference to greenhouse gas emissions reductions to ensure that these issues are strongly ingrained in decision making processes
- Ofgem to undertake a capability-building programme for its staff on sustainable development.
- Ofgem to use the Government's Green Book Guidance and to institute a social cost of carbon in compliance with government department practice, with a range of £35-£140/tC with the mid point of £77/tC (for 2007); to be updated in line with any new social cost of carbon that is agreed within government once its evaluation of the implications of the Stern Report recommendations is complete
- Ofgem's RIA Guidance to be made explicit about assessment of social impacts

4.5 Developing a properly regulated heat market

Heat is produced to meet demand in homes, businesses and industrial processes. Changing the ways in which we generate, distribute and use heat is as important as changing the electricity system for achieving our environmental goals while meeting our energy needs. Heat accounts for 76% of total UK energy demand, not including the transport sector, and it accounts for 47% of UK carbon dioxide emissions. Government recognises the need to reduce demand for heat in homes through improving household insulation, but whilst this is valuable and necessary, it is not a radical reassessment of how heat supply could be decarbonised. Such an assessment is needed, and in our view Ofgem should be a part of this.

Current status of heat

Heat is generated from a number of sources: 68% of heat is produced from gas, 14% from oil and 14% from electricity, 3% is produced from coal and coke, and 1% is produced from renewable sources.

Over two-thirds of the energy input to power stations is lost as waste heat. This waste costs the UK economy over £5 billion a year.[27] Using waste heat can contribute to security of supply by reducing our reliance on imported gas, and other fossil fuels. 40% of our gas requirements in 2010 may be met by gas imports, (and 90% by 2020).[28] Using waste heat can also contribute to tackling fuel poverty.

District heating networks in Barking are offering heat at 3p/therm as opposed to 5p/therm from conventional gas boilers.[29]

In addition to 'waste heat' there is also 'wasted heat' which is lost in homes and business due to poor insulation, inadequate draught proofing and over-heating of the building. Reducing demand for heat helps cut carbon emissions, contributes to improving our security of supply, and lowers fuel bills. Historically, the supply of cheap, abundant North Sea gas has meant that gas has been seen as proxy for heat. Now that North Sea gas is in decline, a re-evaluation of this policy is urgently needed.

There are many policy measures in place to encourage renewable heat supply (such as biomass), limit demand for heat (through the EEC and Warm Front/ Warm Deal programmes), and for CHP systems (inclusion in the EU ETS, enhanced capital allowances for good quality CHP, reduced business rates and reduced VAT on micro-units). However, these will not be sufficient to create a substantial shift away from gas to lower carbon sources of heat.

Meeting heating demand in cities and towns

Denmark and the Netherlands have created extensive community heating networks, and 60% of homes in Denmark are powered by community combined heat and power (CHP) networks. Research by PB Power and updated by AEA,[30] indicates the energy and carbon savings to be achieved from community heating in the UK. In summary, assuming a public sector financing discount rate of 6%, there is 18-21 GWe of potential for gas-based community-based CHP that would cover both residential and commercial loads. This equates to a carbon emissions reduction of 4.3-5.1MtC/yr or 17-20% of total direct household emissions (in 2000). This benefit would be significantly increased through greater use of renewable-based fuels and industrial waste heat (including power station heat).

Work carried out by Delta for the SDC[31] highlights that it is unlikely that renewable fuel supplies will be sufficient to meet the full 18-21GWe but could provide around half of this capacity, around 5.5-6.5 million homes and commercial buildings, or one quarter of the UK housing stock. However the up-front capital cost of developing the full 18-21GWe of community CHP schemes is estimated to be £26.5 – 31 billion.[32] Developing a financing regime that could spread the cost of this in an acceptable way would be critical.

Using waste heat through CHP and community heating schemes face the following barriers:

- High upfront capital costs for CHP generation, and for community heating networks
- The relative price difference between gas and electricity 'spark spread' means that at times of high gas wholesale prices and low electricity prices the economics of CHP are unfavourable
- The locational element of the Use of System charge for generators penalises CHP generation in the north
- CHP requires long-term contracts for heat produced to ensure future sales
- Planning can be a barrier, and some utilities are unwilling to invest in community CHP schemes because of the administrative burden of dealing with the local authority
- Consumers are often suspicious of a new heating system; so far the most successful schemes have been developed using local authority buildings, or are in new developments.

Box 3 Developing community CHP schemes

There is growing interest in the potential of CHP to reduce the carbon intensity of our energy supply. The inclusion of CHP in the Greater London Plan has had the effect of raising the regulatory floor, particularly in respect of planning for private developments. There has been a ripple effect in the rest of the country with major developers, such as English Partnerships, now looking seriously at CHP for delivering against current building regulations, and future changes in 2010. The way they do this is typically by energy service companies offering competitive packages to developers, or by developers themselves becoming energy service companies, as in the case of Urban Splash.

The carbon savings from generating electricity using CHP technologies, and making use of the heat for heating or cooling, depend on many site-specific factors. The most successful examples typically exist in large blocks of flats, particularly in mixed use developments, where there is a broadly constant aggregate demand. Where a development, or group of developments, is close to a hospital or other institutions with a constant demand, this can also help the viability of the project. For systems with an electrical output of over 50MWe BERR has estimated that, in the right conditions, efficiency savings of between 10 and 23 per cent can be achieved. This is considerably more than for smaller systems, with an output of between 1MWe and 50MWe, where efficiency savings of 7 to 21 per cent can be achieved.

Despite this potential there are still some regulatory barriers which stand in the way of the wider take-up of CHP in suitable sites. One of these is the way the charges from distribution companies for carrying locally generated electricity on the system are structured. This is seen by many as unfairly biased against small, low-carbon generation plants.

The reason is that the charges fail to recognise the benefits the generators are bringing for carrying their locally-generated renewable or low-carbon energy; on the contrary, they include an element for use of the high-voltage transmission system even though the generator is unlikely to make any use of it. Although some loss benefits are passed to the generator by the supplier, the charges from the distribution company still significantly outweigh these benefits. The charges for importing electricity are also unfairly biased against CHP generation that has an atypical demand profile. (This is explained in more detail in the Urban Splash case study.)

These charges all feed into the price for imported electricity which is 9.5 pence per kWh while the price a generator can expect for exported electricity is just 3.5 pence per kWh. The differential does not properly reflect the true costs and benefits to distribution companies.

Finally, there is no regulated framework for the distribution of heat. Developers would welcome this since it would create a level playing field for providing heat to households and businesses.

What role for Ofgem?

There is no overarching regulatory framework for heat and in our view this should be corrected. Theoretically it would make the most sense for Ofgem to become the regulator for heat supply, networks and demand management. By integrating heat with electricity regulation there should be a coherent relationship between electricity and heat, and a more holistic and supportive assessment of the contribution that CHP can make to the energy mix.

Recommendation

- That Ofgem becomes a regulator for the supply of heat once its primary duty has been changed.

Most of the policy levers for fundamentally changing the way CHP and community heating schemes are developed, lie with government, but Ofgem does have a role in enabling willing participants to create a fully integrated CHP community system.

If Ofgem became the heat regulator the following options could be examined:

- the network charging structures and electricity trading arrangements could support Combined Heat and Power
- the objectives of industry code panels could support heat developments
- incentives could be placed on generators through generating licences, to reduce heat loss
- The construction of heat networks could become one of the permitted activities of gas and electricity distribution network operators or other parties.

At present the passive role of network operators means that they respond to the actions of determined individuals in local authorities to establish heat networks (e.g. in Leicester, Sheffield, Southampton, Woking and London). Over 43km of pipeline exists in Sheffield, delivering nearly 120,000 MWh of heat to over 2,800 homes, public buildings and commercial properties, across two networks. For every 100 MWh of energy supplied by this district CHP scheme, 31,000 tonnes of carbon dioxide are displaced.

Our fourth option above builds on the current business model of network operators, and would incentivise them to put heat networks in place. Heat network licencees could include groups as diverse as local authorities (who could construct heat networks as a means of combating fuel poverty) and gas or electricity network operators. Gas distribution network operators already engage with local authorities on pipe repair and replacement programmes. Ofgem would be in a position, as regulator, to stipulate minimum network standards in the network owner licence conditions, similar to the Security and Quality of Supply Standard (SQSS) on the transmission network.

There would still be a question over how heat networks should be financed. One option is to have heat networks developed and financed on an entirely commercial basis. However, another option is to treat the development of heat networks as a matter of long term public good, and therefore requiring public funding. It is clear that many homes in the UK can reduce their CO_2 emissions only so far with energy efficiency measures. Many cities have solid wall terraced housing capable of limited efficiency improvements (loft insulation, draught-proofing, efficient heating systems, appliances and double glazing). Micro renewables such as wind turbines may also have minimal impact in the middle of towns. In some cases solar hot water is attractive, as are ground source heat pumps, depending on garden space available. But equally, an efficient heat network initially powered by gas CHP, could at some point in the future be converted to biomass or hydrogen, switching the heat demand for the whole area to a zero carbon source. While we accept that there is considerable cost involved in supporting heat network developments, it is clear that there is cost involved in many options for energy supply that are not considered excessive by government, whereas policies for energy demand reduction are frequently designed with least cost basis as the driver.

Estimated costs and carbon benefits of proposal

If 20-40% of future electricity supply was district CHP from renewable sources, the energy produced could be between 110 TWh and 270TWh, leading to annual carbon savings of between 5.7 and 14MtC/yr.

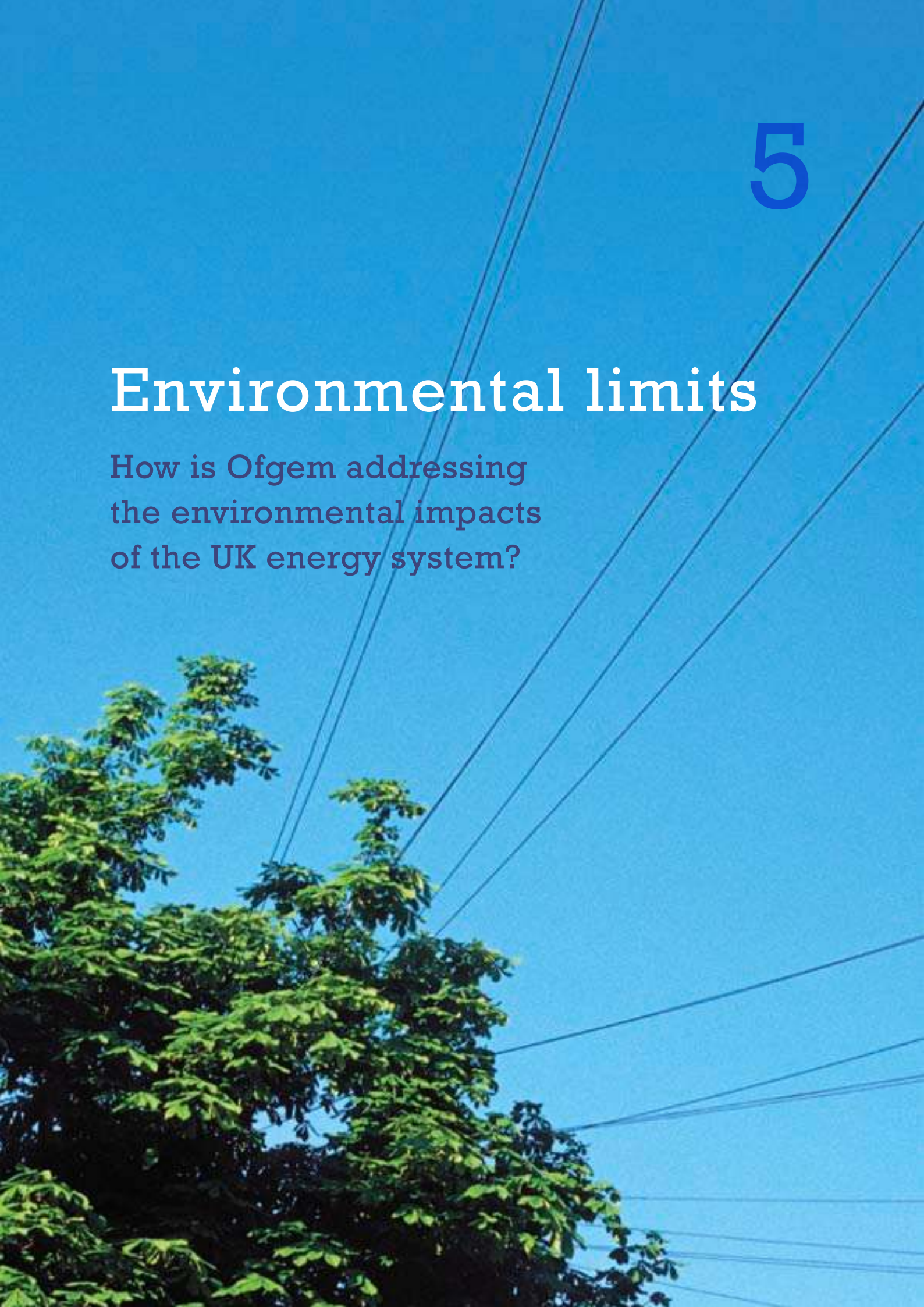
A one-off cost of £10M-£25M is assumed for overseeing the formation of heat networks, and the total capital cost is estimated to be £53bn-£88bn over several decades for establishing the networks and connecting households.[32]

The development of such a network would take several decades to create, and therefore the increase in consumer bills to cover these costs would be spread over the years during which the developments take place. Case studies developed by the EST and the Carbon Trust[33] suggest a whole life benefit for both retrofit and new build community heating schemes.

5

Environmental limits

How is Ofgem addressing the environmental impacts of the UK energy system?



The environmental policy context for Ofgem will be important over the next few years, particularly as the electricity networks, built in the 1960s, become due for replacement. The nature of this investment will be crucial if the UK is to achieve a decarbonised electricity system.

We are heartened by those aspects of the Energy White Paper 2007 that imply that the delivery of energy to consumers will radically change after 2011. The context for the Energy White Paper is the increasingly clear evidence from the Intergovernmental Panel on Climate Change that climate change is occurring as a result of human activity. We have only a decade or so to make a fundamental cut in our overall carbon emissions. This analysis is backed up in the highly influential Stern Review which confirms that radical technology and behaviour change is needed over the next decade.

This means a significant shift in emphasis away from a demand driven approach to a fundamental re-evaluation of how the necessary production and use of energy can be achieved within the context of the need very rapidly to reduce carbon emissions. In our view, the approach to energy supply and demand in California is an interesting model, although probably not directly applicable in the UK. A mechanism is needed to transform the existing energy policy framework into one where energy suppliers are incentivised to create a business around saving energy, as they do by selling energy units now. To this end, we are working further with government on the design of the Supplier Obligation for 2011, although this is outside the scope of this report.

In this section, we examine how far Ofgem's regulation of the energy markets and the energy networks has succeeded in setting us on the path of a low carbon energy system. We also examine ways in which greenhouse gas emissions could be saved through much more proactive management of the networks, and make proposals for ways in which Ofgem's practices could be changed. We particularly focus on:

- Creating a greenhouse gas incentive package to reduce the greenhouse gases associated with the operation of the network, reduce the losses from the networks, reward the connection of low carbon generation, and promote innovative solutions to reducing greenhouse gas emissions
- Enforcing this package by requiring network operators to report on their associated greenhouse gas emissions
- Increasing the innovation incentives in the electricity transmission and distribution price and broadening the remit for innovation expenditure and demonstration from the narrow focus on connecting distributed generation to reducing greenhouse gas emissions
- Increasing the incentive package for distribution network operators to move them towards more active management of the networks to ensure the system is 'future-proofed' for the connection of clean local generation
- Adopting a 'connect then manage' approach, to reduce the GB Queue and facilitate the connection of low carbon energy, to better implement the priority access requirement of the renewables directive
- Strengthening mechanisms to reduce greenhouse gas emissions from the GB generating mix.

5.1 What are the barriers to reducing greenhouse gas emissions and how can Ofgem overcome these?

There are a broad range of barriers to low carbon electricity generation in the UK and its movement from generation to customers via the transmission and distribution systems.[34] There are also barriers to improved demand management and to the development of heat networks. We have identified the following as the major barriers that could be tackled immediately:

Electricity markets:

- The electricity trading arrangements are penalising intermittent and small scale generation, and requiring them to participate in the market as distressed sellers
- The objectives and governance of industry code panels frequently support the interests of market incumbents to the detriment of small scale generators.

Electricity networks:

- Capacity constraints are delaying the connection of low carbon generation
- 7% of the GB generation output is lost on the transmission and distribution networks. This is higher than is achieved by best practice countries
- For low carbon electricity generation the cost of connection to the grid can be prohibitive, particularly in the north of England, Wales and Scotland
- The RPI-X formula for regulating network operation is restricting network operators from employing solutions to reduce greenhouse gas emissions. The cost of these emissions is not adequately priced within the incentive structures of Price Control Reviews, therefore insufficient attention is given to greenhouse gases through the transmission and distribution networks
- The existing energy system is wasteful of heat and supply of heat is not properly incorporated into the regulatory regime.

Energy consumers:

- Consumer engagement with their energy use is poor as one in three bills is estimated and presented in terms of p/kWh which is not readily understandable to consumers
- The level of complaints relating to domestic billing issues in the energy market is six times higher than the number of complaints received by Ofcom relating to domestic telephone bills
- Pre-payment consumers are paying, on average, £120 more per year for their energy than direct debit customers
- Many green tariffs are misleading consumers into believing they are contributing to additional environmental outcomes over and above a company's legal obligations
- There is still a strong correlation between energy supply company profit and increasing energy sold
- The current allowance price within the EU ETS is too low to drive energy efficiency and demand for low carbon energy.

In an ideal world, the carbon price in the EU ETS would itself provide sufficient incentive for generators to find additional low carbon generation. This may occur in the forthcoming EU ETS period, but whether it does or not, the government and Ofgem need to find ways to meet UK obligations. This will require additional mechanisms for promoting low carbon electricity generation.

5.2 Delivering improved environmental performance in the energy system

A more complete analysis of the options for action to reduce carbon emissions from the energy system can be found in the accompanying evidence base to this report. In this overview, we have selected some of the options that we feel are most likely to deliver emission savings within the current framework, and are most likely to enable Ofgem to alter its current approach to one that better embeds greenhouse gas emission reductions into its thinking.

These options are likely to be met only when our recommendations for institutional change, and change to Ofgem's primary duty, are also delivered. In our view, the options outlined below, in themselves capable of delivering improvements, will be best developed into fully workable options by an institution fit for purpose for this agenda. It is also worth noting that many of our recommendations depend on Ofgem adopting a proper price for carbon.

5.2.1 Electricity market arrangements

Government and Ofgem introduced the New Electricity Trading Arrangements (NETA) in 2001 and this was extended to cover Scotland through the British Electricity Trading and Transmission Arrangements (BETTA) in 2005. These market reforms increased competition and contributed to wholesale prices falling over that period. Some of these price falls have been passed through to consumers and in this respect, Ofgem has clearly delivered on its primary duty. By focussing on maintaining a

downward pressure on wholesale and retail prices, Ofgem has contributed to achieving government's fuel poverty goals (covered in the next chapter).

However, the trading arrangements have created difficulties for low-carbon energy generation. Under BETTA, predictability and flexibility of supply is rewarded and intermittent generators like wind and CHP are penalised. This increases costs for these generators and inhibits their development. Small-scale generators face a disproportionate burden from the transaction costs of participating in the balancing market. The balancing risk is often passed to the supply company so that energy from small-scale generators is frequently undervalued. At the outset of BETTA, it was envisaged that small-scale generators would sell their energy through consolidators who could achieve a better price through collective bargaining. However, there is presently only one consolidator (SmartestEnergy) in the market.

Ofgem oversees the market arrangements including decisions on modifications to the industry codes. In 2006, Ofgem approved a modification to the Balancing and Settlement Code (BSC) (P194) which changed the cash out payments (the penalty for being out of balance) to a more marginal basis. This had a disproportionate impact on intermittent generators, which Ofgem explicitly acknowledged in its RIA:

'...if certain generation technologies are less reliable than others it is appropriate that they are exposed to the costs of managing this. They can either manage their exposure by contracting with the demand side or other more reliable generators.'[35]

This approach means new innovative low carbon generation must fit within a market framework designed for large centralised fossil fuel fuelled power stations. An alternative approach would be to alter the system architecture to better recognise the unique characteristics of low carbon generation. A step towards this would be to include the achievement of sustainable development in the code objectives. This would allow the impact of code modifications on sustainability to be fully assessed as part of the code modification process.

Code modifications are taken through an industry based panel. Proposals are developed and consulted on by the industry panel before Ofgem takes a view on whether the proposal should be accepted or not. Whilst this process does enable all industry to participate, smaller players complained to us, in the course of this review, that they often did not have the resources to participate fully in these multiple panels. This creates a bias in favour of large participants, usually the incumbents, as they have a greater ability to participate in and influence the processes. The complexity of the codes and the modification process means that the electricity trading arrangements as currently operated are unlikely to be particularly supportive of small scale generators.

In the recent proposed Connection and Use of System Code Modification CAP 148, Ofgem suggested environmental costs could arguably be included in the deliberations of code panels, under the objective relating to economic and efficient system operation. This change in position is welcome but does not, in SDC's view, provide enough traction for participants looking to make substantive modifications to industry codes.

Recommendation

- The code modification process to be simplified to ensure that the interests of smaller participants are fully represented in the process
- Ofgem to amend the industry code objectives to include sustainable development, and support industry in developing modifications to reflect any changes in the objectives.

5.2.2 Network charging

The National Grid model for transmission network charging for generators contains three elements:

- Connection charges – associated with the assets needed to connect a generator to the network
- Transmission Network Use of System (TNUoS) charges – associated with the cost of operating and maintaining the transmission network; and
- Balancing Services Use of System (BSUoS) charges – associated with the costs of balancing the GB system.

TNUoS charges include a locational element

designed to signal the economic and environmental cost associated with transmitting electricity and hence the benefits of generation capacity being located near to centres of demand.

The locational element of TNUoS charges disadvantages renewable or CHP generators in the north of the country, which are located where the renewable resource is greatest or where there is a heat demand. By contrast, fossil fuel generators in the south of the country, closer to centres of electricity demand, may receive a surplus payment.

It can be argued that renewable generation requires less transmission reinforcement than conventional generation and so TNUoS should be lower for renewable generators. This is because renewables will be able to share capacity with conventional generators and because renewables tend to occupy less transmission capacity at peak periods. Against this, it can be argued that the cost of reducing the output of conventional plant should be borne by renewable generators and that renewables have the potential to use a large proportion of transmission capacity at peak times.

In response to this problem, government has capped the TNUoS and transmission connection charges for renewables in the Orkney Islands, Shetland Islands and the Western Isles. Ofgem considered this unnecessary as the RO subsidy should cover the higher connection charges. Arguably, high transmission charges in areas of greatest renewable resource reduce investment in renewable projects and maintain the high cost of the RO.

CHP does not receive the same level of support that renewable generation does and needs to be located next to heat load rather than electricity demand. TNUoS charges thus have a larger impact on CHP projects than on renewable projects. Since CHP is a highly efficient technology when used in the right circumstances, any barriers to CHP should be identified and removed.

Recommendation

- Government and Ofgem should review TNUoS charging arrangements for CHP generators and exempt CHP from the locational element, or provide additional support to CHP generators to meet the TNUoS charges.

The DNOs' model for charging generators connected to the distribution networks also includes connection and use of system charges, although in this case, the use of system charge is based on voltage rather than location.

Prior to 2005, the DNOs used a 'deep' connection charging methodology which meant that a single generator had to pay the full costs of all reinforcement work required for it to connect to the network. Other users, subsequently able to connect, did not contribute to the reinforcement costs. Ofgem recognised this could be a barrier to the development of distributed generation, and in the 2005 DPCR moved to a system of 'shallower' charging so that some of the reinforcement costs are spread over more users through a Generator Use of System charge. This change in charging methodology recognises the benefits of local generation. However, large power stations connected to the distribution network must also contract with National Grid and pay TNUoS charges.[36] Smaller distribution connected generators benefit from both their avoided TNUoS and their contracted supplier's avoided TNUoS.

These charging arrangements are currently being reviewed. The Structure of Charges Implementation and Steering Group (replaced by the Distribution Charging Methodologies Forum in March 2007) looked at options for how distribution network charges will operate from 2010. Meanwhile the Transmission Access for Distributed Generation (TADG) Group has been assessing how generators connected to the distribution system should pay for the costs they may impose on the transmission system. It can be argued that because distributed generation avoids TNUoS charges this creates markets distortion. If the charges paid by distributed generation are not cost reflective, this may be inefficient and could lead to capacity constraints on the transmission network; and may encourage larger projects to connect to the distribution rather than transmission network. A move towards more cost-reflective pricing is likely to remove some of the commercial advantage of local generation.

Cost-reflective pricing is considered to be an important regulatory principle which creates clarity and consistency for investors. However, the costs used in the current charging models for both transmission and distribution only reflect economic costs and not wider environmental or social costs. At present,

there is a misalignment between the principle of cost-reflective charging and the development of a sustainable energy system.

Recommendation

- Ofgem to ensure any changes to the transmission charges paid by generators connected to the distribution network do not undermine the benefits that can be gained from clean local generation.

The complexity of the charging arrangements may in itself be a barrier as it is difficult to determine the costs involved in connecting at a particular point, and how these costs change as other developments come forward. Small players do not have the resources to monitor developments in cost charging. This may be addressed through the current reviews of charging arrangements, although this process also places a disproportionate burden on small players. Ofgem is also considering the development of a web-based tool to address this issue.

Recommendations

- Ofgem to consider how the system of charging and process of reviewing charging arrangements could be improved to reflect better the interests of smaller generators
- Ofgem to require National Grid to develop a web tool that allows generators to see the cost implications for connecting in various areas of the grid in real time.

Box 4 Charging arrangements for energy services companies

Urban Splash is the developer behind some of the UK's most exciting urban regeneration projects. The company seeks to deliver innovative and contemporary solutions to living and working. This approach extends to the energy system: Urban Splash would like to offer consumers genuinely low carbon power, heating and cooling. To deliver this, it has developed a model which would allow energy suppliers to earn more in return for selling less to consumers. In this way Urban Splash believes it can shift the paradigm away from the traditional model of selling electricity and gas.

To do this Urban Splash sets itself up as an energy service company (ESCo) and guarantees the residents of its 300-flat developments power, heating and cooling distributed through its own wires. Part of this is generated on-site, for example through CHP or renewable technologies, and the remainder is provided by an energy supply company, and resold to residents. In some cases, several developments can be linked together and connected to the same local energy network. This is the case in Urban Splash's Third Millennium Community Initiative in Manchester.

Residents pay a flat amount, calculated to be about 15 per cent lower than actual energy costs: around £100 per month at current prices. In return for the saving, residents give the ESCo the right to ensure that their property is as energy efficient as possible. As well as the fabric of the development, this might include providing a smart meter so that energy use can be tracked, and providing energy efficiency advice on a regular basis. Urban Splash is thus incentivised to 'beat the market' by ensuring the properties are as low carbon and energy efficient as possible.

The problem for Urban Splash has been that the structure of the existing energy market is not conducive to delivering its new business model. Rather, it is constantly being forced to adapt its model to comply with the requirements of what it sees as an antiquated, highly-regulated sector configured more to protect the incumbent energy companies than the consumers they serve.

Companies like Urban Splash have to negotiate with their incumbent DNO. (There are very few independent ones.) Yet the incentives on the network operators to incorporate and make use of low-carbon developments in the local network are weak. This, combined with high charges for using the system, puts developers like Urban Splash at a disadvantage in negotiations with the network operators and the terms that they receive are highly unfavourable.

In its Third Millennium Community Urban Splash will be distributing around 0.5 MW of electricity through a private electricity network. Because this is below the threshold of 2.5 MW, it is exempt from having to have a distribution licence, and so will not be required to provide open access to the network for suppliers, although it may choose to do so.

Before one of its developments can be connected to the system, Urban Splash is required to pay around £1,000 per flat for network re-enforcement, a total of £300,000 for the development. The way this sum is calculated is not transparent and is based on the site's requirement for stand-by power. Ofgem's regime for demand connection, which it describes as 'shallowish', has remained broadly unchanged since 1994 and takes no account of environmental benefits. Typically, developers of domestic properties are required to fund the full cost of the single-phase service to each flat, the low voltage mains, the substation, the extension to the 11kV network and the 11kV joints to the existing network. If reinforcement is required at the voltage level above 11kV, then the developer will also need to meet 25 per cent of these costs. Where 132kV is being transformed directly to 11kV the developer would have to pay for 132kV assets as well.

Once connected to the system, developers of domestic properties must pay charges for using the distribution system. These so-called distribution use of system charges are imposed by Ofgem on the network operators as standard licence conditions. The objectives of the charging regime are to encourage competition and to adopt a cost-based approach to charging, but they do not explicitly mention sustainable development. Ofgem last consulted on these charges in May 2005, but did not propose then to include sustainable development in the objectives for the charging regime.

The charges are levied on the basis of both a 'capacity' and a 'commodity' element, with a significant element based on capacity. What this means in effect is that the charges are based on the maximum demand a site could have. This discriminates against sites with distributed generation, such as combined heat and power that do not often demand up to the maximum. One way to reverse this would be to levy all distribution charges on a purely commodity basis. This would not discriminate against sites with combined heat and power, would encourage energy efficiency and would better reflect the environmental costs associated with energy consumption.

Finally, Urban Splash finds the restrictions on reselling electricity that it has bought from suppliers punitive. It is prevented from making any additional charges, despite the costs of running the local network and distributing the electricity. It therefore suffers a loss on the buying and reselling of electricity through its own networks. This is a further discouragement for companies such as Urban Splash to set up and run energy supply companies using their own local distribution networks.

5.2.3 Electricity Transmission Connections

With the introduction of BETTA in 2005, the Scottish network became an integral part of the GB network. As part of this, generators are now expected to contract directly with the GBSO, and any connection offers made are conditional on necessary reinforcements across the whole of GB being in place. In anticipation of this, many generators submitted bids to be connected onto the grid but most of these did not have planning permission, which can take many years to achieve. 9.3GW of capacity is awaiting connection onto the grid in Scotland. This is known as the GB Queue. At the moment, connection into the transmission system is dependent on spare capacity being available, but an alternative approach could be taken.

The issue of the GB Queue is compounded because the proposed major transmission line in Scotland, the Beauly-Denny line, is subject to planning appeals, as it will affect a large swathe of land through Scotland, including designated landscapes. Decisions on under-grounding have not yet been taken. Ofgem has contributed to the construction of new lines to connect generation in Scotland by introducing a flexible funding mechanism in the most recent Transmission Price Control. Ofgem has also held working group meetings to facilitate the shortening of the GB Queue and formed the Access Reform Option Development Group to review the options for transmission access. However, the outcomes of these working groups have not yet sufficiently influenced the Price Control Reviews. Industry participants have noted that without explicit support from Ofgem for the adoption of more innovative ways of reducing the queue, industry is unlikely to proceed as the need to improve efficiency (through RPI-X) is so strong in Ofgem's Price Control Review processes.

In the light of the medium term need to further exploit the UK's renewable energy resources, we believe that promising energy sources such as tidal power need to be included in future plans. The transmission system may need to be planned in a similar way to the original nuclear power station network. Exploitation of the significant energy generating potential of Pentland Firth, believed to be sufficient to contribute to around 3% of our electricity supply, will require grid strengthening to transmit the generated energy.

Ofgem has been proactive in pushing government to agree a regulatory regime for the connection of offshore generation. The recent announcement to allow competitive tendering for offshore connections is welcome and should help ensure that new offshore networks are built quickly and cost-effectively. Most recently, Ofgem has released the principles for the offshore regime to connect generation in the Scottish islands.

Box 5 Scottish Renewable Generation Connections

A 2001 Scottish Executive study concluded that there was sufficient renewable resource to provide 59GW of capacity, or enough to meet up to 75% of the UK's electricity needs. Of this, 46.5GW was from onshore wind, offshore wind, wave and tidal sources.[37] However, while progress has been made developing new onshore wind farms in Scotland, much less progress has been made in offshore wind, wave or tidal technologies.

In 2004, *the Forum for Renewable Energy Development in Scotland* – a joint industry-government group – reported that by 2020 up to 10% (1.3GW) of Scotland's electricity needs could be met by wave and tidal sources, and that this would support the creation of 7,000 jobs in Scotland, but changes in policy and regulation were needed. There is significant tidal resource in the Pentland Firth alone, with a number of project sites that could cumulatively contribute around 3% to the UK generating mix.

Schemes are under development in Shetland, Orkney and the Western Isles which, if approved, would bring substantial revenue to these communities and make a major contribution to renewable electricity targets. However, Orkney and Western Isles only have lower capacity connections and Shetland has no connection to the mainland. Ofgem has been assessing alternative connection options to the islands, but there is growing concern that the timescale for any decision and provision of infrastructure is too long.

The current capacity constraints from this 'invest then connect' approach to transmission network operation create uncertainty around the connection date. This acts as a disincentive for investment decisions in offshore tidal projects in the Pentland Firth area.

National Grid has recently proposed a code amendment that would allow it to prioritise connection applications based on the projects' ability to connect; if approved this could reduce the waiting times for connecting renewable generation. However, a move to a 'connect then manage' approach could see a more rapid increase in the connections of renewable generation. However, without the adoption of a 'connect then manage' approach to our network, and without more innovative approaches to connection and management, many renewables generators believe that long term prospects for growth may be stymied, and that companies will be forced to look oversees for better development opportunities. This would have serious implications for the UK's ability to meet its European obligations on developing renewable energy.

5.2.3.1 Adopting a 'connect then manage' approach

We think Ofgem could have a role in working around such delays in the transmission system upgrade, by supporting a 'connect then manage' approach. This proposal would entail the network operator, National Grid, connecting a generator to the grid as soon as the connection can physically be made, and then 'dispatching' (or permitting) them to use the grid in real time. Priority in the dispatch could be given to renewable generators, to maximise the low carbon element of the grid mix. With priority access for low carbon generation guaranteed in this way, the SDC believes there would be a significant increase in connection to the grid in the short term, and (coupled with our recommendation on embedding a carbon incentive into the Price Control Reviews, see below) much improved conditions for new renewables connections in the medium term. While Ofgem is reliant on proposals coming forward from industry for changes to the relevant codes to occur, it is our view that Ofgem missed an opportunity to signal a clear intention through the recent Transmission Price Control Review.

Recommendation

- Ofgem should work with National Grid to develop a 'connect then manage' approach to the transmission network and prioritise the connection of low carbon generation.

We recognise that this approach will adversely affect high carbon electricity generators such as coal fired power stations, and that high carbon generators will be required to reduce their output to make space for the renewable generation capacity. However, in view of the UK's overall carbon emission reduction goal, coupled with the Large Combustion Plants Directive and the recently agreed EU target for 20% renewables to be in the UK energy mix by 2020, this approach is consistent with UK energy policy and environmental goals.

Alongside this, Ofgem and National Grid need to develop a standard methodology for calculating the carbon intensity (carbon per MWh) of all generation capacity, to form the basis for the priority access. The security standards for use of the transmission system should also be reviewed. At present transmission capacity is expected always to match or exceed generation capacity, so generators have to wait until the transmission network is upgraded before they can connect. The 'connect then manage' approach challenges this assumption as it allows renewable generation to use the backup/reserve capacity that exists in the transmission system (in case of faults on the grid). Should there be a fault elsewhere in the system, renewable generation would be disconnected while the fault was corrected. The number of recorded faults on the transmission system has been declining so this option would not pose a significant risk to the transmission network operator.

Potential costs and carbon savings from this recommendation

It is estimated that a one-off cost to National Grid of between £2M-£5M for setting up this system would be incurred, with ongoing costs to high-carbon generators who would be required to reduce their output as renewables generators come onto the system. It is estimated that this approach could save between 1.3 to 3.2MtC per year.[38]

5.2.4 Greenhouse Gas incentives Package in the Price Control Reviews

The Price Control Reviews occur every five years and are the main interventions that Ofgem makes on all the networks. The TPCR covers both gas and electricity, and there are separate reviews in distribution for electricity and gas. The allowed levels of expenditure by the 14 electricity distribution networks, eight gas distribution network companies plus the transmission companies, are set in the price control reviews. This level of expenditure influences the costs that are passed onto the consumer.

We have discussed elsewhere in this review the limitations of a five-yearly timeframe for long-term planning of the networks, but we are here proposing an option to work within Ofgem's existing regulatory framework to achieve improved outcomes for reducing the environmental impacts of the electricity and gas system.

In the 2005 DPCR, Ofgem introduced three new incentives – for connecting DG, innovation and reducing losses. We believe these incentives are

important, and although they are showing only limited signs of having an impact (as the level at which they were set was conservative) we believe they can be significantly strengthened.

We have examined a number of options[39] for introducing a costing of greenhouse gases into Ofgem's regulatory arrangements, including examining the option of introducing it into the overall calculations per company in the price control review process. We explored the possibility of adding a price of carbon onto the standard regulatory formula of RPI – X to allow network operators to charge for carbon, but we concluded that this amendment would not be workable as this formula applies to the whole of the company operating costs, and a carbon emission valuation is not applicable to all expenditure. We have therefore proposed a specific incentive for the transmission and distribution companies to reduce greenhouse gas emissions on the system, supported by other strengthened incentives to reduce losses and promote innovation.

Recommendation

- That Ofgem creates a Greenhouse Gas Incentive Package for use in the Distribution Price Control Reviews, as follows:

1. Strengthened incentives to reduce losses, either set at a level consistent with the current social cost of carbon (£80/tC) or the DNOs are required to purchase losses in the market, as is the case in gas distribution

2. Continuation of the existing incentive for distributed generation, but with specific increases in operational expenditure allowances to support the development of active management, to handle increasing two-way power flows and increasing proportions of distributed generation

3. Altering the IFI to raise the level of expenditure on innovation to levels closer to the UK average, and that overall innovation in systems and technologies is significantly increased

4. Widening the scope for innovation in the RPZs (the areas where innovative solutions can be tested) from just connecting distributed generation, to including any innovative means of reducing greenhouse gas emissions. The RPZ rules should be reviewed, as they currently limit the wider deployment of innovative technologies.

A similar package of measures should also be considered as part of the Transmission Price Control Review in order to ensure consistency of treatment for similar generators located in different parts of the UK.

With the incentive at the right level, we believe a greenhouse gas incentive package would:

- encourage transmission and distribution companies to connect low carbon generation (also supported by the 'connect then manage' recommendation)
- stimulate the distribution networks and energy suppliers to encourage decentralised, renewable supply, and offer a fair price for electricity fed back into the grid.

5.2.5 Reducing losses from the electricity network

Electricity is lost as heat or noise and through theft on the networks as it is transported. At present losses from the GB system equate to 7% of electricity generating mix, equal to the yearly generating output of Drax, the UK's largest power station at a capacity of 4GW. Ofgem estimates that 'a reduction in losses from the current level of 7% to 6% might contribute to 4% of the government's target reductions in CO_2 emissions by 2010 which equates to around 0.5MtC'.[40] Overall losses from the system have fallen from 8% in 2000 to the current level of 7%.

International comparison highlights that other European countries have loss levels substantially lower than the UK. In 2000, the level of losses from Finland was 3.7%, Netherlands 4.2%, Belgium 4.8% and Germany 5.1%.[41] Although it should be noted that the geographical differences in these countries may explain some of the difference, it would appear that a goal for the UK of reducing losses to around 4% would be viable. In our view, the UK should be aiming to achieve such a level, which could save up to 1.5MtC, depending on the type of generation displaced.

The level of losses from a network depends on a number of factors; these include the nature of the equipment distributing the electricity (overhead lines, cables, etc); the geographic size of the area covered by the network; the voltage at which the generators are connected, the number of customers and generators connected to the network and the quantity and pattern of electricity distributed by the network. Some would argue that our recommendations to improve access of renewable generators onto the system from remote locations would increase UK losses; however losses from a carbon free source as a result of long distance transmission should be discounted as they do not contribute to increased greenhouse gas emissions.

There are several measures that can be taken to manage losses to an efficient network; they include investment in low loss equipment, more effective network configuration, and management of demand during peak periods.

In the 2005 DPCR, Ofgem introduced a losses incentive of £48/MWh of energy saved to encourage the network operators to invest in new systems and technologies for reducing losses. In its initial consultation on the level of the losses incentive, Ofgem proposed three options:

- improving and increasing the existing losses incentive
- changing the losses incentive to correspond to the system used by National Grid and
- requiring the distribution network operator to purchase electricity to replace that lost from their network.

The incentive adopted by Ofgem, to increase the existing incentive, in the 2005 Review was the weakest of these three options and it has not proved strong enough to make network operators invest in reducing technical losses. Instead the targets are largely being reached through reducing non-technical losses (e.g. improving measurement of losses). While this is useful in itself, there continues to be a need to stimulate investment in low-loss equipment. There are a number of options for stimulating this investment:

- Increase the losses incentive to £82 per MWh (and continue to apply the incentive charge/reward for five years after installation). The aim of this measure would be to strengthen incentives to reduce losses in the short term through 'soft' measures such as managing demand. This level of incentive implies a cost of carbon around £70/tC (2000 prices) and is consistent with the level DNOs suggest would have an impact on losses
- Alternatively, Ofgem could require the DNOs to buy enough electricity in the market to cover the losses on the network. This would be consistent with the way the gas distribution networks have to buy gas to cover shrinkage (which includes losses from the gas network). While the wholesale electricity price will partially incorporate carbon costs through the EU ETS allowance price, the DPCR could include a mechanism to enhance the incentive on DNOs.

5.2.6 Facilitating the development of distributed generation

The strength of the distribution network is critical both for maintaining electricity supplies from centralised electricity generation (but with minimal losses), and supporting a more decentralised electricity network that could cope with increased levels of electricity sold back into the grid from small sources of generation (from community or household level).

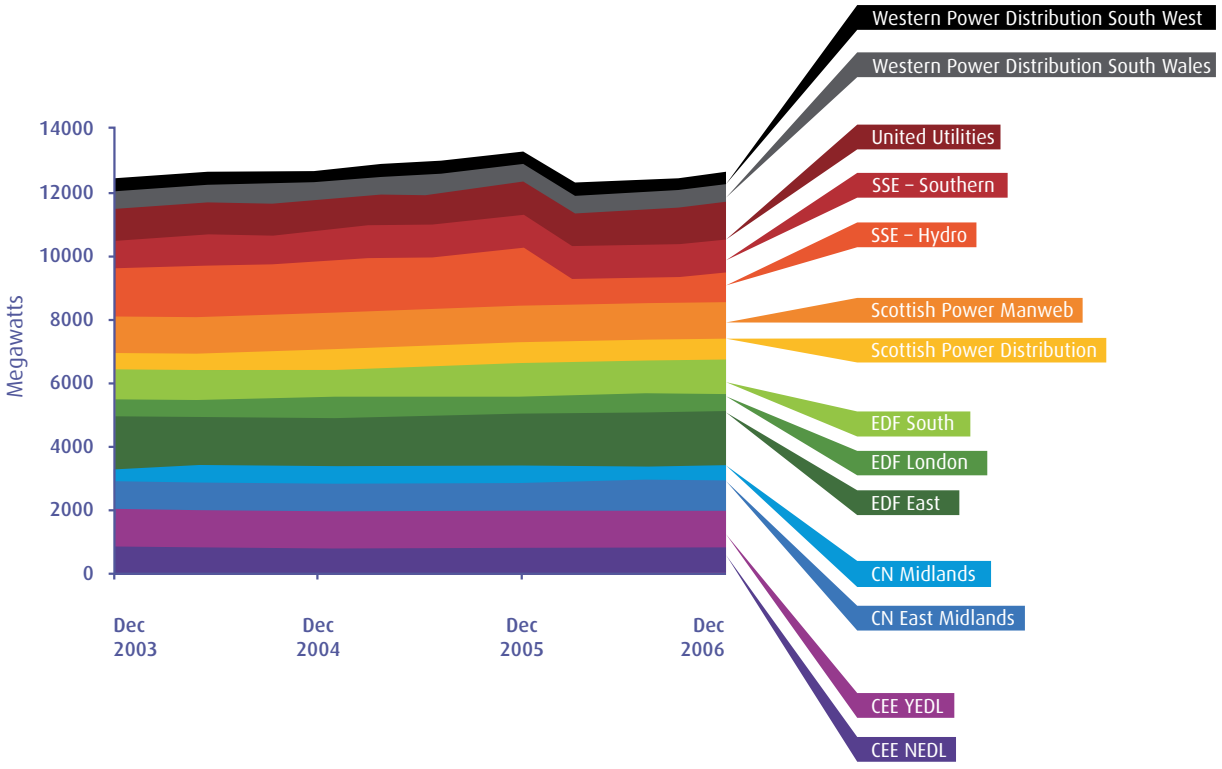
The Energy Networks Association estimate that around 'two thirds of the UK energy network is nearing the end of its design life and will need to be replaced sooner rather than later.'[42] This is particularly critical in the light of the UK's 2050 carbon reduction targets, and the need to move towards complete decarbonisation of electricity supply. The recent EU agreement for 20% of energy supply to be from renewable sources by 2020 puts additional pressure on finding near-term solutions.

The distribution system today is largely passive, transporting energy from the transmission network to the demand source. At present the level of connected local generation (distributed generation) is relatively low at around 12GW, compared to a total generation capacity of around 80GW. Figure 6 shows the amount of DG in each network region, while Figure 7 shows the fuel mix for DG. Increasingly decentralised systems, such as those envisaged in London, and already operational in Woking, Southampton and Leicester, require improved

operation of the distribution systems to cope with the two-way flows of power. At significantly higher penetrations, technical changes to the network will be required. In future, the distribution networks will need to actively manage the flows of energy across the network so as to maximise the contribution that can be made from low carbon distributed generation.

In addition to the need to strengthen the physical infrastructure, there needs to be a significant shift in the regulatory barriers and burdens that confront developers who wish to develop decentralised energy supply. In our view, and in the view of many commentators, the regulatory barriers are significantly slowing down development of decentralised supply, and this is not consistent with Ofgem's own recent shift to support decentralised supply close to demand (for example, the Connection Charging regime). Regulatory barriers and electricity industry issues were identified in the joint DTI/Ofgem Distributed Generation review[43] and we welcome the announcement in the 2007 Energy White Paper that Ofgem and government will consult on more flexible market and licensing arrangements for distributed generation.[44]

Figure 6 Installed Distributed Generation

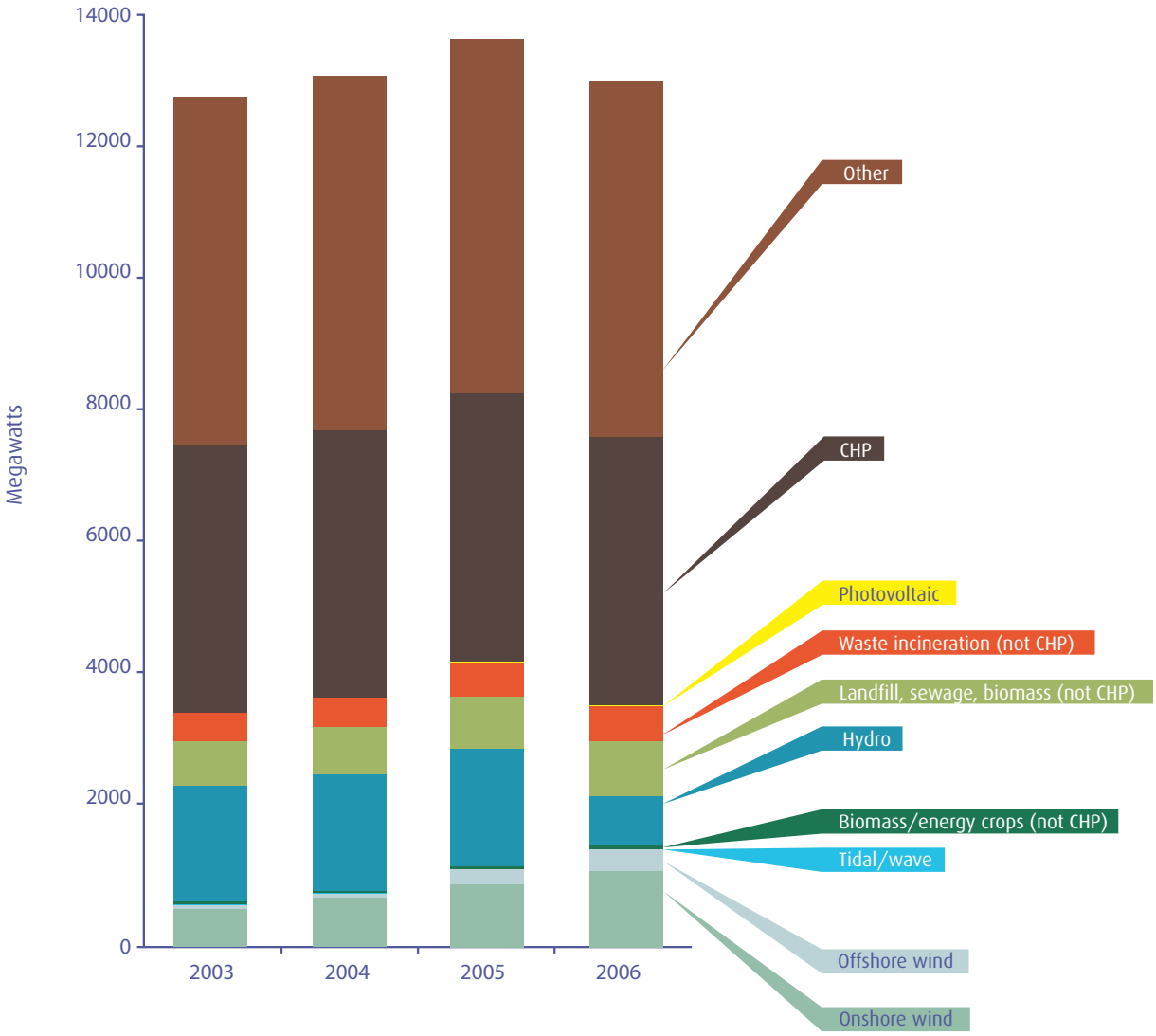


The level of investment in the distribution networks has been approximately £1bn per annum. In the 2005 DPCR, Ofgem allowed a further £5.7bn to be spent between 2005-10. Of this capital expenditure, 35% is for new connections, 15.3% for reinforcement, 17.5% for substations, 11% for overhead lines, 7.5% for underground cables, and 12.8% for other activities.[45] The reliability of the network has improved since privatisation, mirroring the increase in expenditure allowed at each DPCR.

Ofgem has committed to creating scenarios for the development of the networks to aid future investment plans. The scenarios will outline how the networks might deal with different levels of penetration of local and remote generation.

The 2005 DPCR included an incentive to connect DG. At present the DG incentive is set at £2.50 per kWh of DG connected each year. However work done by United Utilities in association with the University of Sussex shows that the level of the incentive may

Figure 7 Distributed Generation by technology 2003-2006 (MW)



Source: Energy Networks Association.

not be strong enough to compensate for the loss of revenue the DNO will face as a result of the loss of through-put on the distribution network. While this work is still at an early stage, it suggests that the DG incentive may not be as effective as it could be because the overall RPI-X framework is so tight. The DG incentive will need to be strengthened if it is to encourage the connection of DG by the DNOs.

Recommendation

- Ofgem should analyse the work being done by United Utilities and the University of Sussex and, if it finds the conclusions to be valid, adjust the DG incentive accordingly.

5.2.7 Amending the Innovation Incentive

Innovation capacity in the industry has been severely affected by the reduction in investment over the past decade.

In the 2005 DPCR, Ofgem introduced an innovation incentive to reverse this trend. The IFI allowed companies to spend 0.5% of turnover (approximately £1-2 million) on innovation over the next five years. In February 2007, this was extended to 2015 to improve longer term certainty. While this is a welcome measure it is worth noting that the level of innovation funding is small compared to levels of innovation spend in other sectors. The low levels

of innovation funding in the sector over the past decade have led to noticeable skill shortages in the industry. The incentive will help to overcome this under-investment, but in our view it is not strong enough to stimulate real change quickly enough.

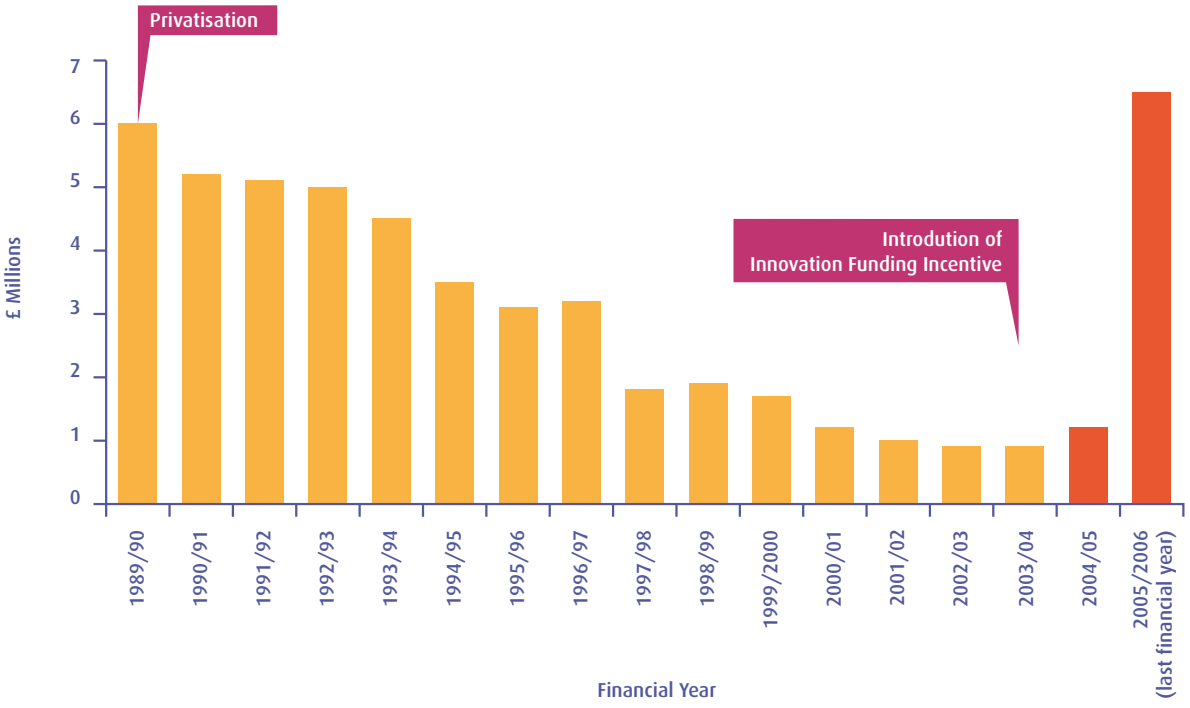
However, innovation is more than just research and development: it is also the commercialisation and deployment of innovative ideas. A recent EU survey of energy R&D projects revealed that 89% of R&D projects delivered new knowledge and patents, but fewer than 15% resulted in commercialisation. This is especially true for regulated industries where there is no consumer pull for innovation (in contrast to the telecoms or pharmaceutical industries). In the light of this, regulators can often take the short term view and consider innovation, with its high failure rate, to be a poor use of consumers' money. We understand that Ofgem is particularly reluctant to 'micro-manage' the network companies, with some in the organisation believing the regulator should not be involved in intervening in this one area of network activity.

5.2.8 Registered Power Zones

To support commercialisation and deployment of innovative ideas, Ofgem created RPZs. The RPZs particularly support the connection of DG, and operators receive a tripled incentive if DG and innovation are combined. However this restriction to DG does not incentivise mass rollout because innovative solutions are rarely ready to be commercially viable, and therefore do not feature in operators' normal operations in the Price Control Reviews. There is a need to maintain support for innovative solutions beyond the initial first demonstration phase.

The 2006 Better Regulation Commission Annual Report[46] highlights the relationship between innovation and regulation. It points out that in many cases poorly considered regulation can stifle innovation as it leads to mandated conformity rather than new ideas. The report recommends simplification of the regulatory regime to enable regulated companies to innovate. It further notes

Figure 8 Distribution company spend on network R&D since 1990



Source: Ofgem

that regulating minimum permitted standards can promote environmental innovation. For Ofgem, this could mean setting a limit on losses from network assets, and implementing incentives that are strong enough to promote innovative new solutions.

Recommendations

- That Ofgem increases innovation funding for the network companies
- That the scope of the innovation funding is broadened to cover any innovative solution that reduces greenhouse gas emissions.

6

Strong society and sustainable economy

How is Ofgem addressing social and economic concerns?

Our recommendation for the framework of energy policy is for a shift from a sole focus on energy supply to one that combines security of supply with demand reduction through an energy service approach. The introduction of a Supplier Obligation in 2012 is the opportunity to effect this transformation. Between now and 2012 there must be increased effort to promote consumer awareness of energy use through improved billing information and the introduction of smart metering.

The Sustainable Consumption Roundtable's report Seeing the Light[47] noted that micro-generation was an effective way of connecting consumers with their energy use and that once installed, micro-generators stimulate a change in consumer behaviour to reduce overall consumption.

A regulatory approach should adapt to the need to curb demand. Competition will not be just for reducing the price of energy in terms of pence per kilowatt hour, but also seen in terms of offers to consumers. A Supplier Obligation modelled on an approach which caps energy sales, as we are suggesting, would be more about the energy services provided to consumers, and not just the unit cost.

Box 6 Decoupling Energy Demand: The California experience

The oil price shocks of the 1970s forced policy-makers to confront the growing levels of energy use in the State of California. They recognised that expecting energy companies to sell less energy to their consumers was counter-intuitive in a capitalist economy. They therefore needed to come up with a policy designed to 'decouple' the financial health of the energy companies from the amount of energy they sold by implementing rigid Price Control Reviews every few years. These Price Control Reviews allow the companies to recover their costs based on a realistic forecast of sales.

The decoupling approach allowed energy companies to be rewarded for investing in energy efficiency improvements and achieving greater resource productivity. But it did not sit well alongside a policy of deregulation designed to promote competition and investment in the energy sector. Some even consider that decoupling was partly responsible for the blackouts in 2001, since retailers were unable to respond to the electricity generation price spikes by raising prices for consumers. While energy retailers in California continue to be tightly regulated, the 'decoupling' approach as such has largely been abandoned.

Since the blackouts in 2001 the State of California has pursued a range of other policies specifically designed to limit demand, increase efficiency and increase the proportion of renewables in the fuel mix. In 2001 the State invested $1 billion to incentivise domestic consumers to replace eight million lightbulbs with compact fluorescents; cities and towns installed LED traffic lights; and factories replaced old motors with new, more efficient ones. The result of the investment programme was a reduction in demand of 5,000 MW in one year, equivalent to the output of five large generating plants and enough to meet the daily demand from Los Angeles.

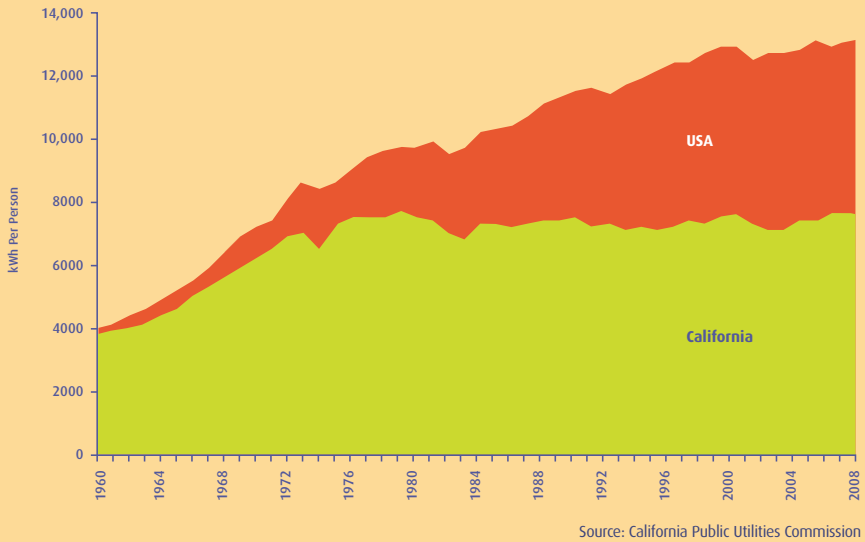
This approach was developed into a long-term state energy policy in 2003. At that time, the State regulator and other institutions jointly introduced the Energy Action Plan (EAP) as the way to implement California's energy policy objectives. The EAP proposes a hierarchy of options for meeting California's energy needs. They are designed to guide agencies' decisions: 'first acquire cost-effective energy efficiency and demand response, followed by distributed generation and renewable resources, and finally, clean fossil fuel power plants'. The three major electricity utilities are authorised to enter into long- and short-term contracts with their electricity customers in line with the EAP hierarchy.

The specific actions within the hierarchy include for example: energy retailers adopting a voluntary dynamic pricing system designed to reduce peak demand by 1,500 to 2,000 megawatts by 2007; providing customer incentives for energy demand reduction; and providing utilities with demand response and energy efficiency investment rewards comparable to the return on investment in new power and transmission projects. These show the paramount importance attached to demand reduction in a State where peak demand is largely driven by air conditioning during the summer, and a quarter of capacity is used for less than 100 hours a year.

Smart meters are being seen as key to demand reduction in California, particularly when combined with financial and environmental incentives for companies, municipalities, hospitals and universities to reduce their demand at peak times. A State-wide trial in 2003/4 aimed to test the advantages for all consumers from the greater freedom that smart metering gives them over their energy usage. The trial found that, where societal benefits were added to the operational benefits, the cost benefit case was positive, even for smaller consumers. Based on these results, the regulator has agreed that by 2011 all commercial and residential consumers will have smart meters installed. They will pay a surcharge of $0.5 – $1 for five years.

As a result, compared with the rest of the United States where energy use and carbon emissions have risen over the period, California has managed to become one of the least energy- and carbon-intensive states. While energy use per person in the US as a whole has increased by 45 per cent over the last 30 years, California's per capita use has remained relatively flat. Gross greenhouse gas emissions in California increased about one per cent from 1990 to 1999. The increase is much lower than for the US as a whole where emissions increased 12 per cent over the same period. California will also establish the first US cap on greenhouse gas emissions in a plan to reduce the State's emissions by 25 per cent by 2020.

Figure 9 Per Capita Electricity Sales



Source: California Public Utilities Commission

Much of the credit for this should go to the California energy regulator which has had a significant and long-term role in the energy market, alongside the Energy Commission, the Consumer Energy Center and the Governor's Office. The regulator has used its legal discretion to interpret its general duties to protect consumers to include the promotion of a sustainable energy policy. The result has been that the regulator has taken an active role in promoting energy efficiency and renewable energy even when this has meant large amounts of consumers' money being spent. This example of joint working shows how different institutions can achieve effective outcomes if their aims and objectives are clearly aligned.

In addition to the change in policy approach that we envisage from 2012 with the Supplier Obligation, there is more that Ofgem could do now to facilitate much greater consumer engagement with the use of energy. As emissions of CO_2 and levels of energy use continue to rise, despite efforts on energy efficiency, there needs to be much greater consumer understanding about energy use, its impacts and ways in which to reduce these impacts. Information is key to building this understanding, and Ofgem's role is important.

In this section we look at the contribution Ofgem could make to help consumers manage their bills:

- the introduction of improved meters, particularly for use with micro-generation
- the different tariffs that exist, and how these could be improved for low-income consumers
- Ofgem's current practice of encouraging supplier switching, as the principal mechanism for consumers to achieve lower energy prices, and whether this is a successful approach.

6.1 Engaging consumers with energy use

There is little prospect of meeting the government's goal of reducing emissions by 60% or more unless consumers take active responsibility for their energy management. Improving people's engagement with their energy use can be done in a number of ways and is critical to influencing behaviour to reduce demand.

6.1.1 Energy bills

The energy bills that consumers receive are an important way of informing households about their energy use. Research by the Environmental Change Institute found that feedback, both direct and indirect, can provide an impetus for reducing energy use. Furthermore, persistent feedback appears to promote persistent reductions in energy use.[48] This research highlighted that consumers were most receptive to the provision of historical analysis on the energy bills with less consumer acceptance for benchmarking consumption against other households.

Research carried out in Stavanger in Norway studied the effects of requiring households to send their electricity and meter readings to their utility company regularly in return for a very comprehensive bill which was easy to understand. Three years after the trial started the households in the study were consuming eight per cent less electricity than the general population.[49]

Estimated bills

At present, one in three energy bills provided to domestic consumers are estimated.[50] Estimated bills are in integral part of the industry's billing practices. However, the benefits of providing historical information are undermined given that estimated bills are themselves based on historical consumption information, which may also be estimated. It is therefore unlikely that bar charts based on estimated bills will show any change in the level of consumption over the previous year, undermining the impact of energy efficiency messages.

Even where the bill is based on an accurate meter reading, the information is provided in terms of kilowatt hours, for both electricity and gas. This is a unit that is not readily understood by to most consumers.[51]

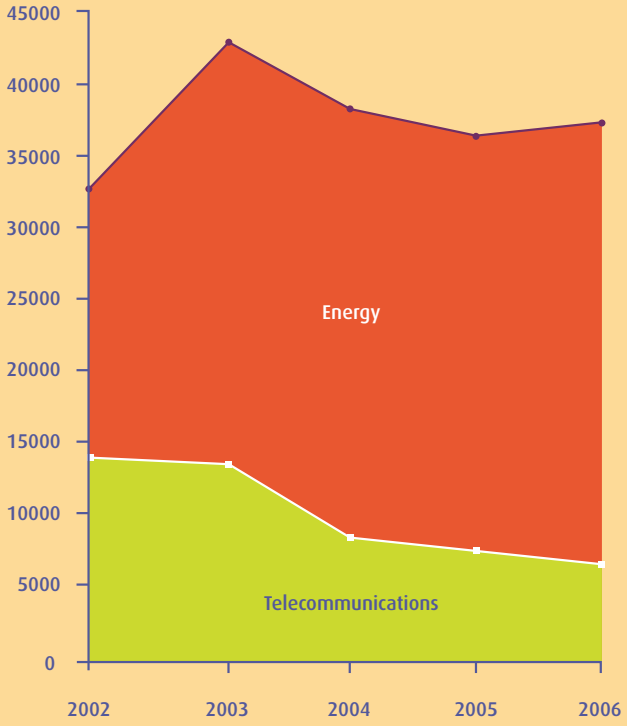
A standard billing format could allow consumers more easily to compare the products on offer from supplier companies, and increase the level of switching in the market.

Box 7 Billing super-complaint

In 2005 Energywatch made a super-complaint to Ofgem on the energy market's standard of billing, stating that Energywatch receives around 70,000 complaints and enquiries relating to billing and account management each year. However, it should be borne in mind that many consumers may not be aware of the existence of Energywatch, so do not make a complaint and in addition, many consumers may be prepared to tolerate a fairly high level of dissatisfaction before making a complaint to Energywatch. In the super-complaint, Energywatch indicated that approximately one-third of customers contact their supplier to query their bill or account every quarter.

Ofgem note that of the 200 million bills sent out each year the number of complaints to Energywatch is equivalent to a monthly average of 0.07 per 1000 consumers. However, this is six times the rate of complaints about domestic telephone lines, and is rising, whereas in the telecommunications sector rates of complaint are stable. In the water sector, the Consumer Council for Water received 6704 complaints about metering and billing from consumers in England and Wales in 2006/07.[52]

Figure 10 Complaints relating to billing practices in the telecommunications and energy markets



In response to the billing super-complaint, Ofgem asked suppliers to establish and finance an independent dispute resolution body, the 'billing ombudsman', to revolve any billing complaints that could not be resolved with the supplier. Ofgem also requires suppliers, from July 2007, to stop seeking payment from customers where a supplier has failed to bill for over 12 months.

The Energy Retail Association (ERA) agreed to draw up a billing code of conduct with industry participants. However, the Office of Fair Trading's (OFT) code of conduct accreditation committee rejected the billing code on the grounds that the current arrangements for billing were not sufficiently consumer facing.

Evidence from Sweden[53] suggests that by mandating accurate monthly bills the business case for supply companies installing smart meters becomes positive and has resulted in a mass rollout of smart meters. The Energy Review concluded that the provision of historic information alone could save 0.1MtC/yr by 2020.

Improvements to industry practice for metering and billing opens up the potential for a range of new technological advancements which could simultaneously work to achieve both social and environmental objectives. Smart metering could lead to developments in a number of areas, including:

- Micro-generation - more accurate calculation of exported electricity could improve the business case for micro-generation technologies
- Time of day tariffs – meters that are capable of recognising energy demand at different times of the day could lead to innovative tariff structures that reward consumers for using energy during off peak periods, thus reducing demand and greenhouse gas emissions during peak periods. Such tariffs would be an extension of the already existing economy 7 tariffs, which require a different meter at present
- Dynamic demand appliances – household appliances could be fitted with devices that communicate with the meter to reduce demand at various points in the day; such devices would tie in with time of day tariffs.

The combination of smart metering with more active management of the networks could ultimately result in a more information rich energy system that could match the characteristics of different types of generation with different consumer demand profiles.

Options for change

Ofgem could address these issues in the short term by working with the Energy Retail Association to include energy efficiency information in the revised Code of Practice for Accurate Bills. The revised Code could then apply to all consumers (domestic, commercial and industrial) not subject to half hourly metering. However, the revised code of practice is likely to remain a voluntary agreement. In the longer term, Ofgem could mandate suppliers to take action by amending the electricity and gas supply licences to incorporate improved billing, should the metering and billing trials provide evidence to support such an intervention.

Changes to the supply licences could follow a similar theme to EEC and the proposed cap and trade scheme. Ofgem could set minimum standards and suppliers could then be encouraged to come up with innovative ways of presenting the information. This link could be taken a step further by allowing suppliers to claim EEC credits if the information meets Ofgem's minimum standards. Ultimately, if a cap and trade scheme is implemented it will be in the suppliers' interests to encourage consumers to manage their own demand.

The minimum standard for bills could include the following features:

- Accurate monthly bills so customers receive regular feedback regarding their energy use and see evidence of the reduction in energy usage following the implementation of energy efficiency measures
- A graphical comparison between current and historic gas and electricity use in that dwelling.
- Fuel source disclosure on a tariff basis so that customers receive an accurate picture of the environmental impact of their energy use.

6.1.2 Smart meters

The EU Energy End Use Efficiency and Energy Services Directive (2006/32/EC) (also known as the Energy Services Directive) requires the installation of new and replacement meters which measure the actual time of use, subject to financial and technical feasibility, and for energy suppliers to provide accurate bills that enable customers to make informed choices about energy use. In addition, the mass installations of more innovative meters in countries such as Italy, Sweden, USA, Canada and Australia have highlighted what could be achieved in the UK if a similar installation scheme were introduced. In recognition of the Energy Services Directive, the government announced in the Energy White Paper 2007 a commitment to require supply companies to provide real time displays to consumers on demand from January 2008.

Whilst these are not smart meters and therefore do not allow for the innovative solutions described above, there is evidence to suggest that they could help change consumer behaviour and ultimately lead to a reduction in energy use. It is also worth noting that there can be innovative ways of keeping energy users informed of their current energy usage, by techniques such as a continuous information point on an individual's computer. Improvements in information technology should be creatively linked to metering.

The need for accurate usage information should be seen in conjunction with the rising profile of the role that micro-generation can play in delivering a more secure and sustainable energy system. In addition rising household energy bills have made the issue of metering and billing very important.

Ofgem's work

Ofgem is working with government to trial innovative billing and metering arrangements. These trials, which have only recently started, should conclude in 2009 and will provide important UK-specific evidence on the impact better billing and metering could have. As part of this process Ofgem has consulted on the benefits of smart metering.

The Climate Change and Sustainable Energy Act 2005 placed an obligation on supply companies to provide tariffs to micro-generators for the sale of exported electricity. Supply companies have until 2008 to provide these tariffs; however, should they be inadequate Ofgem and the government will intervene. In addition, Ofgem could help to reduce the number of estimated bills sent to consumers, and thus be more actively engaged with energy use. Ofgem's consultation on smart metering outlined the potential for metering innovation to overcome this barrier.

Ofgem noted that there were four types of smart meter

- Automated Meter Reading (AMR) allows for one way communication with the meter. This means that the meter can be read remotely, which allows the supplier to provide bills based on actual rather than estimated readings
- Automated Meter Management (AMM) allows for two way communication meaning that the supply company would not only be able to read the meter remotely, but also change energy prices and tariffs without the need to visit the customers home to manually re-set the meter
- Interval metering with AMM which allows for two way communication but also records more information on energy use, e.g. on a half-hourly basis. This information would allow supply companies to offer time-of-day tariffs where consumers could use energy outside peak time. This would also allow energy using appliances to include dynamic demand controls which would activate household appliances during low cost periods
- Pre-payment meters (PPM) could include better information and displays to allow consumers to budget for their energy use.

The potential for smart metering to improve the level of consumer engagement with the energy system is immense. Ofgem concludes that smart meters could cost between £30 to £150, depending on the type of meter, which covers the costs of the meter, installation, (potential) stranding and the systems costs necessary to retrieve and process the data from the meters.

However, many industry participants have commented that the decision to promote competition in the metering market has led to a very complex set of arrangements with numerous industry participants involved in the innovation process. One Chief Executive Officer stated that the decision to promote competition in metering was 'competition for competition's sake'. The market may well arrive at smart metering solutions but over a longer time frame than if metering was the responsibility of network operators. Competition in metering was introduced in 2003 so it is too early to tell if competition in the metering markets will be a success, but Ofgem needs to ensure that the arrangements will result in a swift uptake of smart meters should the trials support a policy intervention in this area.

The innovations in metering technology could allow for innovation in customer bills and, ultimately improvements in the quality of information provided. Research carried out for Ofgem by the

Centre for Sustainable Energy (CSE)[54] found that there was a high degree of acceptance for including historical consumption information on bills which resulted in changing consumption patterns. The research also showed a lower level of acceptance for other forms of benchmarking, for example against neighbours' consumption levels. Metering of water use is also gradually increasing, and there could be opportunities for multi-metering to cover all utilities.

Recommendation

- We recommend that Ofgem responds rapidly once the billing and metering trials are complete though a combination of improving the frequency and accuracy of bills and a roll-out of smart meters

6.1.3 Microgeneration

The Sustainable Consumption Roundtable found that Consumers who generate their own electricity and heat with micro-generation are noticeably better engaged with broader energy management and other environmental issues.[55] It seems that micro-generation provides a tangible hook to engage householders with the issue of energy use. At present, the percentage of the total generating mix that is supplied by micro-generation is less than 1%.

There are noticeable barriers to increasing the level of penetration of micro-generation technologies. These are:

- Overall project costs, including the costs associated with the technology purchase, metering and operation
- The difficulty of selling surplus generation to the grid, as main suppliers do not offer export tariffs and those that do often charge a higher price for electricity purchased
- The complexity of claiming Renewable Obligation Certificates (ROCs) and the delay in receiving payment for ROCs
- Perception and awareness of the technologies and what benefits can be achieved
- Practical issues such as planning permission, although government is now proposing to tackle this through the new Planning White Paper.

Ofgem is already undertaking work announced by the Chancellor in the 2007 Budget to look at whether microgenerators receive a fair reward for energy exports. Other measures, beyond the price received for exported electricity, may also be important in supporting the development of microgeneration.

Options for further Ofgem work:

- In some instances it may be more cost effective to install micro-generation than to extend the distribution network. Network extension options could be an opportunity for micro-generation companies to offer an alternative service
- A stronger Losses Incentive could incentivise the DNOs to offer lower connection tariffs to consumers with micro-generation.

6.2 Improved Tariff Structures

Since privatisation of the energy markets, consumers have had more choice over their supplier, tariff and payment options. Consumers can now choose different types of tariff such as green tariffs, dual fuel tariffs and economy 7 tariffs as well as different payment options such as standard credit, direct debit and pre-payment. Consumers can also opt to pay their bills monthly, quarterly or biannually.

Green Tariffs

Research by Powergen[56] and the National Consumer Council[57] shows considerable support for 'green' sources of energy, but not necessarily a willingness to pay a premium for it. To date only 200,000 customers have switched to a green tariff.[58] The 2006 NCC report found that 'many green tariffs are not delivering the environmental benefits they claim. As a result consumers may not be making the positive contribution they think they are.' Independent accreditation of green tariffs is a pre-requisite if consumers are to be confident that they are making a genuine contribution to reducing emissions.

Green electricity tariffs vary between suppliers but typically fall into three main categories:

- Green electricity supply tariff, where the supplier guarantees that the electricity it sells is from renewable sources
- Green energy fund tariff, where the supplier invests the premium paid by consumers into new renewable or environmental projects
- A carbon offset tariff, where suppliers offer to offset the CO_2 emitted by the consumers by planting trees or investing in other CO_2 reducing projects.

Ofgem set out guidance on green tariffs in 2002[59] and is currently reviewing it prior to issuing renewed guidance later in 2007.[60] Ofgem is working with the Energy Saving Trust on a rating system for green tariffs which is currently out to consultation.

Options for action by Ofgem:

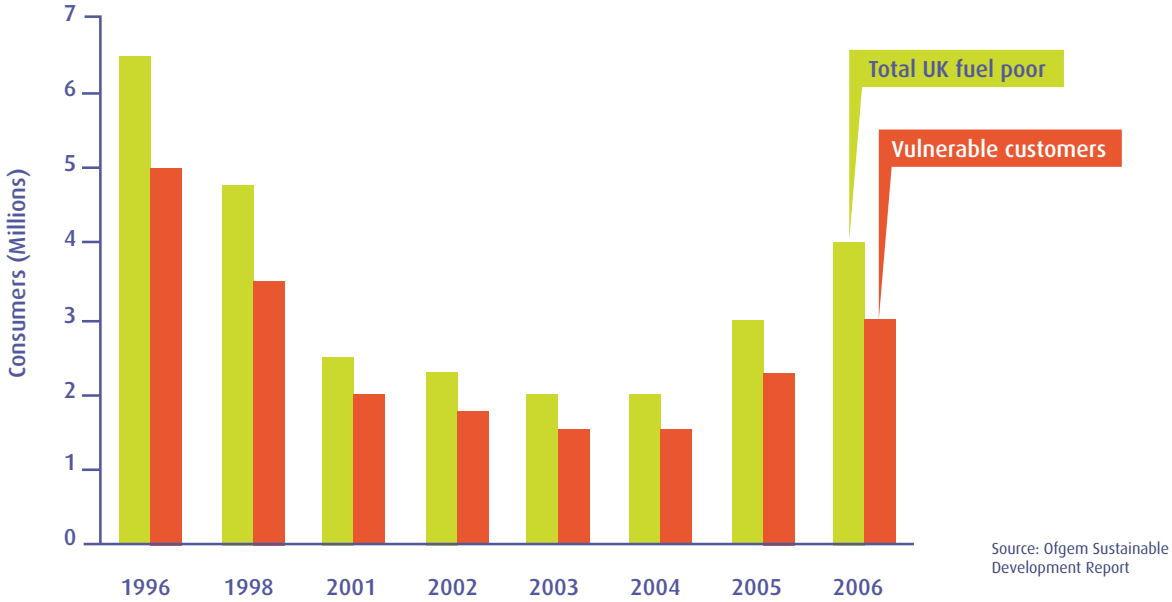
- Ofgem could amend the supply licence so that suppliers are mandated to sign up to the green supply guidelines (i.e. they effectively become regulations rather than guidelines) if they wish to offer green tariffs.

- Ofgem could also oblige electricity suppliers offering green tariffs to:
  - Produce an individual fuel mix disclosure chart for each of their green tariffs set within the context of their overall generation mix
  - Calculate the declared amount of CO_2 reduction that will be achieved from swapping to a green tariff from a conventional variety
  - Have their green tariffs independently audited each year against a benchmark set by Ofgem. This is a low cost measure that will provide a level of confidence for the consumers.

6.3 Improved treatment of low income and vulnerable customers

A fuel poor household is one that spends more than 10% of income on energy bills. The UK Government and the DAs have stated their commitment to end the problem of fuel poverty. In England, the target is to seek an end to fuel poverty for vulnerable households by 2010 and an end to fuel poverty altogether by 2016. In Scotland, the overall objective is to ensure an end to fuel poverty by 2016, whilst in Wales the target date is 2018.

Figure 11 Total number of fuel poor and vulnerable customers



Source: Ofgem Sustainable Development Report

Ofgem has a duty to protect the interests of individuals who are disabled, or chronically sick, of pensionable age, with low incomes, or residing in rural areas. It should be noted that the terms low-income consumers and fuel poor consumers cannot be used interchangeably. The low-income group is rather broader but does encompass the fuel poor and Ofgem may have regard to other descriptions of consumers outside of those expressed in its duties.

As Figure 11 shows, the number of people in fuel poverty has increased over the last three years. The Fuel Poverty Advisory Group (FPAG) 5th annual report highlights that energy prices rose 50% between 2004 and 2006[61] and the graph above shows that this increase in prices pushed two million consumers into fuel poverty.[62] Action taken to raise income levels and energy efficiency measures installed in housing, have reduced this figure by 0.3 million. However, FPAG projects that by the end of 2007, 2.5 millions households will be in fuel poverty in England, twice as many as in 2004, largely as a result of increased retail prices for energy.

6.3.1 How is fuel poverty being combated?

Currently, fuel poverty initiatives are focused on three areas:

- raising household income levels. Government provides income support through provisions such as tax credits, pension credits and Winter Fuel Payments to assist low income households
- improving the energy efficiency of the home to reduce energy demand, and
- reducing energy prices.

Energy efficiency measures are installed through two programmes: the EEC and government's Warm Front programme (and Warm Deal in Scotland, Warm Homes in Wales) provide energy efficiency measures and heating to those on low incomes, with expenditure exceeding £600 million between 2005-2008. EEC programmes include a provision for 50% of effort to be targeted to the 'priority group' of low income consumers, who receive energy efficiency measures from their supply companies. Ofgem, in administering EEC, contributes to the success of this mechanism, although the policy is developed by government.

A third means of combating fuel poverty is by focussing on the price of energy paid by low income and vulnerable consumers. The downward pressure on prices through competition and Ofgem's role in maintaining this has benefited low income and vulnerable consumers, as has the availability of different payment options. Energy supply companies' social responsibility schemes are also becoming increasingly important.

6.3.2 How should fuel poverty be combated?

Over the short to medium term the existing fuel poverty measures are aimed in the right direction, with a focus on income, energy efficiency and price. As the FPAG report suggests there is potential for fuel poverty benefits to be achieved by increasing the level of funding to fuel poverty schemes such as EEC and Warm Front. Evidence from Northern Ireland suggests that smart meters could also play a role.

In the short-term, an examination of the energy tariffs for low income customers would be welcome. In the longer term, a more sustainable solution would be to protect vulnerable customers from prices rises by reducing their demand. This could be done by installing energy efficiency measures and through micro-generation (or community scale) technologies in buildings.

Box 8 Keypad meters: the experience in Northern Ireland

During the 1980s the pre-payment metering stock in Northern Ireland was largely based on coin meters but had gradually changed to card meters by the start of 1990. Several problems persisted with pre-payment despite the change to card meters. These were:

- the stigma for low income families being on pre-payment meters
- the annual meter charge
- costs to NIE of tracking and reconciling usage and statements
- the costs to NIE of servicing the meters
- high levels of fraud
- high levels of complaints arising from prepayment meters.

These problems led to a trial in 1998 of new pay-as-you-go technology developed by PRI and used extensively in Soweto in South Africa. Customers pre-pay for electricity using a card. Each time they pre-pay they receive a dedicated code which they key into their meter. The code will not work in any other meter. First, customer acceptance was tested in focus groups. Then the keypad meters themselves were tested in 200 homes. The research and the trials were very successful. This pilot study showed a reduction in electricity demand of 11 per cent compared with homes without keypad meters

As a result Northern Ireland Electricity (NIE) and the energy regulator for Northern Ireland agreed in 1999 that keypad meters should be introduced into Northern Ireland, initially with the aim of replacing all existing pre-payment metering stock. Although keypad meters are capable of two-way communication, the model chosen had lower technical specifications. Each meter cost around £40, more than the existing card meters which cost around £35 and considerably more than the standard credit meters which cost only around £10. Northern Ireland Electricity was allowed through its price control agreement to pass through to its customer base half of the up-front costs of the keypad meters. Subsequently the regulator agreed that up to 200,000 keypad meters could be introduced.

The benefits for customers from keypad meters can be summed up as follows:

- electricity at a discount of 2.5 per cent compared with standard credit
- free installation
- easy-to-read real time and historical usage displays allow for reduced consumption
- no self-disconnection at nights, weekends and fixed bank holidays
- no bills
- no lost tokens
- vending options between £2 and £175
- large choice of vending outlets and 24/7 telephone vending facility
- option to pay by cash or debit card
- cheaper electricity tariffs at off-peak times of the day (for Powershift or Economy 7 tariff options).

The success of keypad meters has been phenomenal. To date, 192,250 homes have a keypad meter installed, or over a quarter of all homes in Northern Ireland. Demand has been driven by word of mouth. This level of uptake has extended well beyond the original prepayment base, with

demand for pay-as-you-go proving very strong among households on standard credit. Consumer satisfaction surveys consistently show high levels of satisfaction.

There have been several attempts to measure the actual reduction in electricity demand as a result of keypad meters. Since households are paying for the electricity in advance, they are giving greater thought as to how much electricity they will need to use; and since regular small top-ups are being made to the credit, consumers will be observing more closely how much electricity they are actually using. The meter also provides both real time and historical usage information.

In 2003, NIE carried out an in-depth investigation of a random sample of some 30 households that were formerly standard credit customers and had had a keypad meter for at least a year. Their consumption history for the year before and after the installation showed a reduction in electricity demand in real terms of 4 per cent. This was lower than the 11 per cent reduction suggested by the trial during the pilot phase, but was a more rigorous and long-term investigation. It remains important to understand whether initial reductions in electricity demand are sustained over longer periods, and NIE are carrying out further work on this during the next few months.

In 2005, NIE looked at how households with keypad meters reacted to a 'time of day' tariff that offered them low, medium and high priced electricity at different times of the day. A random sample of 200 households was selected. 100 households were provided with the 'time of day' tariff, while the other 100 were the control group. Over half of the households surveyed reduced their electricity demand at peak times thereby making financial savings of 0 – 3 per cent, while one fifth of the households made financial savings of 5 – 10 per cent. Further analysis showed that these households typically were made up of 2 to 4 people living in a detached house. Overall, the trial showed a perceptible reduction in demand at peak times of 1.7 MW when extrapolated, and household savings of £0.5 million over a year. The trial did not find evidence of overall electricity demand reductions.

As a result of the trial NIE introduced the 'time of day tariff' to certain households in 2005. They now plan a major trial with the University of Ulster to test the potential of a combination of keypad meters and energy saving advice to reduce electricity demand more rigorously. The trial will run over the next two years, with results available in 2009.

6.3.3 What has Ofgem done to protect the interests of low income and vulnerable consumers?

In 1999, Ofgem included provisions in supply licences requiring supply companies to offer a range of payment methods and stipulating the amount that companies could recoup from consumers in repayment of debt. Around this time Ofgem also facilitated the establishment of the Priority Service Register (PSR) which requires supply companies to provide additional support to vulnerable households through, for example, better location of meters (so use is more apparent) or provisions to send bills to other family members. These provisions also require supply companies to install a pre-payment meter before disconnecting a consumer. Ofgem has agreed to keep these social provisions in the most recent review of supply licences.

Ofgem has focused on reducing the cost of energy for vulnerable consumers by promoting competition. Part of this approach involves informing low income consumers of the benefits of switching through the EnergySmart campaign but has also included research to investigate consumer attitudes to prepayment meters. Another strand to the strategy promotes corporate social responsibility between energy suppliers. To date supply companies have spent around £110 million on CSR related schemes.

6.3.4 What more could Ofgem do to protect the low income and vulnerable consumers?

Customers who are offered pre-payment meters as an alternative to disconnection face higher energy costs as a result. The FPAG noted that the difference in annual cost between consumers on pre-payment meters and direct debit was as much as £120 in 2006, up from £70 in 2004 as shown in the table 1.[63]

Table 1: Difference between average direct debit (DD) and pre-payment (PP) tariffs

	England and Wales			Scotland		
	Gap between DD and PP prices			Gap between DD and PP prices		
	Electricity	Gas	Electricity & Gas	Electricity	Gas	Electricity & Gas
2000	29	47	76	21	48	69
2001	27	43	70	21	45	66
2002	27	46	73	21	48	69
2003	26	44	70	21	44	65
2004	28	42	70	26	46	72
2005	36	48	84	23	53	76
2006	46	74	120	48	83	131

Source: BERR, Quarterly Energy Prices, June 2007

This shows that, at a time of generally rising fuel prices, customers on pre-payment meters have been burdened with even greater price rises than customers in general. This is despite the fact that the difference in cost to suppliers of servicing pre-payment meters compared to standard meters has not changed.

The average figures though mask significant in performance between suppliers, as illustrated in the table 2.

Table 2: Difference between tariffs for different payment methods by supplier

	Gas			Electricity		
Supplier	**Prepayment bill**	**% difference to standard credit**	**% difference to direct debit**	**Prepayment bill**	**% difference to standard credit**	**% difference to direct debit**
British Gas	£636	8.5	21.1	£399	4.5	9.6
EDFE	£650	1.4	4.2	£357	0.0	2.3
npower	£582	9.4	13.9	£435	15.7	22.5
Powergen	£615	13.7	17.4	£384	3.2	6.4
Scottish Power	£629	1.1	6.4	£379	0.0	14.2
SSE	£578	8.4	15.4	£355	0.0	6.3
Average across GB	**£615**	**6.8**	**12.6**	**£385**	**4.0**	**10.2**

Source: Energywatch

However, switching rates among pre-payment meter customers are lower than average due to a lack of awareness and limited availability of switching services (e.g. access to internet-based comparison services). Relying on competition may not be the most appropriate way of reducing energy costs for this group of consumers. Some customers may prefer to remain on pre-payment meters as standard credit or direct debit arrangements may not be suitable for their needs. Alternate methods of payment, including more flexible direct debit arrangements (e.g. weekly payment) and post-office deductions, could make cheap tariffs more accessible.

Ofgem's supplier switching policy

Ofgem has consistently promoted switching energy suppliers to consumers as the most effective means of reducing overall energy bills. However research by the National Consumer Council both found that only around 20% of consumers actually seek out ways of reducing their energy bills,[66] and over 50% of energy consumers have remained with their incumbent supplier since privatisation. The level of switching was stimulated by the rise in energy prices in 2006.[67]

Ofgem's sustainable development report highlights that switching between suppliers is at a lower level among consumers in lower income deciles, and some commentators have argued that this is partly as a result of limited access to internet based price comparators, which allow consumers to more easily compare tariffs and suppliers.

The lack of switching amongst lower income deciles means that many fuel poor and vulnerable households are not able to achieve any cost reductions that might be available through supplier switching. In addition, the lack of understandable information given to households relating to energy consumption is under-utilising this means of reducing household fuel bills.

Energywatch noted in its super-complaint to Ofgem on the standard of billing (see above under Metering) that almost one in ten complainants believed that estimated billing had pushed them into debt with their supplier, and for a third of those, the debt exceeded £100. For one in four, the debt was difficult or impossible to pay off.[66]

Our conclusion from this evidence is that supplier switching is not a particularly helpful or appropriate method of reducing low-income household fuel bills and that more proactive steps need to be taken to protect low income and vulnerable consumers.

Recommendations

- Ofgem should mandate that pre-payment meters are smart meters capable of two way communication which would allow for tariffs changes to be adjusted instantaneously and could give consumers a better understanding of their energy use which could help reduce overall energy consumption and energy bills
- Greater focus should be placed on a wider range of payment options, including using post-office deductions and fuel direct services as a means of paying outstanding fuel bills
- Ofgem to require energy companies to provide energy tariffs for pre-payment meters that are not excessive in comparison to direct debit and standard credit tariffs
- Ofgem's Consumer First campaign has already revealed a level of concern amongst consumers on the amount of profit gained by energy supply companies. Ofgem should ensure that wholesale price changes are being passed on to all consumers, especially low income and vulnerable consumers.

7

Conclusions

Our review of the role of Ofgem and its impact on achieving a sustainable energy system has revealed a number of key opportunities for government to achieve a significant shift in its efforts to reduce UK carbon emissions through electricity and heat generation, transmission, distribution and use. We believe the next few years are critical for ensuring the infrastructure is put into place to support progressive decarbonisation of the energy system. Without investment, such infrastructure will not be established, and without the right regulatory framework such investment will not be encouraged.

In our view, the regulatory framework provided by Ofgem requires significant change, and our conclusion is that this can most effectively be achieved through a change to Ofgem's primary duty. Changing the primary duty to stimulate Ofgem to integrate greenhouse gas emission reductions into its business would provide a clear and stable framework within which all energy generators, suppliers and network operators would operate. We believe such a change would secure greater consistency in the delivery of government energy policy, and would alleviate the tensions that exist between Ofgem's current approach of strengthening competition, and government's climate change goals.

Our detailed recommendations on improvements to be made to the operation of the energy markets and networks, through the Price Control Reviews, align closely with our recommendation on the primary duty change. Similarly, we believe that our recommendations on the cultural and practical changes required within Ofgem as an institution, align closely to a change to the primary duty. Ofgem is a highly efficient institution for delivering against its existing goals, but these goals are not compatible with the scale of change that is required to meet government's environmental goals.

We recognise that Ofgem has made progress in supporting low income energy consumers, but we believe there is more that can be done. In particular we believe Ofgem should require energy companies to provide energy tariffs for pre-payment meters that are not excessive compared with the tariff for users on direct debit or standard credit. For all energy users information on how much energy is used, in an understandable format, is a basic requirement if we are to encourage people to engage with their energy use and reduce their demand. Current practices with metering and bill information do not support improved consumer information. Ofgem could make changes to tackle this.

The next few years are critical for setting the UK on a path to a low carbon economy, and it will require changes in policy, regulation and practice. As the principal regulator of the energy system, Ofgem has a key role in ensuring that the UK's energy sector makes the investment necessary to equip us with a system suitable for the challenges of the 21st century.

Appendix: Implications for Scotland

Introduction

Regulation of the gas and electricity networks is a reserved power, so this Review has focused on the role of Ofgem and its relationship with the UK Government. However, in Scotland a number of devolved powers relate to energy, so the findings of this Review are likely to have significant impact on the Scottish Government's delivery of its energy related functions. This Appendix provides more clarity on how our findings also relate to devolved powers in Scotland.

Energy is a reserved matter, but the Scottish Parliament and Government have significant devolved powers relating to renewable energy, energy efficiency and climate change, and the way in which the energy market is regulated will therefore influence how Scotland delivers its energy policy goals.

Over the previous two administrations, the Scottish Government has been very active in energy efficiency and renewable energy work, and with the new Government now in place this work will certainly continue and may increase in priority.

Energy is a key issue for Scotland. The energy industry makes a significant contribution to the economy. The bulk of this has been in oil and gas, but the electricity market is also important and Scotland remains a net exporter of electricity. Scotland has also set more ambitious targets on renewable electricity generation than the UK as a whole. As is the case across the rest of the UK, climate change is an increasingly important focus of government policy and Scotland has significant long-standing fuel poverty problems.

Devolution

Energy policy is a reserved matter, but importantly the Scottish Government has devolved powers[65] on:

- promotion of renewable energy and energy efficiency
- consents for new electricity generating plant and transmission lines
- planning and building regulations
- economic development
- environmental regulation
- climate change
- fuel poverty
- transport
- related research and development.

Key issues for Scotland

Of particular relevance to Scotland are the following conclusions of our Review:

- The electricity trading arrangements (BETTA) penalise intermittent and small-scale energy generation
- Capacity constraints are delaying the connection of renewable generation; this is particularly acute in the northern England/Scotland area where the Beauly–Denny line has been awaiting planning permission for some time, and where decisions on undergrounding of transmission lines are particularly important
- The Connection and Use of System Charging arrangements penalise generators located at points distant from the major sources of demand in the south east of England
- Heat as a commodity is unregulated. We believe that it should be treated in parallel with electricity, so that the relationship between heat and power, the use of waste heat from industrial sources, and the drive to eliminate wasted heat from buildings, is integrated
- A more radical and systematic drive to improve efficiency in our use of heat in buildings, and to decarbonise the supply of heat, will be needed to ensure Scotland meets its carbon emission reduction goals in the medium and longer term.

Decarbonising our economy

The Scottish Government has announced its intention to bring forward a Scottish Climate Change Bill setting targets to reduce greenhouse gas emissions by 80% by 2050. This challenging target will require major changes in the generation and use of energy.

Our Review has concluded that Ofgem's process for integrating carbon impacts into policy development is flawed. Ofgem systematically undervalues the social cost of carbon in its cost benefit analysis. We have recommended that Ofgem 'aligns with government practice and revises its social cost of carbon, as used in cost benefit analysis' and also that its primary duty is changed to give better alignment to government energy policy. This will also provide clearer alignment with Scottish Government policy on climate change and carbon related emissions.

It is our view that these changes will ensure more coordinated delivery of energy policy and that the regulatory framework will therefore reflect the importance being placed on carbon reductions by government.

Promotion of renewable energy

Scotland has a significant renewables resource, and has been making a considerable contribution towards wider UK renewable targets. The UK target for renewable electricity is 10% by 2010. In contrast the Scottish target is 18%. The UK has set a 20% target for 2020, whereas the previous administration in Scotland set a 40% target for 2020.

The new Scottish Government has committed to developing an energy strategy for Scotland. Details of this have yet to emerge, but it is expected that the new government will retain targets at least as high as those of the previous administration. Relevant energy generation priorities set out in the Scottish National Party 2007 electoral manifesto were to:

- take forward proposals for a North Sea super-grid
- continue investment in offshore renewables and look to extend available support.

Given our findings on capacity constraints and Connection and Use of System Charges that penalise more remote sources of generation, we would expect that our recommendations, if followed through, would assist the new Scottish Government in both these areas. Development of long distance grid networks would be expensive under the current framework, and offshore renewable resources will tend to connect in more peripheral locations where transmission charges are currently highest.

Promotion of energy efficiency

The Scottish Government has a wide range of initiatives designed to support an increase in energy efficiency in Scotland. In early 2007 it released a draft Energy Efficiency & Microgeneration Strategy for consultation. It is not yet clear how the new government will take forward action on energy efficiency and microgeneration. However, it is clear that Scotland has a significant problem with energy inefficiency and fuel poverty.

The new Administration made a number of relevant commitments in its 2007 election manifesto, including to:

- Convene an expert group to make recommendations on changes to building regulations to increase energy efficiency and encourage more local energy production
- Consult on the introduction of a planning presumption requiring all new buildings in Scotland to include sufficient renewable generation on-site to deliver between 20% and 50% of energy needs
- Consult on setting a new guideline for energy saving in new buildings with the aim of reducing their energy footprint by between 20% and 33%.

Our Review has highlighted that Ofgem has successfully delivered energy efficiency programmes for government, but could do more to support provision of accurate billing that would help keep consumers better informed of their household energy use.

Our conclusion that Ofgem should regulate not only gas and electricity but also the wider heat market would support any move in Scotland towards decentralised energy. One way to deliver increased efficiency in our system would be to support

combined heat and power systems, both at the large and small scale. Combined heat and power is particularly suited to more localised forms of generation so could play a major role in delivering on-site energy solutions.

Conclusions

Energy is an important policy area for Scotland, and the findings of our Review are likely to have a significant impact on the Scottish Government's delivery of its energy policy goals and any emerging Strategy, for both generation and efficiency.

Scotland's generation and supply businesses have been subject to significant changes over the last few years due to the introduction of BETTA. It is clear that if Scotland is to press on with the delivery of carbon reductions in its energy system then the regulatory regime needs to be reformed, so that carbon considerations play a larger role in regulatory decisions, and clearer signals are sent to industry and consumers. While regulation is currently a reserved matter, changes in Ofgem's duties and in how it takes its work forward will be important for Scotland's energy policy and energy sector.

Abbreviations

AMM	Automated Meter Management
AMR	Automated Meter Reading
ARODG	Access Reform Options Development Group
BERR	Department of Business, Enterprise and Regulatory Reform
BETTA	British Electricity Trading and Transmission Arrangements
BSC	Balancing and Settlement Code
BSUoS	Balancing Services Use of System
CEO	Chief Executive Officer
CHP	Combined Heat and Power
CLG	Department of Communities and Local Government
CO_2	Carbon Dioxide
CRC	Carbon Reduction Commitment
CSE	Centre for Sustainable Energy
CSR	Corporate Social Responsibility
CUSC	Connection and Use of System Code
DA	Devolved Administration
DD	Direct Debit
Defra	Department for Environment, Food and Rural Affairs
DG	Distributed Generation
DNO	Distribution Network Operator
DNUoS	Distribution network Use of System
DPCR	Distribution Price Control Review
DTI	Department for Trade and Industry
EAP	Energy Action Plan
ECI	Environmental Change Institute
EEC	Energy Efficiency Commitment
EESOP	Energy Efficiency Standards of Performance
ERA	Energy Retail Association
ESCo	Energy Services Company
EST	Energy Savings Trust
EU ETS	EU Emissions Trading Scheme
FPAG	Fuel Poverty Advisory Group
GB	Great Britain
GBSO	Great Britain System Operator
GDN	Gas Distribution Network Operator
GW	Gigawatt
IFI	Innovation Funding Incentive
IPPC	Intergovernmental Panel on Climate Change
kWh	Kilowatt Hour
LEC	Levy Exemption Certificates
LED	Light Emitting Diode
MtC	Million Tonnes of Carbon
MWh	Megawatt Hour
NCC	National Consumer Council
Neta	New Electricity Trading Arrangements
NIE	Northern Ireland Electricity
Ofcom	Office of the communications market
Ofgem	Office of the gas and electricity markets
OFT	Office of Fair Trading
PP	Pre-payment
PPM	Pre-payment Meter
PSR	Priority Service Register
R&D	Research and Development
RIA	Regulatory Impact Assessments
RO	Renewables Obligation
ROC	Renewables Obligation Certificate
RPI	Retail Price Index
RPZ	Registered Power Zones
SD	Sustainable Development
SDC	Sustainable Development Commission
SHETL	Scottish Hydro Electricity Transmission Limited
SQSS	Security and Quality of Supply Standard
TADG	Transmission Access Development Group
TNUoS	Transmission network use of system.
TPCR	Transmission Price Control Review
TWh	Terawatt hour
UK	United Kingdom
UU	United Utilities
VAT	Value Added Tax

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