Credible energy policy

Meeting the challenges of security of supply and climate change

Professor Dieter Helm

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Executive summary

British energy policy is no longer fit-for-purpose. It was designed for the 1980s and 1990s – years of excess supply, North Sea oil and gas, low prices and no serious climate change constraints. Circumstances have changed: the challenge now is predominantly to maintain security of supply while at the same time decarbonising our economy.

Britain's commitment to meet the 2020 EU renewables target requires a transformation to low carbon energy supply in just 11 years. The EU Large Combustion Plant Directive will mean closure for much of the existing coal generation capacity and this will happen at the same time as the current nuclear power stations are being closed. If nothing is done, this will result in a rapidly expanding energy gap.

The emphasis must now be on investment – not only in power stations and renewables, but in transmission and distribution systems too. The current energy policy framework, by contrast, remains too focused on asset sweating and on a volatile short-term energy market. It will not deliver enough excess capacity to ensure security of supply, nor does it provide the long-term price signals needed to scale up investment in low carbon technologies.

A new energy policy needs to start with clear objectives. Fortunately, considerable progress has been made here and there is a remarkable consensus across the political parties. The carbon targets are set, and few would disagree with an excess capacity margin (excess supply relative to the mean expected demand) of around 20%. It is now the job of the new Department of Energy and Climate Change (DECC), which brings security of supply and climate change under the same roof, to achieve these.

In order to realise Britain's security of supply and climate change objectives, the following recommendations should be adopted. Together this package represents a new energy policy,

distinct from our current model and fit for the long-term challenges we now face.

1. Create a market for energy capacity

Security of supply requires that there is sufficient capacity to meet peak demand. This means having excess supply relative to expected demand. Britain's current energy market does not incentivise the provision of this capacity margin. Over time this could result in higher and more volatile prices, and in extremis even blackouts. To solve this problem a market for the supply of this capacity margin should be created.

2. Network reform

The regulation of networks was designed for a different time and very different circumstances. The idea that network regulation could be delegated to an independent regulator to adjudicate on the appropriate capital expenditure arose in an excess supply context. This regime is no longer fit-for-purpose. We need to provide a longer term framework for investment priorities and develop a rolling investment programme that encompasses grid expansion.

3. Smart meter rollout

Smart meters can reduce emissions and enhance security of supply to all users. A co-ordinated investment process is required to be rolled out across the country. For this to happen, meters need to be brought back into the regulated asset bases and the roll out should be one of the functions of the regulated monopolies, which the regulators in turn have a duty to finance.

4. The expansion of strategic gas storage and interconnectors

Britain's growing energy dependence and our largely spot-based

energy markets are creating supply volatility and price spikes. This is exacerbated by the fact that we have very little strategic gas storage; this is the result of our reliance upon varying the take-up from the North Sea fields. As dependence on insecure sources of supply (e.g. Russia) intensifies, British energy policy should be shaped by trying to gain more insurance. This has two dimensions (apart from thinking again about the renewables policy and speeding up investment in carbon capture and storage): strategic gas storage, and more interconnections with continental Europe in both gas and electricity. Both will help to reduce energy market volatility, increase diversity of supply and enhance security.

5. Transformation of the Renewables Obligation into a Low Carbon Obligation that includes nuclear and Carbon Capture & Storage (CCS), as well as renewables

The Renewables Obligation (RO) and the associated market in Renewables Obligation Certificates (ROCs) have so far delivered very little and yet been among the most expensive such schemes in the developed world. It also fails to support other low carbon technologies, such as nuclear and CCS. The RO should be transformed into a more technology neutral and effective Low Carbon Obligation.

6. The reduction of carbon price uncertainty through the introduction of a European Union Emissions Trading Scheme (EU ETS) price floor and ceiling, as well as longer term carbon auctions

A carbon price needs to be established and predictable for the period of investments in lower carbon technologies. This obvious requirement is almost completely absent from current policy. There are two complementary ways of achieving a long-term price of carbon now, which take the EU ETS as given. The first is to set a floor in the carbon price to the EU ETS, and to guarantee

that this price will extend beyond 2020 and not fall below a given level. The second is to auction tranches of carbon contracts for the period after 2020 now.

7. The creation of an Energy Agency charged with delivery

In order to translate a set of piecemeal changes into a coherent new energy policy framework, the institutions need to be recast. An Energy Agency should be created and given the task of meeting security of supply and climate change objectives set by DECC. The Energy Agency would see that these objectives are met through the instruments available to it, such as the EU ETS and a new Low Carbon Obligation. The Energy Agency would run the capacity and carbon auctions, the strategic gas auctions and oversee the regulation of the networks. It would subsume the licensing functions from DECC, and it would incorporate the regulatory functions of Ofgem. It would also incorporate much of the Carbon Trust and Energy Saving Trust functions, leaving the remainder to be provided by local government and by legal trusts. There would then be a corralling of the host of *ad hoc* bodies in the energy field into one organisation, and a by-product would be to cut out lots of duplication, overlaps and administrative burdens. The overall costs of regulation should fall sharply as the bureaucracy is pruned back. Lobby groups would find it harder to capture rents from the energy policy and climate change subsidies. More importantly, there would finally be a much more "joined-up" delivery of energy policy.

1

Introduction

Almost a quarter of a century ago, Nigel Lawson, then Secretary of State for Energy, made a speech on energy policy entitled "The market for energy".[1] It began a revolution in energy policy not just in the UK, but also in due course across the developed world. At the heart of his conception was a simple idea: that it was not the job of government to plan energy investments and to deliver them through nationalised monopolies, but rather to provide a framework within which markets would decide what got built, and set the prices accordingly.

Contrary to how it was interpreted by some of his more ardent followers, Lawson's approach was not one of unbridled laissez-faire. But it did herald a sea change from what had been the norm for the post-Second World War period, after Labour's nationalisations. And it has been remarkably successful in capturing the intellectual wind – it became the new conventional wisdom. As late as 2006, in its Energy Review the Labour Government was extolling the merits of the market to even "decide" whether and how many nuclear plants might be built (DTI 2006).

As with many such intellectual ideas, the implementation has proved more messy and complex than anticipated. But at least for the first couple of decades after the speech the wind was set fair – fossil fuel prices collapsed around the time of the speech and stayed low and, crucially, the energy sector was characterised by excess supply. Put simply, Lawson's markets did not have to decide about investment because little was needed. They had the altogether simpler task of deciding how to sweat the existing assets – a job which was done tolerably well by privatised industries and price-capped networks. The happy historical coincidence

1 Lawson N, Speech given at the Fourth Annual International Conference, International Association of Energy Economists, Churchill College, Cambridge, 28th June 1982 reproduced in Helm D, Kay J and Thompson J (eds), The Market for Energy, Clarendon Press, 1989

of North Sea oil and especially gas provided secure supplies in Britain's backyard.

The situation has now moved on: the excess supplies have gone, fossil fuel prices have increased and become volatile, and North Sea oil and gas are in rapid decline. The new context is one of potentially deficient supply, more expensive primary fuels and a reliance on imported gas. In addition, the challenge of climate change has brought into the picture three technologies which all sit ill with the market – renewables (principally wind), nuclear, and carbon capture and storage (CCS).

"excess supplies have gone, fossil fuel prices have increased and become volatile, and North Sea oil and gas are in rapid decline"

The old Lawsonian model is now struggling with the new challenges: markets can provide as Lawson intended, but they cannot easily decide either between the technologies, or what capacity is needed without the State setting out the framework. A new energy policy aimed at investment is needed to supplement the one designed to sweat the assets. Fortunately, such a framework does not have to throw out what has been achieved. But it does need the State to decide what its approach to security of supply and climate change should be, to design institutions to deliver on these objectives, and to provide credible long-term incentives to the markets. In an important sense, governments need to decide on the objectives so that markets can provide.

This report sets out the content of a new energy policy designed along these lines. It is a framework designed to endure through the next decade and provide the incentives for new technologies further ahead, in the context of the need to decarbonise the economy. The structure of the report is as follows. Section two explains why the existing policy framework is no longer fit-for-purpose. Section three sets out the new challenges: coming to terms with external dependency, notably on Russia; tackling

climate change; and ensuring security of supply. To address each of these, section four sets out a package of reforms to the market – in electricity markets and capacity; in networks; in strategic gas storage; and in carbon markets.

Each helps to align the incentives in markets with the overarching policy objectives. These necessary – but not sufficient – measures then need to be put into an overarching framework. Section five provides the institutional content: the location of the policy responsibilities in respect of security of supply and climate change; the delivery body to replace the institutional mishmash that has now evolved; and the contractual basis for long-term investments. There follows a summary of the new energy framework as a whole and why it's necessary to meet the challenges of the next decades.

2

The legacy of the 1990s – why British energy policy is no longer fit-for-purpose

Energy policy is typically the prisoner of its past. Policies are put in place in particular contexts, usually as a result of crises sufficiently great to render what has gone before as no longer workable. So, at any point in time, the energy policy framework is one that has been designed for a different context. As time goes on, so the mismatch becomes greater.

What we have now is a framework that was reasonably well designed to address the problems of the 1980s and 1990s. These problems were, in turn, inherited from the 1970s. After the Second World War, the State planned the energy sector: the task was to ensure that investment kept pace with demand. This meant that, for every 3% growth in GDP, electricity supply had to be expanded by around 7%. The Central Electricity Generating Board (CEGB) built coal and nuclear power stations to meet the predicted demand. It also developed the national transmission grid to cope with the fact that coal stations were located near to coal mines, and nuclear power stations were located near the sea for cooling and safety purposes. In the case of oil, the national champion, BP, operated in international markets, and when North Sea oil began to be developed, it was natural for governments to turn to a planned expansion here too, eventually creating the ill-fated British National Oil Company (BNOC).

Despite the criticisms heaped upon it after the general election in 1979, the nationalised and planned model worked tolerably well for its time. It did deliver the necessary supply, and it did build up a civil nuclear industry. The co-ordination of investments between the coal industry, the grid and new-build power stations

had considerable economic advantages – indeed, the highly centralised state models of France and the UK stood up well in comparison to other more disaggregated systems in Germany, the Netherlands, Italy and Belgium. Put simply, it worked.

But by the early 1980s, the basic economic assumptions of the model had radically changed, largely because of two significant developments. The OPEC oil shocks profoundly altered the nature of demand; and the upheavals of the 1970s changed the position of the trade unions, which had come to represent a credible threat to internal security of supply. While most commentary on the period looks at the supply side of the OPEC shocks, it is on the demand side that the effects were most long term. After the Iranian-induced shock in 1979, supply too eventually responded, but demand never fully recovered: the energy ratio cracked for several related reasons. The macroeconomics of the oil shocks changed the nature of developed economies, and started the gradual de-industrialisation in respect of energy-intensive industries. Britain gradually ceased to be an energy-intensive economy. Consumers reacted too: the energy price changed their behaviour – just as it is doing now. The result was massive excess supply; in electricity, for example, the capacity margin over expected demand shot up to over 40%. The industry had planned in 1970 for 100GW of capacity for 1995, but it turned out that a little over half was in fact required.[2]

This excess capacity position did not immediately register with the trade unions, and particularly the National Union of Mineworkers (NUM). On the contrary, the NUM argued that no coal pits should be closed for economic reasons, only on exhaustion grounds. As long as the nationalised industries planning model stood – and, in particular, as long as there was a complete vertical monopoly from the coal pit to the power stations, to the transmission and distribution systems and to supply – the miners could force customers to pay the higher costs.

Excess supply created the opportunity to focus on reducing costs – to sweat the assets – in a context where there was no need to invest. Since the capital stock was given, that meant driving down

2 Brown S "The Next 25 Years in the Electricity Supply Industry", lecture delivered to the Institute of Electrical and Electronic Technical Engineers, 16th November 1970

labour costs. Private ownership would provide the basis for incentives (since profits could be made) and competition would provide the constraints. In essence, the 1980s model was designed to do just that: and the great miners' strike in the mid-1980s provided the political stage on which the arguments were played out.

Not surprisingly, it took time, and there were messy compromises to make along the way. British Gas had to be left intact – to be unbundled ex post rather than ex ante. Electricity was not privatised until 1990, and coal took longer still. Nuclear proved intractable, and it ended up being bailed out first by the Government and then by the French state-owned company, EDF.

> "Put simply, the model is no longer working: indeed, it is being supplanted by the incremental intrusion of largely ad hoc policy interventions. It is no longer fit-for-purpose"

The model had the additional difficulty that not all the energy sector could be opened up to competition. Hence, regulation was required for the networks – and this took the form of the RPI – X formula. The idea was a simple one: offer fixed-price, fixed-period contracts to private network owners and they would maximise profits by minimising costs. In other words, the competitive market could be mimicked by regulation, so these assets could be sweated too.

As long as excess supply continued and there was little need for investment, this new model worked too. Indeed, as time went on, it was refined and the cost-minimisation aspects were intensified. In the networks, it turned out that the cost-saving potential was much greater than anyone had anticipated, and investment could be sliced up even further. The regional electricity companies in 1990-95 (the first period) kept the lights on and cut the capital expenditure (CAPEX) by half that assumed at privatisation. This CAPEX gaming was gradually reversed, though the regulators maintained pressure to drive competition into the core of the networks. This made them passive deliverers of what generators dictated, resulting in new areas like offshore

networks being competitively provided rather than subjected to integrated planning. The new nuclear building programme announced in 1981 by Lawson's predecessor, David Howell – one a year for ten years – was reduced to just one, Sizewell B. And in the electricity market, the capacity market which formed part of the new Electricity Pool of England and Wales and which was designed to incentivise investment, was dropped (since little investment was needed) and the new electricity trading arrangements (NETA) put in its place.

By the end of the 1990s, the model had achieved dramatic cost reductions – well beyond those anticipated by even the most ardent enthusiasts in the early 1980s. As with the state monopoly model after the Second World War, it basically worked in its time. But as with its predecessor, it also contained the seeds of its own destruction. The earlier model had created an investment machine to match the 7% annual growth in demand, and to bring on natural gas. It kept on doing this after the underlying fundamentals had gone into a sharp reverse. So, too, with the model of the 1980s and 1990s: it has kept on sweating the assets when there is little left to sweat and it has not provided the investment incentives to deliver what is now needed.

From a wider perspective, the concentration on short-term incentives (which are reinforced in NETA) has left the market wide open to volatility. As international markets have tightened, and as imports have grown, the UK is now experiencing higher and more volatile prices than those on the Continent. The investments have not been made: there is little gas storage; renewables investment has been so low as to merit a lower European-determined target for Britain; nuclear plants are closing; and the networks are ill placed to tackle the investment agenda.

As the assets created before 1979 by the CEGB come to the end of their lives, the replacement cycle is about to kick in with a vengeance. Between one-third and a half of the existing capacity will need to be replaced by 2020. But this replacement of generation arises in a

context in which the security of supply must be met alongside the climate change objectives. Already the 1980s and 1990s model is fractured: renewables are not "market-decided"; they are determined by an obligation. Nuclear too is being driven by the state – indeed, the first new nuclear stations will probably be constructed by a predominately state-owned company. Coal's future is to be decided in large measure by governments too: the EU Large Combustion Plant Directive (LCPD) constricts the operation of existing plants, and new plants are a matter of high political controversy.

> "the UK is now experiencing higher and more volatile prices than those on the Continent"

EU Large Combustion Plant Directive

Adopted in 2001, the European Union's Large Combustion Plant Directive (otherwise known as Directive 2001/80/EC) aims "gradually to reduce the annual emissions of sulphur dioxide and oxides of nitrogen from existing plants and to lay down emission limit values for sulphur dioxide, nitrogen oxides and dust in the case of new plants."[3]

In practice the directive applies to all combustion plants with a rated thermal output greater than 50MW irrespective of fuel. These are commonly found in, but by no means limited to, power stations, petroleum refineries, steelworks and other industrial facilities. The directive itself builds on previous European legislation with the end result that:[4]

- All combustion plants built after 1987 must meet specified emission limit values.
- Existing plants, in operation before 1987, can either comply with these emission limit values by installing emission abatement (flue gas desulphurisation) equipment or opt out of the directive.
- An existing plant that chooses to opt out is restricted in its operation after 2007 and must close by the end of 2015.[5]

3 Pollution from large combustion plants, Europa, 2008; http://europa.eu/scadplus/leg/en/lvb/l28028.htm

4 European Union, Directive 2001/80/EC, 2001; http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:309:0001:0021:EN:PDF

5 Energy Markets Outlook, BERR, 2007; www.berr.gov.uk/files/file41999.pdf EU plan could lead to power blackouts, The Independent, 21st May 2008; www.independent.co.uk/news/business/news/eu-plan-could-lead-to-power-blackouts-say-electricity-generators-831590.html

Due to the cost of installing new equipment, nine of the UK's existing coal and gas-fired power stations have opted out, with the result that they will close in 2015.

So only gas is "market-decided", although its economics are driven by the available gas supplies, gas storage and the market for liquefied natural gas (LNG) – all matters heavily influenced by policy. Finally, the future of the electricity and gas grids is being determined in an increasingly intrusive policy context. Put simply, the model is no longer working: indeed, it is being supplanted by the incremental intrusion of largely ad hoc policy interventions. It is no longer fit-for-purpose.

3

The new challenges

The world has moved on from the 1980s and 1990s. These decades are now increasingly to be viewed as a peculiar period in economic history – a period of extraordinary economic growth, blessed with cheap oil and excess energy capacity. Now there are new challenges which require different solutions and, hence, a new energy policy framework.

These new challenges are many and various. They include technological change, which in time will revolutionise the energy sector and undermine current assumptions and conventional wisdom. This is a good reason to be sceptical about picking winners, and to try to minimise technology bias in the design of energy policy. But there are three broad challenges which are unlikely to go away, and each marks a significant move away from the 1980s and 1990s. These are: the increasing dependency on energy imports, notably gas, and notably from Russia; the security of supply concerns which arise from the ageing of existing plants and the likely emergence of a major capacity gap in the next decade; and the need to decarbonise the economy. Each would on their own mandate significant reforms in energy policy; together they create a whole new context within which the old solutions look, at best, inadequate to the task.

The external challenges – Russian gas, European dependency and European energy policy

In the late 1960s, oil and gas were discovered in the North Sea. At first the costs appeared prohibitive, given the very limited experience with offshore drilling and production. But then OPEC changed the economics in the 1970s: the oil price shocks took the

price above the US$10 a barrel threshold of North Sea costs, and a whole new energy chapter opened up for Britain. It rendered Britain energy-independent: not only did we have coal and nuclear, but now gas and oil too. The bane of most of 20th-century macroeconomic policy evaporated too: there would be no more balance of payments crises.

Successive governments pumped out the oil and gas as fast as possible, anxious to get the revenues for wider public purposes. There was no sovereign wealth fund to spread the benefits over future generations (unlike in Norway) and no depletion policy (unlike in the Netherlands). Indeed, the dash-for-gas in electricity generation in the 1990s accelerated that depletion. Within 25 years the North Sea was in sharp decline, and by the mid-2000s imported gas began to dominate the British gas and electricity markets.

Planning for the future – Norway and the Netherlands

Despite all being favoured with ample natural resources, the UK, Norway and the Netherlands have each taken radically different approaches to these assets.

In the UK, tax revenues from North Sea oil and gas have funded government expenditure. No provision has been made against the eventual depletion of resources.

The Netherlands took a different approach through the introduction of a depletion policy. This was originally based on legislation passed in 1961 that stated that "the exploitation of Netherlands gas reserves should be harmonised with the sale of such gas and that security of long-term gas supply should be a state task."[6]

Another approach has been taken by Norway. Concerned with the long-term depletion of North Sea oil, in particular its effect on fuel prices and tax revenues, the Norwegian Government decided to establish a sovereign wealth fund (a state-owned investment fund where excess revenues are invested for long-term return rather than

6 Lundin Petroleum, 2008; www.lundin-petroleum.com/eng/operation_netherlands.php

spent on immediate consumption). According to the Norwegian Ministry of Finance the purpose of the fund is "to facilitate government savings necessary to meet the rapid rise in public pension expenditures in the coming years and to support a long-term management of petroleum revenues".[7] Known as the Statens Pensjonsfond – Utland or The Government Pension Fund – Global, it is now one of the largest such funds in the world with assets (pre-credit crunch) totalling approximately $391 billion (£261 billion), equivalent to $81,500 (£54,000) per Norwegian citizen.[8]

Import dependency is not in itself necessarily a bad thing. But there were a number of aspects of North Sea policy which made the switch to imports particularly painful for Britain. While the North Sea delivered, there was little need for storage, since manipulating the drawdown from existing fields could balance the system. But, once depleted, Britain confronted its import dependency without the necessary cushion of storage. Abundant domestic supplies undermined the long-term contracts that had been put in place at the outset to recover the sunk costs of the investments in the fields and the national transmission system. Britain opted for a spot-market model, which proved effective in driving down prices in excess supply conditions but volatile and painful when supply margins tightened – especially when relying on a predominantly long-term-contracted Europe. Finally, excess supply had given Britain no real interest in European energy market developments, other than trying to persuade the Europeans to match the structures in Britain by unbundling and using the spot market. As a result, little attention was paid to strategic partners, to the relationship with other countries dominating the supply chains or in promoting the development of European electricity and gas grids. Instead, Britain bleated on about liberalisation and unbundling to the exclusion of almost everything else.

7 Norwegian Ministry of Finance, 2008; www.regjeringen.no/en/dep/fin/Selected-topics/The-Government-Pension-Fund.html?id=1441

8 Norges Bank, Key Balance Figures May 2008; www.norges-bank.no/upload/68615/norges_bank_balance_may_2008.pdf.

The end of great days of the North Sea has therefore come as something of a shock to the energy sector, and Britain has been almost completely unprepared for the new energy dependency it is now confronted with. That earlier complacency was mirrored in the 2003 energy White Paper, "Our Energy Future – Creating a Low Carbon Economy"[9] and the Performance and Innovation Unit study, "The Energy Review", which preceded it.[10] In the early 2000s, the Government appears to have convinced itself that networks were adequate, there would be abundant supplies, and therefore the pipes would be available and full, and the gas price would be reasonable (low) for the foreseeable future.

> "it exposed all the main weaknesses of the British energy sector: inadequate infrastructure, inadequate storage, a gas dependency in the electricity sector, and a lack of long-term contracts"

In the winter of 2005-06, that complacency was shattered by developments in a "far away land". The Russians interrupted gas supplies to the Ukraine for a matter of hours, and suddenly Britain felt the direct impact. Gas prices spiked and Britain came very close to running out of gas. LNG simply did not arrive; there were more lucrative markets in the US and elsewhere. There was little storage to draw upon. And whereas the gas and electricity industries had been thought of separately, the impact fed directly into the electricity market as Combined Cycle Gas Turbine (CCGT) plants scrambled for supplies and the coal stations could no longer rapidly plug the gap.

Fortunately, the interruption was short-lived, but it exposed all the main weaknesses of the British energy sector: inadequate infrastructure, inadequate storage, a gas dependency in the electricity sector, and a lack of long-term contracts. Ministers, however, failed to appreciate what was at stake: we had the bizarre event of the energy minister telling the House of Commons that markets were behaving "irrationally" because prices were higher in the Britain

9 "Our Energy Future – Creating a Low Carbon Economy", White Paper, CM 5761, Department for Trade and Industry, TSO, 2003

10 "The Energy Review", Performance and Innovation Unit, Cabinet Office, London, February, 2002

than on the Continent, but the gas was not flowing – demonstrating a deep ignorance of the impact of long-term contracts.

Since the events of 2005-06, the dependency problems have become worse, through a combination of several factors: the bearing down of the EU Large Combustion Plant Directive on the coal stations and the limitation on their operations; the continued failure to develop strategic gas storage; the renewables commitment which will require more gas to balance the system; and the deteriorating relationship with Russia.

Gas import dependency is here to stay for at least another two decades. It cannot now be avoided: it is too late. Britain will need to source its gas predominantly from the Continent (with LNG at the margin, given its much higher costs relative to pipeline gas). Sources are in principle diverse and multiple: apart from Russia, there is Norway, Algeria, Libya, Iran and the Caspian states. But in practice, this diversity is not quite what it seems. Norway has a small population and an active depletion policy. It has no incentive to be price-competitive with Russia. Algeria and Libya are similarly interested in maximising their economic rents, and have signalled considerable co-operation with Russia. Iran is a political pariah in Europe and as yet there is no pipeline. With greater Russian influence, particularly after the invasion of Georgia, the Caspian states have understood that sending their gas north via Russia is politically safer than west via Georgia and Turkey. The EU, in any event, has gone cold on Turkish membership.

So that leaves Russia in a much more powerful position than its current share of the European gas market indicates, and its strategy has been clear and rational: it aims to maximise its economic rents, and at the same time use its leverage to reassert its dominance over its near neighbours. The gas-poor countries have responded by forging closer relationships with Russia. Germany has a deep and "special" relationship, exemplified by the Baltic Pipeline proposal, which bypasses Poland and the Baltic states, and a direct owner-

ship link between E.ON and Gazprom. Austria has done a deal over Baumgarten as a physical gas hub jointly between OMV and Gazprom. Finally, Italy has embraced Russia to the extent of becoming its principal ally in the EU and accepting the Libyan–Gazprom dominance over Italy's supplies.

Thus, the three central countries of Europe – Germany, Austria and Italy – have formed deep, long-term contractual ties with Gazprom (and Russia). Not surprisingly, countries to the East – notably Poland and the Baltics – feel the political and economic chill of being caught between the two again, and countries to the West feel the need to explore diversification options. For France, its nuclear power capacity in electricity provides some cushion. For Britain, with declining nuclear output and declining coal generation as the old plants close and the EU LCPD bites, the position is very exposed.

Ministers have finally grasped that there is a problem, and shortly before being reshuffled, the Secretary of State for Business, John Hutton, spoke of the need for "energy independence".[11] What that means in practice is hard to fathom, though it appears to underpin two main policies: the dash-for-wind before 2020; and the dash-for-nuclear after 2020. The former will probably make security of supply worse; the latter will take a decade to start materialising. What has not yet been grasped is that the nature of British spot markets, and their design with asset-sweating in mind, is not conducive to the sorts of investment that are urgently required. We return to this below.

Security of supply and investment

Security of supply has many dimensions. The external aspects have been dealt with above. In the domestic context, security of supply requires that there is sufficient capacity to meet expected peak demand. And since we are uncertain about how big peaks might be, and since plants (and networks) might fail, in practice secu-

11 Labour party conference, Manchester, 22nd September 2008

rity of supply means having excess supply relative to the mean expected demand.

It is immediately apparent that unless this excess supply is paid for, it is unlikely to be provided. For if it were, prices would fall and existing assets would not be adequately remunerated, as prices moved towards marginal cost and away from average cost. Indeed, for incumbents, as supply conditions become tight, prices rise more rapidly, rewarding all existing plant and yielding excess profits. No incumbent would want to meet the capacity needs for security of supply if there were not additional payments. This problem is exacerbated in the British market, as there is now no new entry in generation or supply to limit returns.[12]

It is therefore not surprising that once the legacy of excess supply from the 1980s and 1990s has been eroded the incentives to invest become muted. As a result, as the ageing plant comes to the end of its economic life (and, in the case of coal, is constrained off the system by environmental considerations), a capacity gap is emerging. The 2006 Energy Review indicates that this may be of the order of up to 35GW by the middle of the next decade.[13]

The scale and timing of this capacity crunch is uncertain. The credit crunch and economic recession may depress demand, and energy efficiency measures may further limit demand growth. However, few doubt that there will need to be considerable new capacity to meet demand by 2015, and that this capacity will be required not only to meet the expected demand, but also to balance the system in the presence of substantially more intermittent wind generation. Indeed, even if demand does not increase, to balance off the system by 2020, around 110GW may be needed compared with around 70GW now.

Below, we set out how the investment decisions may be incentivised through the creation of a capacity market. This is a necessary condition to address the investment shortfall. It is urgent too. An investor contemplating new generation capacity in, say, 2015 is

12 "Energy Supply Probe: Initial Findings Report", Ofgem consultation document, 6th October 2008

13 "Energy Review: The Energy Challenge", Department for Trade and Industry, TSO, 11th July 2006

faced with a daunting prospect from 2020 onwards. It is to be expected that the major additional renewables capacity to meet the 2020 20% EU Renewables Directive will come on to the system right at the back end – very close to 2020.[14] The impacts of the new nuclear capacity, smart metering and other energy efficiency measures will also be expected at the back end.

The implication is that the energy market might go from acute excess demand to excess supply, leaving a short period of very high prices followed by a period of lower prices. To invest in such a scenario depends on getting the returns quickly to remunerate the capital investment. Only one technology meets these exacting requirements: Combined Cycle Gas Turbines. And a further dash-for-gas in the next decade as the dependency on Russia increases is likely to make the external security position, and the price of gas, much more adverse.

Thus, the renewables policy, together with the absence of a capacity market to incentivise the provision of excess supply, will present a serious security of supply threat, and be reflected first in higher and more volatile prices, and then perhaps even in quantity constraints.

To these electricity generation concerns, there are also worries about the grid transmission and distribution infrastructure in respect of security of supply. The current approach is to use five-year fixed-price contracts, mediated through Ofgem and translated into an RPI – X price formula. It would be hard to think of a more inappropriate matching of the investment horizon and asset lives with the regulatory approach in the infrastructure industries (though airports might figure here too). But there are special reasons why it is inappropriate now – notably, that the Government is pursuing a radical policy of introducing, extremely rapidly, lots of intermittent and decentralised wind generation. If the task is to go from around 5% of electricity generated by wind now to perhaps 30% or more within just 11 years, it is obvious that the grid and the distribution networks

14 "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – 20% reduction in emissions and 20% of all energy consumption from renewables by 2020 – Europe's climate change opportunity" COM(2008) 13 final, (COM(2008) 16 final), (COM(2008) 17 final), (COM(2008) 18 final), (COM(2008) 19 final), Commission of the European Communities, 2008

will need radical and immediate very large-scale investment programmes. Indeed, the grid owner and operator, National Grid, has suggested such an approach, involving two major North–South offshore grid lines.

The regulatory approach is not one that could be described as sympathetic to the renewables target. In addition to the five-year horizon, which requires the grid operator to wait until the next periodic review before decisions are made about what will be financed for five years ahead, in the North Sea Ofgem takes the view that networks should be "competitive". This fits with a broader Ofgem idea that grids and distribution networks should be the servants of generators, to provide what "the market" demands. According to this view, the grid is passive, rather than active, reactive to the needs of generators as they apply for connections, rather than coming up with positive plans for the networks within which generation will be nested. This passive approach was driven in large measure by a rejection of the centralised role of the CEGB, which planned grids and generation in a co-ordinated, monopolistic, way. The task the regulators set themselves has been to unbundle as many of the functions of the networks as possible and subject them to competition. This has been applied at one level to meters and at the other to connections. The approach to the offshore wind networks takes this to its competitive limits, and as a result, instead of a planned offshore grid with core hubs, a patchwork is being encouraged.

If the grid and distribution networks are gold-plated and over-engineered, and if demand is low relative to the available supply, then the competitive approach makes a lot of sense. But if 15 years of asset-sweating has eroded that margin, if the limited margin is compounded by a tightening of the supply/demand balance, and if so much intermittent generation is required in just 11 years, then the competitive grid model may turn out to be a (costly) threat to the security of supply.

Climate change – the challenge of decarbonisation

The third challenge is climate change and the decarbonisation of the economy. The British economy is overwhelmingly carbon-based. Although gas has displaced coal, nuclear has been in decline. Transport is oil-based. If the policy objective is to reduce carbon emissions by 80% by 2050, with significant progress by 2020, then much of the energy infrastructure and capacity will need to be replaced, and by technologies that are not currently economic without significant government support.

The scale of this challenge is masked by the fact that the targets at the EU and national level are set in terms of carbon production, excluding aviation and shipping. This approach to measurement flatters the figures: on the Kyoto production basis, emissions have fallen by more than 15%, but on a consumption basis they have gone up by around 19%.[15] The difference is explained in large measure by the offshoring of carbon-intensive activities: put simply, instead of producing energy-intensive chemicals, steel, ships, and so on, at home, we now import these goods from countries like China. The important point here is obvious: we have been increasing our contribution to global warming, while professing to have been reducing it.

“on the Kyoto production basis, emissions have fallen by more than 15%, but on a consumption basis they have gone up by around 19%”

The failure to make much progress on decarbonisation is not, however, for the want of policies, policy initiatives and targets. The UK has a domestic target to reduce carbon emissions by 20% from 1990 levels by 2010, and now it is likely to have an EU target for a 20% reduction by 2020. There is an additional domestic target which will be turned into five-year carbon budgets by the Committee on Climate Change. Then there are sub-targets for renewables and energy efficiency.[16] Progress on the former has been slow and incredibly expensive: the Renewables Obligation (RO)

15 Helm D Smale R and Phillips J, “Too Good to be True? The UK’s Climate Change Record”, 2007; www.dieterhelm.co.uk/ December

16 “UK Renewable Energy Strategy – consultation paper”, BERR, June 2008

and the associated market in Renewables Obligation Certificates (ROCs) have proved not only to deliver very little wind generation, but also to have been among the most expensive schemes in the developed world.

Energy efficiency policies have multiplied and to date have been largely ineffective. There has been repeated political rhetoric about energy efficiency measures transforming behaviour, but the reality remains one of very poor performance. And, as with the renewables policy, this failure has not been cheap. Despite the best efforts of the numerous energy efficiency lobbies (and the institutions that represent them), it has not proved to be the case that a very large number of projects are "net present value-positive before intervention" – in other words, better than free. On the contrary, as the costs of support schemes rise, the housing and building stocks remain poorly insulated. Indeed, the very recent acceleration in energy efficiency (or at least demand reduction) appears to have had much more to do with the sharp increase in energy prices – a feature replicated in the decline in demand for petrol.

In addition to the measures on renewables and energy efficiency, the Government has pursued both taxes and permit schemes at the domestic level, and in the EU Emissions Trading Scheme (EU ETS). The British schemes arose from the Marshall Report in 1998.[17] In the UK ETS, the evidence on cost-effectiveness and performance has been at best mixed. It has been suggested that much of the carbon savings would have happened anyway and the scheme, in effect, provided large – and poorly targeted – subsidies to large energy-intensive users. The Climate Change Levy (CCL) was introduced at a politically sensitive time for the coal industry. Its contracts were up for renegotiation in 1998, with the prospect of a sharp contraction – indeed, so sharp that the 1998 energy White Paper introduced a moratorium on new gas CCGTs.[18] As a result, it was defined on an energy and not carbon basis – negating much of its rationale.

17 "Economic Instruments and the Business Use of Energy: Conclusions", Marshall Task Force on the Industrial Use of Energy, November, 1998

18 "Conclusions of the Review of Energy Sources for Power Generation and Government: Response to Fourth and Fifth Reports of the Trade and Industry Committee", Cm 4071, Department of Trade and Industry, TSO, October, 1998

Against these relatively ineffective interventions, the EU ETS promised a more efficient mechanism: to establish a cap on emissions and then allow trade in the permits to establish a price of carbon. That price would then signal to both the demand and supply sides of the market. The concept was a good one – though arguably a carbon tax might have been a better option. The execution has not been so good: the initial period (2005-08) witnessed big swings in prices, data problems and a generous issue of grandfathered permits. The second period (2008-12) is again short, and although the permit numbers are tightened, the effects will again be limited. Plans for the third period (2012-20) remain to be agreed, and the debates have raised all the main concerns about the scheme.

The EU ETS is not quite what it seems. It is not – at least after 2020 – a fixed-quantity regime. Additional quantities from the Clean Development Mechanism (CDM) will be allowed, and it is far from clear that the amount will not be manipulated to produce the "desired" price. New entry countries after 2012 will probably bring with them packages of "transitionary" excess permits. The extent – and timing – of auctioning remains unclear, as does the treatment of internationally traded sectors. Although officials at the European Commission seem convinced that the resulting price will be stable and within tolerable limits, there can be no guarantee that the scheme will not witness considerable volatility and the price might move within quite a wide range. It will therefore inevitably require some safety valves – with caps and floors as the most likely.

In Britain, the main effect of the EU ETS will be on existing coal-fired generation – and here the EU LCPD will tighten the screw on this capacity. The result will be a lower coal burn (a good thing for carbon emissions), but also to tighten the capacity margins and encourage yet more substitution of gas for coal (a bad thing for security of supply). If the consequences for secu-

rity of supply become too serious, then there will inevitably be pressures to loosen the EU ETS ex post – thereby undermining important incentive effects. Although the Secretary of State for the Department for Business, Enterprise and Regulatory Reform (BERR) claimed that building new coal fired plants now will not increase emissions as reductions under the EU ETS will have to be made elsewhere, this is nonsense: the EU ETS allows for the CDM contributions, and these will inevitably be increased if the pressures become great. And supposing that several new coal plants were built before 2020, it is hard in the British economy to see where greater reductions would come from – certainly not from the expanding airports or from increasing road (or even rail) transport.

> “There is no long term price of carbon on which investors can rely”

But what is missing from all of these measures – apart from any real progress on carbon emissions within the periods – is that the EU ETS does nothing to signal the prices after 2020. This is by far the most important period: for it is only then that new nuclear, CCS, solar and other newer technologies will come on stream. There is no longer term price of carbon on which investors can rely. As we shall see below, there are mechanisms to achieve this price signal, but they are not included within current policy or indeed policy proposals.

The government has not however entirely neglected the post 2020 technologies. It has been a strong advocate of new nuclear capacity since 2006 (previously it has been strongly against, notably in the 2003 White Paper). It has attempted to reform planning law to speed up the process – but then taken the decisions on nuclear back to Parliament. It has provided limited help to pre-licensing of technologies, and it has actively promoted the sale of the existing sites and nuclear power stations to EDF and hence, in effect, to the French Government – reinforced by the

fact that EDF will use Areva's Pressurised Water Reactors (PWRs), a company also owned by the French Government. What remains to be done in the nuclear case is, however, considerable. There is as yet no permanent solution to the nuclear waste problem, there is no long-term price of carbon, and there are no longer term contracts or obligations.

On carbon capture and storage (CCS), the gap between the potential role and the current policy approach is very large. Given that coal is the growing fuel at the global level, and given that China's economic growth is predicated on an increased coal burn, the marginal source of new carbon emissions at the global level is overwhelmingly coal. Without a solution to the emissions from coal power stations, there will be no solution to global warming. CCS is therefore necessary to any credible climate change policy.

Yet compare this fact with policy priorities. Efforts have gone into wind not coal. The CCS option – the only one on the table to address coal emissions – is largely based on known technology – the separation out of carbon emissions at power stations (either pre or post-combustion), the transport of gas, and gas storage are all at least theoretically 19th-century technologies. Demonstration plants allow technologies to be tested, but for Britain there is to be only one and it will take several years to materialise. The questions in relation to the networks of pipes – the transmission system – and the wider management of storage, notably in the North Sea, have not yet been seriously considered. Although it is true that CCS cannot make much of a contribution until 2020, as it is repeatedly put off, so its eventual contribution recedes into the distance. In the report Six thousand feet under: burying the carbon problem there are detailed proposals about how to resolve these issues and promote the development of CCS in the UK. [19]

19 Singh T et al, Six thousand feet under: burying the carbon problem, Policy Exchange, 2008

4
A programme of reform

The burden of proof for a reform programme is not only that the existing arrangements are not fit-for-purpose, but also that there are specific reform measures which can be expected to do markedly better – given that the process of reform will itself create uncertainty and have associated costs.

Reforms should not be thought of in isolation – it is the totality of energy policy which determines how the system performs, not the individual parts. Energy policy is necessarily a package, but there are some key principles as to how such packages should be put together. In particular, there should be as many instruments as objectives, and each instrument should be clearly related to a particular target. These objectives need to be clearly stated, and have where possible a precise target attached. Doing something about climate change, wanting more security, or wishing to reduce fuel poverty are all things most people would agree with. But none is defined with any clarity. If these objectives are translated into specific targets for greenhouse gas emissions by specific dates, for a given capacity margin, and for a specific reduction in fuel poverty by a specific date on the basis of a stated measurement, then instruments can be specified and applied. The difference is between lofty aspirations and credible policy.

In this section the design of the energy market is considered, and specific recommendations are made to reform it with a view to meeting two of the objectives: security of supply and climate change. The fuel poverty objective is ignored; not because it is unimportant, but rather because it is a welfare and not an energy problem and best met by income-compensating measures.

(i) Reforming the electricity market – introducing capacity markets

Energy markets are mechanisms for delivering what people are willing and able to pay for. This breaks down into two components: the energy itself, and the ability to consume it on demand regardless of how many other people wish to do so at the same time. For electricity, where storage is minimal, this in turn boils down to buying the energy that makes the appliances work, and the insurance that when the switch is turned on the energy is actually supplied.

These two aspects of demand are represented by different things. The energy supplied reflects the conversion of fuel inputs (coal, gas, nuclear fuel, wind, etc) into outputs (electricity); the insurance reflects the capacity available within which this transformation takes place and the networks through which it is delivered. Not surprisingly, then, for most of the 20th century these two parts were charged separately: customers paid an energy charge and a capacity charge (and indeed many systems still separate these out). Since 2000, the British system has combined everything into a single market, and a single price reflected in NETA and now BETTA (the unification of the Scottish and England and Wales markets). Here, for simplicity, we refer to NETA throughout.

> “Reforms should not be thought of in isolation – it is the totality of energy policy which determines how the system performs, not the individual parts”

In addition to bundling together energy and capacity into a single market, NETA allows the parties to contract on any basis they choose. It is a voluntary market. For reasons which will be explained below, the voluntary nature of the market has encouraged vertical integration so that the major companies internalise the transactions between generation and supply, matching their upstream and downstream positions. Liquidity therefore has

diminished, and since contract forms are pluralised (and many internalised), transparency is much reduced.

A single price merging energy and capacity together matters little when there is excess supply. But when supply conditions are tight, the single market has to perform two tasks simultaneously: to signal the cost of energy, and to signal the scarcity of capacity. The result is that the price spikes – and the tighter the demand–supply balance, the greater the volatility. And, not surprisingly, spikes and volatility have become much more apparent in the British system since the middle of this decade.

It is argued that such spikes provide a sufficient incentive to invest in peaking capacity. The chance of winning the lottery – reaping very high returns for very short periods – makes the risk worthwhile. This argument, however, depends on two assumptions: that there is entry; and that politicians and regulators will allow such spikes to run their course, and hence facilitate extraordinary profits at precisely the time when consumers feel most pain. Both are questionable: there is no entry now, and hence the price spikes just feed straight through to profits on the existing plant; and investors would be very foolish to rely on a lack of intervention (as, indeed, they found in the great Californian price spike). Furthermore, to the extent that capacity is encouraged, it is as a response to short-term prices, and not in respect of longer term investment in the capacity margin.

So, as a result, NETA creates a wonderful mechanism to increase profits at the expense of sufficient investment. It provides no incentive to provide excess supply. The obvious reform therefore is to go back to the underlying cost structures and the characteristics of demand, and unbundle energy from capacity – and in particular to create a capacity market.

The typical response to this suggestion is to point out that the capacity market under the Pool system which existed before the introduction of NETA was badly flawed. This claim is well

borne out by the evidence, but all it demonstrates is that a badly designed, short-term capacity market is just that – badly designed. It does not follow that all capacity markets are flawed because one particular type is.

Capacity markets come in a variety of shapes and sizes, and the appropriate design depends upon the precise question or questions it is supposed to provide answers to. The starting point is the provision of excess supply. There is no precise answer to exactly what supply margin is needed. This is not only because there is uncertainty about demand, but also about the quality of supply. A supply margin might be set, but it could depend, for example, on the reliability of key power stations – say, for example, the British Advanced Gas Reactors (AGRs), which have a very chequered history. In practice, the answer is about 20%, and any greater precision is spurious.

Suppose, then, that a 20% margin is the target, to be met over time with a margin of error – say 5%. How would a capacity market achieve this ex ante? One approach is to identify forward capacity gaps – times when the supply is expected to fall short of 20%. The National Grid seven-year statement was designed to fulfil this function, though since the grid was supposed to be passive, in practice it amounted to the notified and applied-for capacity intentions of the generators. This subsequently became a shared forecast, between the Government and Ofgem. Much needs to be done to improve it.

Instead of the current system, we propose that once gaps have been identified, an auction is held for the provision of sufficient capacity to meet the 20% target. The auction would be in two stages: first, anyone could bid any type of capacity, including demand-side reductions. If energy policy included preferences for different types of generation (for example, low carbon), the second stage of the auction could be more specifically defined. That way, stage one would yield valuable information about the relative costs, informing the decision about restrictions in respect of stage two.

Given this proposal, two questions immediately arise: who would do the auctioning and who would be the contractual counterparty? Starting with the location of responsibility, there are at least three candidates: National Grid, the Department of Energy and Climate Change (DECC), and Ofgem. Each has drawbacks: National Grid is a profit-seeking business and its own performance may be affected by the degree of risk aversion in the forecasts and the choice of investments. DECC as a government department has the key role in formulating policy, but is less well designed to implement it. Ofgem has a narrow remit, and its history and culture are very much connected with, first, the advocacy and, then, the defence of NETA. As will be argued in Section five, a better route forward would be the creation of an Energy Agency.

The contractual counterparty for the capacity auctions – which would, in effect, be the auction of a particular kind of contract – would be suppliers. Suppliers would be obliged to demonstrate that they held contracts for a security of supply margin of, say, 20% into the future, and hence have an obligation to contract forward for it. The capacity auctions could therefore be packaged out between the suppliers so that the total added up to the 20% margin. It would then be for the regulator or the body responsible for the auctions to make sure that all suppliers complied. There is an analogy here with the Renewables Obligation – which is, in effect, an obligation to contract, and suppliers are obliged to demonstrate compliance.

An alternative would be to regard security of supply as a system property and tie this component to the use-of-system charge for the transmission network. This would be a more radical step, but not without merit. In effect, it would be returning to a broader notion of the "system", and away from the more disaggregated model in which the roles of the grid and distribution monopolies were minimised. The concept would be that the capacity margin is required as a public good to all users. Its marginal cost would be

close to zero (as giving additional users at the margin the benefits of the security of supply it provided would be minimal), and the average costs would be a tax on all users, as is standard for the charging for public goods. That would leave generation and supply to focus on the energy component only. The capacity component would then be another system service alongside the grid itself, balancing, spinning reserves and other system services.

In practice, the two approaches are not dissimilar, in that customers would be obliged to pay for the capacity margin. In the supplier obligation approach, the charges would be volume-related. In the use-of-system approach, they could also be related to volume, though there is scope for other charging bases because the system is itself a natural monopoly and, therefore, customers cannot escape its charges.

With a capacity market in place, there would be an energy-only market alongside. In effect, this is what NETA would become. The criticisms of this component – the lack of liquidity and transparency, and the consequences for competition and market structures – would then need to be addressed.

When the Pool model was under threat, and NETA was proposed, it was notable that the incumbent generators were strongly in favour of the replacement of the compulsory Pool with a voluntary NETA market. Under the compulsory Pool, all significant generation had to be bid into the Pool, and anyone could buy at the Pool price. The compulsion forced the market to be (very) liquid. The right to buy for any supplier at the Pool price prevented discrimination – in particular, in vertically integrated structures where a generator could not sell to its own supply business at prices different from those available to its competitors.

It is true that under the Pool the incumbents could still game the system, since the price of energy was determined by the system marginal price (SMP), which was the marginal price of the last generation required to meet demand. The generators

could manipulate their bids to force up the SMP, thereby gaining monopoly rents. It was this gaming opportunity that encouraged the Government and Offer and then Ofgem to push for the Pool's replacement by NETA.

There is much evidence to support the claim that generators did in fact game the system, but none to demonstrate that the replacement of the Pool by NETA solved the problem. On the contrary, once trading became voluntary, a plurality of contracts could be created and there was no longer any SMP. The effect was to render opaque what had been transparent, and in the process undermine a key efficiency requirement – that plant were dispatched in a merit order based upon short-run marginal costs. Under the Pool, what was going on was painfully transparent: under NETA, it was much harder to judge. No wonder the generators wanted to abolish the Pool, and once this was achieved, vertical integration became the norm. Indeed, as the Ofgem 2008 Energy Supply Probe noted, the consequent lack of liquidity damaged the competitive position of generator-only companies, while the lack of transparency made it harder to identify the costs. By 2008, entry into generation had effectively ceased, generation-only assets were being sold to the dominant incumbents, and independent suppliers were going bust. Finally, it has proved very difficult for the incumbent generators to prove that they are not abusing market power – and hence there has been sustained pressure on them to bail out the fuel poor under the threat of windfall taxes.

Fortunately, this situation can be remedied by one key reform: to compel the auctioning of generation in the energy market. This has been proposed for British Energy's output as a remedy for the takeover of the company by EDF, but it could be generalised. The result would be an evolutionary step back to the Pool model. It would remain to define how far the auctions would have to be based upon a standardised contract (another key element of the Pool). An evolutionary approach would be to require open

auctions, but to allow generators to specify the terms of these auctions, subject to competition requirements. Auctioning itself might help to encourage standardisation since trading would be enhanced (and the existing generators with vertical supply links need trading to balance out their own positions). A further step would be to apply constraints to auction design and, at the limit, to define the auctions in the format of the original Pool model. Given the wide experience of pool-type models internationally as well as in Britain, the transition would not be so complex or costly as it was back in the late 1990s, when it was almost the first of its kind.

For both the energy and the capacity markets, there are a number of variants and the detailing of the specific market design would need to take account not only of the overarching policy priorities, but also the practicalities of auctions and trading. There would in particular be issues about the duration of contracts, the extent to which contracts are physically tied to plant, and the flexibility in secondary markets to meet the obligations to ensure the capacity margin is met. Fortunately, there is almost a century of experience in the pricing of energy, and in recent decades there are many examples of different kinds of energy and capacity markets to draw upon. The argument for a capacity market is a general one: as the experience of the Pool demonstrated, not all designs for capacity markets are necessarily good, and some are very bad. Similarly on the energy market side: the general argument is for efficient dispatch (the merit order) and competition, but some energy market designs are better than others.

Together these two reforms – a capacity market, and compulsory auctioning in the energy market – would achieve security of supply and greater competition respectively. There would, as a result, be a smoothing of prices – the volatility which is an inherent part of the NETA model, with spikes, would be dampened by the capacity margin – and a closer relation between developments in

the primary fuel markets, wholesale and retail prices. Two aspects of security of supply – protection from blackouts and protection from price spikes – would be greatly enhanced. If, in addition, the Government wished to drive through the decarbonisation targets, it would be open for government or regulators to make sure that the capacity auctions reflected the targets for low carbon technologies, and indeed a low carbon obligation could be applied directly to the auctioned capacity. Whether such a step is necessary depends upon the urgency and priority given to decarbonising the energy sector.

> “Together these two reforms – a capacity market, and compulsory auctioning in the energy market – would achieve security of supply and greater competition respectively”

(ii) Reforming the networks and smart meters

Providing for security of supply in generation is but one component in overall security of supply: there remains security in networks and in respect of the external dependency on gas imports. Indeed, it is notable that several of the threats to security have come from network failures in recent years.

As noted above, network regulation has been developed with a view to asset-sweating: it has been designed around short-term (five-year) regulatory periods, with regulators adjudicating on the CAPEX requirements, on the basis of bids made by incumbent companies. What has been noticeable by its absence is a focus on the broad strategic questions: for example, what are the objectives which the grid's investments are designed to meet? In addition: how are grid investments co-ordinated with investments by generators and at the consumer end, including in energy efficiency?

The idea that network regulation could be delegated to an independent regulator to adjudicate on the appropriate CAPEX arose in the context of excess supply. Under Offer, the primary duties included the promotion of competition, and for the networks

this meant unbundling as many components as possible and subjecting these to competition. Under Ofgem, the primary duty was simplified and made even more general, and "guidance" in the interpretation of duties was to be provided by government. In practice, however, the agenda remained much the same, with not only a tightening of the RPI – X formula and the introduction of further incentives on the networks, but the further promotion of competition in respect of connections and metering.

As argued above, this regime is no longer fit-for-purpose and there are a number of reforms which would better align the networks with the two objectives of security of supply and climate change. These include bringing metering and connections firmly back within the networks' domain; providing a longer term framework for the network investment priorities; and, within the detail of network regulation, developing a rolling CAPEX programme, indexing the cost of debt to the market rates, and utilising a split cost of capital in relation to the price-setting mechanisms. All of these reforms involve considerable attention to the details of network regulation and have been subject to intense debate beyond the scope of this report. The point here is that there already exist well-developed reforms to align incentives better and to promote investment.

The domain of the grid is important because it sets the parameters for its co-ordination role in respect of investment planning. In respect of the metering (and particularly smart meters), the move towards more reliance on intermittent and small-scale generation places a greater emphasis on the ability of the grid operator to manage demand. Whereas smart meters are typically presented as mechanisms for customers to take proactive measures to manage and reduce their demands, they also have a key role for the co-ordination of the system as a whole. Smart meters will in due course talk directly to appliances, and enable sophisticated demand management techniques to be used. These functions will create a system

public good, in terms of reducing emissions and enhancing the security of supply to all users for a given density of intermittent generation. Smart meters will also have a crucial role to play in very localised generation and the associated use of feed-in tariffs.

Though there are inevitable technology risks, co-ordination is easier where the technologies are standardised. Rolling out smart metering is akin to the conversion of appliances to natural gas: it requires a co-ordinated investment and fitting process across the country in harmony with the coming on-stream of the renewables – all premised on the 2020 EU targets. Ideally, given the disruption and installation costs to households, smart meters would be co-ordinated with other utility services too.

For the companies, meters represent sunk costs with long asset lives. They are therefore risky investments, exposed to technical change and ex post opportunism by politicians and regulators who might renege on the sunk costs and force through marginal cost pricing. They therefore naturally lend themselves to being included in the regulated asset bases (RABs) of the distribution companies, which in turn significantly lowers the cost of capital.

While bringing the meters back into the RABs, and making the roll-out of smart meters part of the functions of the regulated monopolies which the regulators in turn have a duty to finance are positive steps, the attempt to create competitive networks, notably in the North Sea, is an expensive and retrograde step. Both Ofgem and BERR (as it then was) unfortunately endorsed this approach.

North Sea renewables represent a challenge to any network design. Competing networks look only to their own interests, not to those of the system as a whole, and will want in any connection charging regime to exploit the advantages which might accrue to their own assets. But it is immediately apparent that the outcome will not be the same as that which a single grid entity would deploy, especially if it internalised the costs and benefits of different configurations to its onshore network. Indeed, there would be no

point in incurring the extra costs of competing networks if it were to result in the same answer as an onshore regime would produce. There are good reasons for thinking that the competing networks will be (potentially much) more inefficient – precisely because they fail to internalise the co-ordination benefits. In addition, the cost of capital will inevitably be much higher, in particular because the assets are outside the RAB and hence the regulator's duty to finance them. Finally, competing networks are bound to take longer to deliver because of the additional time co-ordination between the parties will inevitably take.

> "Rolling out smart metering is akin to the conversion of appliances to natural gas: it requires a co-ordinated investment and fitting process across the country in harmony with the coming on-stream of renewables"

Thus, the first set of reforms to grid regulation is to change the domain, and bring metering and competing networks back inside the grid and distribution companies' monopolies. It would then remain for these two aspects to be given co-ordinated frameworks for planning: for the Government to set out a policy framework for the rapid roll-out of smart meters and for a co-ordinated network to be built offshore to coincide with the build-out of wind farms in line with the overarching 2020 target. This should probably take the form of a White Paper and be incorporated within the national planning policy statement. There would also need to be changes to the domain of the licences for the regulated companies.

Metering and offshore networks are not, of course, the only dimensions of grid and network planning to facilitate the renewables programme – and indeed new nuclear investments too. The government's energy policy framework should also attend to the shape of the grid as a whole, and in particular plans which bring its investment programme in line with the overall objectives of energy policy. This might take the form of a long-term investment programme, agreed between the companies, the government

and the regulator; in turn, the regulator should have to take this into account among its primary duties. It would be an additional requirement that this should be taken into account in a timely fashion and not left to short-term, five-year periodic reviews.

Such an approach is one which has a much more significant element of planning than the competitive approach which Ofgem has favoured. But there is really no option here if the government wants to achieve the renewables targets under the EU 2020 framework. There are only 11 years to transform the energy sector. There is no option of waiting for the next periodic review (and the one after that) to get the networks into shape for this purpose. And in addition, there is no option in respect of metering if the increase in intermittent generation is to be accommodated and security of supply maintained. Those who object to co-ordinated planning as proposed here are really objecting to the renewables target itself. This may be a legitimate objection, but it is disingenuous to accept the 20% target and then not provide for the necessary means to ensure that the networks are capable of sustaining the energy system that the target will produce.

More generally, the years of excess supply led to an element of complacency about the nature of energy as a system, and as a result downgraded the importance of co-ordinated investment between generation and networks, and within networks themselves. There is interestingly little evidence that the competitive market in metering has actually worked – or been lower-cost – and similarly little evidence that competing grids reduce costs.

(iii) Strategic gas storage, European networks and external security

Getting the domestic house in order by ensuring that there is sufficient capacity and that networks are developed promptly to meet the overarching objectives of energy policy would be a major

step forward. However, there is still the external position, and in particular gas dependency to consider. This requires a European response since security in the face of an upstream monopoly is a collective European public good.

Britain starts with considerable disadvantages. Unlike Germany, Austria, Italy and, to an extent, France, its relationship with Gazprom is almost non-existent, and its diplomatic relations with Russia are not "special". Britain is also at the end of the pipelines that run through the Ukraine and, if the Baltic Pipeline goes ahead, through Germany. We rely on interconnectors with the Continent. Unlike the continental Europeans too, we have no significant long-term contracts: our NETA-type electricity and gas markets are largely spot-based, so that imbalances of supply and demand create volatility and price spikes. Indeed, at the limit, even when prices spike in Britain, the gas may not flow in the direction of higher prices precisely because the Europeans have to honour their long-term contracts – a reality which was brought home starkly in winter 2005-06. Finally, Britain has very little gas storage since it has relied upon varying the take-up from the North Sea fields.

> "There are only 11 years to transform the energy sector"

The more rapid North Sea decline than anticipated has left Britain playing catch-up in gas contracting. The Norwegian link has proved important, though also vulnerable to pipeline interruptions. There is also LNG, although this is typically inherently more expensive than pipeline gas, except for very long transits. At peaks, the marginal source of gas is from the European Continent, and thus ultimately it depends upon Russia.

Russia's position has a number of features which are worrying from a security of supply perspective. Its energy sector and key companies are intimately entwined with the State and the State is entwined with the security forces. Thus, foreign policy and energy supplies are closely aligned. And given the foreign policy ambition

to play a significant role in its near neighbourhood, given that the Ukraine, Georgia and the Baltic states figure large in this sphere, and given that key pipeline routes are all related to these countries (the existing pipelines through Ukraine, Nabucco via Georgia, and the Nord Stream pipeline deliberately bypass the Baltics), gas supply has major political risks attached.

It might then be thought a good idea to diversify away from gas imports as part of British energy policy. This indeed might be the aspiration. But the reality is quite different: in the next decade two related environmental concerns will very likely usher in a new dash-for-gas. First, environmental constraints will close down much of the coal generation, and second the dash-for-wind will lead to more gas investments to back up supplies. In other words, as the security threat in respect of Russia intensifies, we will increase our dependency on Russia – and at a time when Russian gas supplies are not growing and its own domestic demand is rising.

In such circumstances (apart from thinking again about the renewables policy and speeding up CCS investments), British energy policy should be shaped by trying to gain as much insurance as possible. This has two dimensions: strategic gas storage and more interconnections with the Continent in both gas and electricity.[20]

Strategic gas storage is required to provide an excess supply over anticipated demand (as with electricity generation capacity) and a mechanism for managing crises. Excess supply creates an overhang for prices, and not surprisingly the existing gas producers and suppliers oppose it. What is required is that the insurance is paid for in addition to the gas itself. This can be achieved by defining the gas storage margins and then auctioning their provision. Because gas storage is expensive, there will be an economic limit on how much should be provided. However, it is unlikely to be zero, and the auctions, together with clear and precise rules about the release of strategic gas supplies, should minimise the economic costs.

20 "A European Strategy for Sustainable, Competitive and Secure Energy", COM (2006) 105 final, March 8th, Commission of the European Communities, 2006; Helm D, "European Energy Policy", paper prepared for the UK Presidency of the EU, 2005

Network interconnections enhance security on both sides of the links, since they add a diversity of supply and increase the portfolio of sources on which countries can draw. For Britain, recent experience with Norwegian pipeline problems indicates the desirability of having multiple gas supply pipelines. Further electricity links to France and its nuclear capacity allow for alternative sources of electricity at peak times, and therefore enable gas plants to be constrained off in the event of a gas shortage and/or gas price spikes.

> "British energy policy should be shaped by trying to gain as much insurance as possible. This has two dimensions: strategic gas storage and more interconnections with the Continent in both gas and electricity"

(iv) Carbon markets, the EU ETS and the long-term price of carbon

Securing the domestic supply and reducing the exposure to Russia are key parts of a new energy policy. To these must be added a coherent carbon policy to address climate change. The current approach is an ill thought-out and very much ad hoc series of interventions, ranging from subsidies to the Climate Change Levy, the EU ETS, the Renewables Obligation, a single demonstration plant for CCS, R&D support and energy efficiency measures.

Since the market failures in respect of carbon emissions are numerous, it is unlikely that one instrument will be sufficient to meet the demanding targets. There will need to be many. However, any coherent carbon policy needs a carbon price at its core, so that customers pay the cost of the carbon emissions. Once this is in place, the other market failures, notably in respect of R&D, can then be addressed.

A carbon price needs to be established and predictable for the period of the relevant investments in lower-carbon technologies. This obvious requirement is almost completely absent from current policy: the EU ETS extends to 2012 and it is currently being

considered to 2020, whereas the major technologies – nuclear, CCS and renewables – all have asset lives well into the subsequent decade, and indeed some of the most important plants will not be built until after 2020.

There are two ways of achieving a long-term price of carbon now – or at least conditioning that price – which take the EU ETS as given. The first is to set a floor to the carbon price within the EU ETS, and to guarantee that this price will extend beyond 2020 and not fall below a given level. The floor could be an undertaking to buy back permits at the floor price (and then it requires that the EU ETS continues beyond 2020), or the floor could be a separate carbon tax. The latter has many advantages, not least that it yields additional revenue to governments, whereas the buy-back obligation costs national governments. Helm (2008a) sets out a proposal for caps and floors.

> “Securing the domestic supply and reducing the exposure to Russia are key parts of a new energy policy. To these must be added a coherent carbon policy to address climate change”

The second approach is to auction tranches of carbon contracts for the period after 2020 now. The contracts would be for carbon delivered, and the counterparty would be the Government in the form of a promise to pay at some future date for given carbon reductions. The Government could then cover its financial exposure by selling these carbon contracts back to the market after 2020 if and when the EU ETS was extended into a fourth phase. A more detailed proposal for this approach is set out in Helm and Hepburn (2007).[21]

The core element of a long-term price of carbon is missing from the EU climate change package and the proposed directives. In its place are the proposed renewables and energy efficiency directives (and the shorter-term EU ETS phase three arrangements). The British instruments to achieve the EU Renewables Directive – the

21 Helm D and Hepburn C, “Carbon Contracts and Energy Policy: An Outline Proposal”, chapter 3 in Helm D (ed) The New Energy Paradigm, Oxford University Press, 2007

RO and the ROCs – are among the most expensive ways to subsidise wind power in the developed world. Short of changing the target, there are a number of reforms to the renewables policy that could be made. All have the aim of reducing the rates of return towards the cost of capital. This can be done either by manipulating the subsidy through banding the technologies into a form of feed-in tariff which limits the returns, or by replacing the RO/ROCs with a more utility-style RAB and associated debt cost of capital, underpinned by a regulatory duty to ensure that the renewables functions are financed. Both mechanisms can be criticised for reducing the incentives for efficiency, but then these are capital-intensive investments, and the cost of capital impacts swamp operating and capital efficiencies – especially where the development of projects is put out to competitive tender (thereby maintaining at least the capital efficiency incentives).

> “The British instruments to achieve the EU Renewables Directive – the RO and the ROCs – are among the most expensive ways to subsidise wind power in the developed world”

Renewables – and nuclear and CCS – are all examples of capital-intensive sunk-cost investments which require an element of long-term contract to ensure that the investments are remunerated over lengthy pay-back periods. There is, however, little reason to provide such contractual support for one technology but exclude the others. Hence the RO should be translated into a Low Carbon Obligation. Ideally, the low carbon technologies should then compete with each other to deliver the lowest cost ways of reducing carbon emissions. However, since energy policy currently pre-empts this by setting a target for renewables but not nuclear or CCS, there will inevitably need to be some segmentation in the Low Carbon Obligation to protect the higher-cost wind from the potentially lower-cost alternatives. The overall Low Carbon Obligation can then be tailored to fit the profile

of the overall carbon target, which in turn can feed through into the capacity market auctions for new generating capacity proposed above. Thus, the carbon target, the Low Carbon Obligation and the capacity market can all dovetail together to give a co-ordinated transition towards the low carbon economy, and the grid investment plans can be set in harmony. Such a synchronised approach contrasts starkly with the current disjointed and disaggregated approach.

There remain the R&D policy dimensions and the detailed interventions on energy efficiency. Both are extremely important, and both have associated well-developed and detailed policy instruments. These are beyond the scope of this report, though it should not be concluded that, as a result, they are any less important. Indeed, R&D is crucial to a low carbon economy; new technologies will play the central role in the medium to longer term – and eventually mandate new energy policies to suit their specific characteristics. Energy efficiency has major attractions in both the short and medium terms.

5

Recasting the institutional framework – the Energy Agency and Ofgem's future

The reforms outlined above will each and separately improve the performance of energy policy in Britain. But when added together they represent a significant departure from the current arrangements which are based on the agenda of the 1980s and 1990s. Like Lawson in the early 1980s, we too have inherited a set of institutions designed for an earlier era. In order to translate a set of piecemeal changes into a new energy policy framework, the institutions need to be recast.

An institutional structure needs to reflect the roles and functions of the various public bodies. The starting point is the objectives and, specifically, who sets them. Then come the questions of who designs the policy instruments and who implements them. It is the job of government to set the security of supply and climate change objectives. In both cases, there are important political trade-offs to be made, and since both are system public goods, they cannot be set at a disaggregated level. The responsibility falls to the Secretary of State. In a democracy, it cannot be otherwise.

To set such objectives requires policy advice, and this is the job of the relevant department – now the Department of Energy and Climate Change (DECC). The formation of DECC is a crucial recognition that these two objectives are paramount, and that they should be set together by a department with an understanding of the implications of both. It is also the department's job to oversee performance and to advise the Secretary of State in the event of any likely failure to achieve them.

DECC also has the responsibility for crafting the policy framework to achieve these targets. This is, in effect, a road map. DECC sets out the renewables strategy, the nuclear policy framework and the overarching investment programme for the grids. This is a sectoral policy framework and it feeds through into the national planning statements. White Papers are the conventional way in which such frameworks are established and revised over time, and energy shares this approach with the transport and water sectors.

It is not, however, the task of the department to deliver the framework. This falls to the private sector overwhelmingly. Governments decide but they do not have to provide. Ensuring that the private sector provides requires a set of policy instruments that appropriately incentivise the companies. This function can be delegated to an agency (it could be called an Office of Energy, an Energy Agency or similar title – we call it an Energy Agency here).

The Energy Agency would be given the overall objectives for security of supply and for climate change by DECC. Its job would be to see that these objectives are met, and it would do this through the instruments available to it and typically crafted in outline by the Government. Such instruments include the EU ETS, the CCL, the RO, the nuclear White Paper framework, the licensing regime, and so on.

> “In order to translate a set of piecemeal changes into a new energy policy framework, the institutions need to be recast”

Taking the reforms proposed above, the Energy Agency would run the capacity and carbon auctions, the strategic gas auctions and oversee the regulation of the networks. It would subsume the licensing functions from DECC, and it would incorporate the regulatory functions of Ofgem. It would also probably incorporate much of the Carbon Trust and Energy Saving Trust functions, leaving the remainder effectively to be provided by local government and by legal trusts. There would then be a corralling of the host of ad hoc bodies in the energy field

into one organisation, and a by-product would be to cut out lots of duplication, overlaps and administrative burden. The overall costs of regulation should fall sharply as bureaucracy is pruned back. Specific lobby groups would find it harder to capture the rents from the energy policy and climate change subsidies (the "climate change pork barrel", Helm 2008b).

> "The overall costs of regulation should fall sharply as bureaucracy is pruned back"

To carry out its delivery functions, the Energy Agency would need to build up considerable expertise in modelling, technologies and economic analysis. At present – to the extent that this exists in the public bodies – it is concentrated in DECC and in Ofgem. The latter has the advantage of being capable of sustaining its work through time, whereas the former has significant staff turnover and is naturally driven by particular and immediate ministerial priorities. With around one minister a year, these inevitably change frequently. As a result, Ofgem can run rings around the department in turns of the quality and depth of its analysis. The lesson is that such expertise is indeed better built at arm's length from government, with more stable career patterns and the emergence of a culture of expertise. Ofgem is not, however, the appropriate location, since its remit is narrow and focused on particular aspects of the energy sector, excluding, and indeed sometimes working against, other concerns.

The case for abolishing Ofgem and relocating its regulatory functions in a broader Energy Agency (or Office of Energy, if this is more sympathetic to the idea of an element of continuity) derives from its core functions and duties. It inherited from Offer and Ofgas a specific remit, which has been interpreted as overwhelmingly concentrated on competition and the RPI – X formula periodic review approach to regulation. It has also championed NETA and then BETTA. While competition matters, and regulation has to ensure that the companies are efficient, Ofgem does not

have to have regard to the wider energy policy objectives among its primary duties. The results have been serious: for example, the renewables policy has repeatedly come up against a regulatory approach which is arguably far from sympathetic. Indeed, it is possible to argue that the result of the Ofgem approach has been to focus too little on the investment aspects of generation and grids, with the result that Britain has failed to meet its existing targets and now faces volatile and high prices without the compensation of a secure supply position.

Ofgem has also developed a culture, as all organisations do. It has its interests, it has a past with decisions and approaches which it may be reluctant to re-examine and, however "independent", it operates in a political context. Ofgem's decisions are taken in the context of wider concerns: for example, it indicated publicly that competition was satisfactory in the electricity market, but then launched an investigation when the House of Commons Business and Enterprise Committee intervened. It advocated a windfall tax on carbon permits, and it has now taken for itself the role of reviewing the whole RPI – X formula framework across all the utilities. It therefore strays into energy policy with its own implicit agenda. All such bodies do; they cannot avoid it.

"Abolishing Ofgem and replacing it with an Energy Agency would align the delivery functions with the Government's overarching objectives"

Abolishing Ofgem and replacing it with an Energy Agency would align the delivery functions with the Government's overarching objectives and mirror the laudable decision to create DECC. It would propel security of supply and climate change to a position of primacy in the new body's duties (instead of the bland and highly discretionary general consumer cover-all). Regulation would remain independent (as it does in Ofcom and the Civil Aviation Authority), but the outcomes of regulatory deci-

sions would need to be tested out by the Energy Agency's board (again, as they are in Ofcom and the CAA).

If the reforms outlined above were implemented, the capacity and carbon auctions would take centre stage in the new agency, which would require considerable modelling skills – little of which exists in government at the moment. This modelling and the auctions would inform the evolution of policy under both objectives, and together these would help to develop longer term grid investment plans and feed through into the planning process. There would be much more "joined-up" delivery of energy policy.

6

A new energy policy for Britain

It is not surprising that an energy policy fit for the purposes of the next decades is some way off. Energy policy reform is usually the consequence of an immediate crisis. The challenges posed by climate change and security of supply are enormous: nothing less than the decarbonisation of the economy, and hence the conversion of all the existing assets in the energy sector to low carbon. This is a project for several decades, but the Government and the main Opposition parties have endorsed it. It would be extraordinary if an energy policy designed for the years of low fossil fuel prices, excess supply and no binding carbon constraint could achieve this.

So we have to move on – urgently. There is a need to replace a large amount of ageing power stations before 2020, and the 2020 carbon targets are about to bite hard. The existing energy policy framework does not incentivise the scale and form of the investment programme required: on the contrary, it is positively harmful in that it provides no incentive for the capacity margin and little by way of co-ordinated investment in the networks. The institutional structure pulls in different directions. The result is that the objectives will not be achieved and the costs will be high. Britain under the existing energy policy framework is condemned to high and volatile prices, low security and to missing the carbon targets by a wide measure.

A new energy policy starts with the objectives. Fortunately, considerable progress has been made here and there is a remarkable consensus across the parties. The carbon targets are set, and few would disagree with a capacity margin of around 20%. It is the job of the new department, which brings security of supply and climate change under the same roof, to harden up these objectives.

Thereafter there is much to do and it is best done by an agency at arm's length from government. An Energy Agency mapping the new responsibilities of DECC is required. The two main objectives need mechanisms to ensure that the investment is delivered in a timely and cost-effective way. The core electricity market needs to be incentivised to provide the capacity margin, and a capacity market is the appropriate instrument. Strategic storage of gas and greater interconnection with continental Europe would help to offset growing import dependency – Britain is at the end of very long pipelines, with numerous intermediaries with their own long-term gas contracts with Gazprom.

The climate change side of the policy framework needs at its core a long-term price of carbon. The present and proposed extension of the EU ETS does not provide this. Long-term carbon auctions are one method and a carbon tax is another. The latter could also function as a floor price to the EU ETS. The Energy Agency would be tasked with carrying out these auctions.

Regulation of networks was designed for a different time and very different circumstances. The requirement now is to have an overarching strategy to achieve the objectives and to co-ordinate the grid investments to meet the objectives. This could be set out in a White Paper. The job of regulation is then to ensure that it is delivered in an efficient manner. The five-year, fixed-price RPI – X formula approach has little to recommend itself in this context. The Energy Agency would subsume the regulatory functions of Ofgem in a separate division, replicating the Ofcom and CAA models.

Some argue that there is time to sort out each and every one of these issues over the coming decade. Ofgem, for example, in its review of the RPI – X formula, intends that the results might be applied by 2015. In more stable times, in the normal cycle of replacement, and without the carbon constraints, that argument would be weak. Now it is simply complacent. Indeed, it is already very late in the day.

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