



**DEPARTMENT FOR BUSINESS
ENTERPRISE & REGULATORY REFORM**

ENERGY MARKETS OUTLOOK

CHAPTER 4 – ELECTRICITY

OCTOBER 2007

ofgem

Energy Markets Outlook

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4. Electricity

4.1 Introduction

- 4.1.1 Both the demand for electricity and the level of capacity that will be available to produce it are subject to a very wide range of uncertainty over the next decade. On the supply side, for example, there is uncertainty both around the timing of forthcoming closures of existing coal-fired and nuclear capacity and around the timing and amount of new build. We look separately at the factors affecting supply and demand, and then at the relationship between them as a proxy for security of supply.
- 4.1.2 The analysis in this chapter relies mainly on data⁷ provided by National Grid, who are responsible for electricity transmission in Great Britain. The electricity market in Northern Ireland is described in a separate box at the end of the chapter.

4.2 Electricity demand

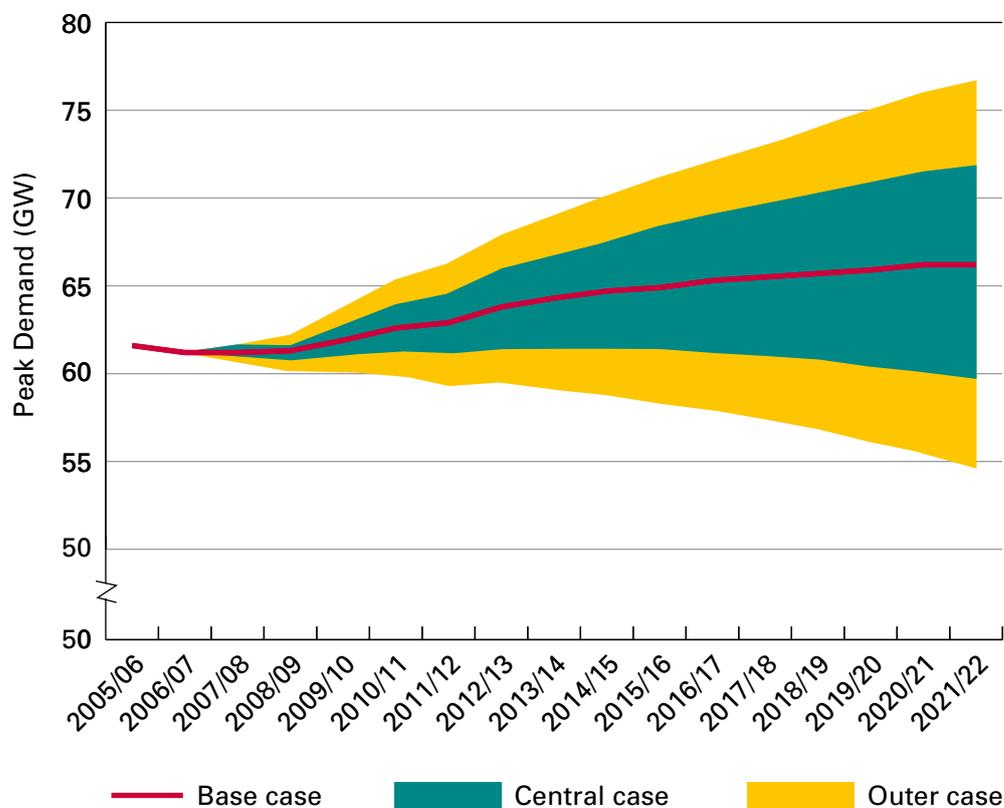
- 4.2.1 Electricity cannot currently be economically stored in meaningful quantities. This means that it is not possible to generate large amounts of electricity at times of low demand and put it aside for use later at times of high demand. Consequently, electricity has to be generated at the same time as it is consumed. To ensure that demand can be met at all times, therefore, it is necessary to have available enough generating capacity to meet the highest expected level of demand (“peak demand”).
- 4.2.2 There is considerable uncertainty about the level of peak demand in the future, particularly over longer time horizons. There are a number of factors that are likely to influence the level of peak demand. For example, higher economic growth and lower electricity prices would be expected to lead to increased levels of peak demand. In contrast, increased energy efficiency, perhaps as a result of environmental policy, or milder winters, might be expected to depress peak demand. However, a combination of increasing peak summer temperatures and greater use of

⁷ <http://www.berr.gov.uk/files/file41824.pdf>

air-conditioning could eventually lead to the development of a summer peak. Overall demand might also be constrained by persistent high prices.

4.2.3 At the moment, demand is largely met by electricity transported across the transmission system from large generators to distribution networks. However, developments in distributed energy, such as embedded Combined Heat and Power and micro-generation, could increase the extent to which demand is met by local generation. This could lead to a reduction in peak demand on the transmission system.

Chart 4.1: Possible future levels of electricity demand on the transmission system in Great Britain



Source: National Grid

There is a wide range of possible future electricity demand levels, depending on the interplay of several variables.

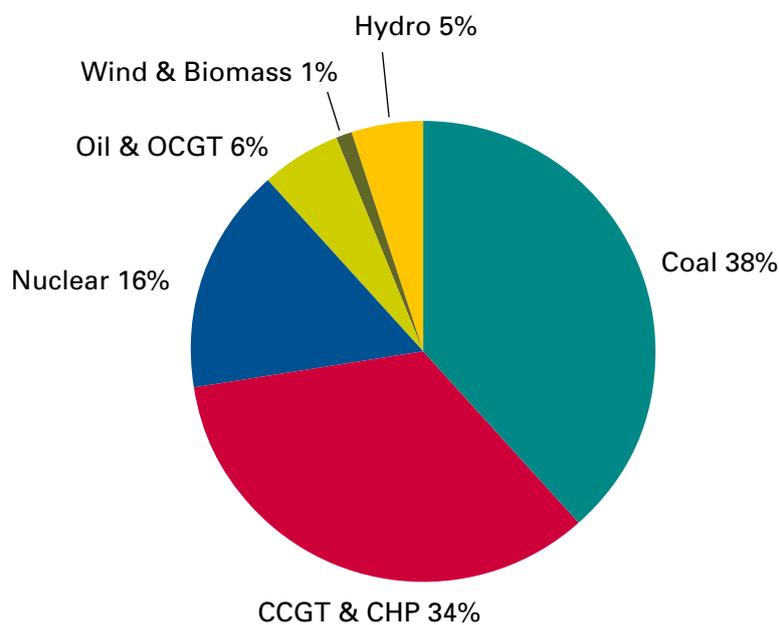
4.2.4 The highest levels of demand shown in the figure above would be reached only if the relevant factors were all stimulating demand growth and no factors were acting to reduce demand. In practice, these variables are not mutually exclusive and it is unlikely that they would all combine to push electricity demand in one direction. For example, it is possible that weaker fuel prices and weaker economic growth could coincide, thus cancelling each other out in

terms of their effect on electricity demand. A narrower central range of more probable demand levels has therefore been highlighted on the chart above.

4.3 Electricity supply capacity

4.3.1 As at winter 2007-08, Great Britain as a whole has a total of 75 GW of electricity generating capacity of various kinds. Coal-fired capacity presently represents the largest share of transmission-connected capacity.

Chart 4.2: GB Electricity generating capacity at the end of 2007



Source: National Grid

In addition there is an electricity interconnector with France which is capable of importing (or exporting) about 2 GW.

4.3.2 Future levels of generating capacity will depend on how much of this existing plant is retired from service and how much new plant is built. There is a range of factors that influence plant owners' decisions on plant closure and the timing, volume and type of new build. These include expected profitability, environmental and safety legislation and station reliability. These factors are discussed in more detail below.

4.4 Plant closures: Fossil fuel

4.4.1 The Large Combustion Plants Directive (LCPD)⁸ requires large electricity generators, and some other industrial facilities, to meet stringent air quality standards from 1 January 2008. If they opt out of this obligation, this plant will have to close by the end of 2015 or after 20,000 hours of operation from 1 January 2008, whichever is the sooner. Some 12 GW of coal and oil-fired generating plant falls into this opted-out category:

Table 4.1: Electricity generating plant which has opted-out of the Large Combustion Plants Directive

Plant name	Owner	Capacity (GW)
Tilbury (coal)	RWE npower	1.1
Cockenzie (coal)	ScottishPower	1.2
Didcot (coal)	RWE npower	2.1
Ferrybridge (stack 2) (coal)	SSE	1.0
Ironbridge (coal)	E.ON	1.0
Kingsnorth (coal/oil)	E.ON	2.0
Littlebrook (oil)	RWE npower	1.2
Fawley (oil)	RWE npower	1.0
Grain (oil)	E.ON	1.4
	Total capacity	12

Source: BERR

All of this plant, some 15% of Great Britain's present total capacity, will have to close by the end of 2015.

4.4.2 The timing of these closures within these constraints is a commercial matter for the plant owners, who would be expected to take into account factors such as other environmental restrictions and the state of repair of the plant. For example, if a facility suffers serious technical difficulties and would otherwise only have a limited life in any case, then it may not be economic to invest in repair and maintenance. Hence, it is impossible to predict the precise timing of the impact of the LCPD on generation capacity.

4.4.3 One approach to estimating the impact, however, is to extrapolate from recent experience. Based on the average number of hours that the coal-fired power stations have

⁸ <http://www.defra.gov.uk/environment/airquality/eu-int/eu-directives/lcpd/index.htm>

been used between 2000 and 2006, it is estimated that all will have used their 20,000 hours allowance before 31 December 2015 and that available capacity will fall as shown in the table below:

Table 4.2: Estimated timing of reduction in coal-fired generating capacity, assuming present operating patterns continue

Date	Available capacity of coal plant that has opted out of the LCPD (based on current operating patterns) (GW)
1 January 2008	8.2
Mid 2012	6.2
Spring 2013	4.2
Autumn 2013	2.2
1 January 2016	0.0

Source: BERR

Based on historical operating patterns, some of these plants could have used up their allowance of hours by early 2012.

The LCPD is likely to affect oil-fired plant in a different way since, as peaking plant, the oil-fired power stations tend to run for fewer hours over the year as a whole, producing electricity only at times of very high demand. They are therefore less likely to run out of hours before the end of the period.

4.4.4 During the next few years while the opted-out plants are working out their remaining lives, the 20,000 hour limit may have an impact on plant owners' operating decisions as to whether and when to run them. To obtain maximum value out of the allowance, the owners of a power station may wish to ensure either that the whole station or none of it is working at any one time, rather than adjusting the level of output to meet the level of demand. This possible reduction in supply-side flexibility from this part of the total generating fleet is likely to present additional challenges to National Grid in their task of balancing aggregate electricity supply and demand, requiring additional flexibility from the rest of the generating fleet and perhaps leading to greater price volatility.

4.5 Plant closures: Nuclear

4.5.1 The operating lives of nuclear power plants can be extended, but only with the approval of the Health and Safety Executive's Nuclear Installations Inspectorate (NII). The decision whether to apply to the NII for an extension of the operating lives of nuclear power stations beyond their scheduled closure dates is a commercial decision for the operators. At present, the operating lives of Great Britain's nuclear power plants are scheduled to end at these dates:

Table 4.3: Estimated closure dates of nuclear power plants in Great Britain if operating lives are not extended

Nuclear Power Plant	Estimated Closure Date	Type of Reactor	Installed Capacity (GW)
Oldbury	2008	Magnox	0.47
Wylfa	2010	Magnox	0.98
Hinkley Point B	2011	AGR	1.26
Hunterston B	2011	AGR	1.21
Hartlepool	2014	AGR	1.21
Heysham 1	2014	AGR	1.20
Dungeness B	2018	AGR	1.08
Heysham 2	2023	AGR	1.20
Torness	2023	AGR	1.20
Sizewell B	2035	PWR	1.19
Total		2 Magnox 7 AGRs 1 PWR	11.00

Source: BERR

According to current timetables, 7.4 GW of nuclear generation capacity will have closed by 2020.

4.5.2 There are no proposals at present to extend the lives of either of the remaining Magnox nuclear power stations. We understand that British Energy expects to make a decision on whether to apply for life extensions for its Hunterston B and Hinkley Point B stations by the end of the 2007-08 financial year. Decisions as to the extension or otherwise of the operating lives of other stations are expected to be taken nearer the time and will take into account such factors as plant safety and operating cost, as

well as supply, demand and price expectations in the electricity market as a whole.

4.6 New build

4.6.1 We show here a list of all the conventional electricity generating plants which we understand to be at various stages in the development process.

Table 4.4: New conventional electricity generation projects

Station Name	Owner	Capacity (MW)	Type	Section 36 Status	Construction Status
Langage	Centrica	890	CCGT	Approved	Commercial operations expected by winter 2008-09.
Immingham	ConocoPhillips	450 (expansion from 730 MW to 1180 MW)	CHP	Approved	Commercial operations expected by summer 2009
Marchwood	SSE and ESB International	840	CCGT	Approved	Production expected to start in 2009
Grain	E.ON	1275	CCGT/ CHP	Approved	Work started May 2007. Commercial operations expected by 2010.
Staythorpe	RWE npower	1650	CCGT	Approved	Construction expected to start late 2008 (some ground works already complete) with commissioning due 2010

Uskmouth	Severn Power	800	CCGT	Approved	Site works started. Commercial operations expected by 2010 after 4 months commissioning.
Pembroke	RWE npower	2000	CCGT	Applied	Building contractor appointed pending section 36 consent, with the intention of starting construction in 2008
Drakelow	E.ON	1220	CCGT	Approved	
West Burton	EDF	1270	CCGT	Applied	
Sutton Bridge	EDF	1260	CCGT		
Partington	Bridestones	380	CCGT	Approved	
Barking	Barking Power	470	CCGT		
Kingsnorth	E.On	1600	Coal	Applied	Two super-critical generating units proposed
	Total	14105			

Source: National Grid; public sources. Valid as at October 2007. See EMO webpage for latest position.

Of the total 14 GW listed here, nearly 4.5 GW of conventional capacity is presently under or close to construction.

4.6.2 The construction of an additional 2 GW of capacity, in the form of the BritNed interconnector and a number of wind farms (further information is in chapter 9), is also under way.

4.6.3 In reality, the type and total amount of new build could out-turn higher or lower. Generators' investment decisions fundamentally depend on expected future profitability, which is largely informed by investors' views of such factors as likely future developments in the supply-demand balance, Government and regulatory policy, relative movements in fossil fuel and CO₂ prices, and the capital costs of new plant.

4.7 Other potential sources of new generating capacity

4.7.1 The forecasts set out above are based only on those technologies currently deployed on a large scale. In this report, we do not speculate about potential new technologies or designs that may come into commercial operation over the next decades beyond noting that their widespread deployment could have a major impact on energy supply. Examples of these technologies might be:

- medium-scale fuel cell combined heat and power (CHP) plants
- new designs of nuclear reactors
- wave and tidal energy
- improved energy efficiency and/or demand-side flexibility
- electricity storage technologies
- carbon capture and storage (CCS) technologies
- microgeneration⁹

4.7.2 It is also possible that the UK will develop greater interconnection with other European countries in the future and even, through Europe, to electricity markets further afield. Although there are costs from building more interconnection capacity (especially to islands such as Britain), a trans-national electricity system brings security benefits.

4.7.3 These benefits arise from the fact that interconnection allows relatively small national markets to access a greater volume and diversity of generation. This can reduce the need to invest in more expensive domestic sources that would otherwise be required to meet periods of high demand. The fact that periods of national peak demand in different European regions do not tend to coincide also means that capacity can be utilised more efficiently. Such developments may all contribute to future security of supply.

⁹ <http://www.berr.gov.uk/energy/sources/sustainable/index.html>

4.8 Potential influences and constraints on the level and nature of new build

Skills

- 4.8.1 The 2007 Energy White Paper tasked the Sector Skills Councils with reporting on the skills situation and actions being taken to ensure an adequate supply of skilled workers for the future. It is anticipated that this will be completed in the first half of 2008.
- 4.8.2 Recent work by the Sector Skills Council, Energy & Utility Skills,¹⁰ has shed more light on the ageing workforce in the power sector. While recruitment and natural wastage have been balanced over recent years, retirement will have an increasing impact from 2010, earlier than anticipated from previous research. Without a marked increase in recruitment and training, a significant shortage of skills could develop as early as 2013. Apprentice recruitment attracts a healthy level of applicants but the graduate market is more competitive. Moreover, current training capacity is short of what is needed. The industry is developing plans to increase recruitment and training, but the next decade is likely to be challenging, not least because competition for skills from the rest of the economy and from the power sector internationally will be strong.
- 4.8.3 The nuclear sector carried out a major study of the skills needed for operations and decommissioning in the early 2000s. Since then, significant parts of the sector have achieved a more balanced age profile, although some areas still face retirement issues in the 2010s. The sector faces significant skills gaps, as workers are re-deployed from operations to decommissioning. With a strong lead from the Nuclear Decommissioning Authority, employers and the Sector Skills Council, Cogent are developing a nuclear skills strategy¹¹. A key role will be played by the National Skills Academy for Nuclear, which should be formally launched early in the New Year. The Academy has firm plans to deliver 800 apprenticeships, 150 foundation degrees and re-skill 4000 workers in its first three years. Higher education is responding with eleven university institutions now offering Masters level courses.

¹⁰ <http://www.euskills.co.uk/index.php>

¹¹ A Skill Needs Assessment for the Nuclear Industry, <http://www.cogent-ssc.com/pdf/SNA/Nuclear.pdf>

- 4.8.4 Building significant numbers of new power stations and new transmission and distribution network infrastructure would require a strengthening of the science, engineering, project management and on-site trade/technician skills base¹². We anticipate increased competition for construction resources, in particular, if planned capital projects in the UK all go ahead. Specialist science and engineering skills, for example in reactor engineering, would be needed in the short term for design and licensing; these are in short supply and face a demand overlap with the submarine reactor programme. This would need careful resource management until the universities and graduate training programmes can deliver more people.
- 4.8.5 The longer lead times for nuclear power would allow time for the industry to plan ahead for the skills needed to build and operate the stations and to manage supply chain constraints through such measures as placing contracts well in advance to secure slots in manufacturers' order books.

Planning

- 4.8.6 Another risk to construction programme delivery is delays in the planning and consents regime. There are numerous examples where major infrastructure projects, both of generating plant and transmission networks, have been delayed for a number of years in the planning and consenting processes. At the current time, arguments about the need for major infrastructure can be re-rehearsed every time a planning application for a nationally significant project is received. Invariably this causes delay, uncertainty and expense for all parties concerned and acts as a disincentive for investors.
- 4.8.7 The proposed reforms in the Government's White Paper *Planning a Sustainable Future*¹³ aim to make the planning and consents regime, including for major energy infrastructure projects, more streamlined and certain whilst ensuring that the rights of interested parties are safeguarded. Policy will be clearly set out by Ministers in National Policy Statements (NPSs); consents will be granted by a newly established Infrastructure Planning Commission (IPC) that will have to ensure decisions are in line with national policy as defined in the appropriate NPS.

12 Nuclear Employers Survey 2005, http://www.cogent-ssc.com/research_and_policy/LMI_and_reports/Nuclear_Employers_Survey.pdf

13 <http://www.communities.gov.uk/publications/planningandbuilding/planningsustainablefuture>

- 4.8.8 By producing NPSs for energy, the Government intends to address the question of need – including the importance of the market providing additional new infrastructure to address security of supply challenges and to meet climate change targets – so that the issue will not have to be re-visited during the planning application process. NPS, will be subject to public consultation and parliamentary scrutiny to ensure they are both robust and fit for purpose.
- 4.8.9 These reforms will be delivered through the Planning Reform Bill which is scheduled to be introduced in the 2007/2008 Parliamentary session. The Bill will set out a new planning regime for major infrastructure projects in water, transport and waste as well as energy; it will also set out reforms to the Town and Country Planning Act which will have an impact on smaller energy (<50 MW) projects, with particular emphasis on renewable energy. It is envisaged that the IPC will be operational in 2009.

Lead times

- 4.8.10 Broadly, the whole process from decision to invest through to start up takes about five years for a CCGT power station – two for design, planning consent, project planning and permitting, two for construction and six months for commissioning. A coal-fired power station might take around seven years, of which four to five years would be needed for construction. A new nuclear power station might take around five years for construction but has an extended licensing period that would extend the overall programme towards ten years.
- 4.8.11 While there may be scope for some time savings in the front end, especially for a fleet of identical stations, growing demand for new power stations from around the world is likely to lead to longer order books at the key manufacturers. Moreover, we expect the UK's construction resource to be under pressure by demand from other sectors. It is therefore possible that these factors will lead to a lengthening of the current lead times.

4.9 Security of supply: Supply capacity margin

- 4.9.1 We showed in Chapter 3 that the margin between demand and supply capacity correlates well with security of supply, which is why we concentrate mainly on this indicator for the rest of this chapter. It must be emphasised, however, that no amount of spare capacity can ever guarantee that demand can be met under every circumstance. There will always be some level of risk that cannot be eliminated.
- 4.9.2 It is also important to bear in mind that security of supply can be improved from the demand side as well as from the supply side. For example, greater energy efficiency, increased microgeneration and/or more price-responsive demand can improve security by reducing the electricity market's reliance on supply-side adjustments to ensure that supply and demand meet.
- 4.9.3 The traditional definition of capacity or plant margin measures the proportion by which installed electricity generating capacity exceeds peak electricity demand on an annual basis. By this calculation, the capacity margin in Great Britain over recent years has been about 20%. However, it is important to recognise that it is impossible to assess, either ex ante or ex post, whether this is the optimal level.
- 4.9.4 This methodology implicitly assumes 100% availability of all input sources, which is not true of any electricity source and may be especially problematic for an intermittent and rapidly growing generation source such as wind power. Our modelling has shown that security of supply correlates more closely with a capacity margin which is adjusted to take account of availability using a "de-rating factor". This factor, which is specific to each type of generating technology, reflects the probable proportion of a source of electricity which is likely to be technically available to generate, even though a company may choose not to utilise this capacity for commercial reasons.
- 4.9.5 This chapter uses the following constant availability factors, which are based on National Grid's Consultation for Winter 2007-2008¹⁴. These de-rating figures reflect assumed availability of generating capacity on the twenty highest demand days during winter.

¹⁴ <http://www.nationalgrid.com/uk/Gas/TYS/outlook/>

Table 4.4: Installed capacity and indicative availability factors for different electricity generating technologies at peak demand in Great Britain in 2006 – 2007

Source	Installed capacity¹⁵ (GW)	Assumed availability (%)	Effective capacity (GW)
Coal	28.78	85	24.46
CCGT & CHP	25.59	90	23.04
Nuclear	11.88	80	9.50
Oil & OCGT	4.08	95	3.88
Wind & Biomass	0.97	35	0.34
Hydro	3.54	60	2.12
French interconnector ¹⁶	1.99	100	1.99
TOTAL	76.83	–	65.33

Source: National Grid; BERR

- 4.9.6 For the current generating mix and using these availability assumptions, effective capacity is some 17% lower than installed capacity. A higher proportion of low-availability generating capacity in the mix would increase this differential.
- 4.9.7 Different assumptions of availability are possible and these would of course give rise to different results. There is no single correct availability factor for any specific generator class and availability factors can fluctuate over time, for example between winter and summer or as technology develops.
- 4.9.8 The effective capacity margin, then, depends on demand on the one hand, and on the quantity and nature of generating capacity on the other. As explained above, all are subject to a wide range of uncertainty. This means that the theoretical range of possible future effective capacity margins is very wide.
- 4.9.9 In reality, however, we are unlikely to see such a wide range in the effective capacity margin because the supply of and demand for electricity, as with any commodity in a

¹⁵ Only the Anglo-French interconnector is included in the table as an electricity source because it typically exports to Britain at times of peak demand. In contrast, the Moyle interconnector to Northern Ireland usually imports electricity from mainland Britain, so it is captured in “peak demand”.

¹⁶ Installed capacity figures are Transmission Entry Capacity (TEC) values published by National Grid.

functioning market, are related to each other through price. If there is excessive supply, prices will tend to decline, which in turn will eventually increase demand and encourage operators to withdraw production; this will lead in time to the reduction and elimination of the 'over-supply'. Conversely, if the market is tight, prices and profits will rise, thus limiting demand and encouraging new build¹⁷. In a similar fashion, market participants will also respond to the level of expected prices, based on their expectations of supply and demand.

4.10 Future trends in the effective capacity margin

- 4.10.1 It is likely that additional new build, over and above what is already planned for, will be needed in due course - the exact amount and timing depending on demand levels, the rate of plant closures and how much of the capacity currently in development is actually delivered. We identify below three broad scenarios to show the possible different levels of opportunity for additional new build, given differing assumptions about these factors but not assuming any investor response. At the end of this chapter, in Box 4.1, we go on to present further scenarios, based on work commissioned from Redpoint for the Energy White Paper, which do additionally include assumptions about future investment in response to the market signals and expectations which would emerge as the supply-demand balance changes.
- 4.10.2 The "tough carbon" scenario starts from the assumption of a strong regulatory approach to carbon reduction, delivering a high price of carbon (which in turn raises the wholesale price of electricity) and helping consumers to become more environmentally aware and technically enabled. This leads to electricity demand being at the lower boundary of the inner fan in Chart 4.1, as a result of more energy-efficient consumption, increased microgeneration and demand-side response to price signals.
- 4.10.3 This scenario also assumes that lower demand leads to only half the proposed new gas-fired capacity being built and the LCPD opted-out power stations running less intensively, thus prolonging their lives to the end of 2015. The high carbon price encourages a higher level of new renewables

¹⁷ <http://www.ukerc.ac.uk/ResearchProgrammes/EnergyInfrastructureandSupply/EnergyInfrastructureAndSupply.aspx>

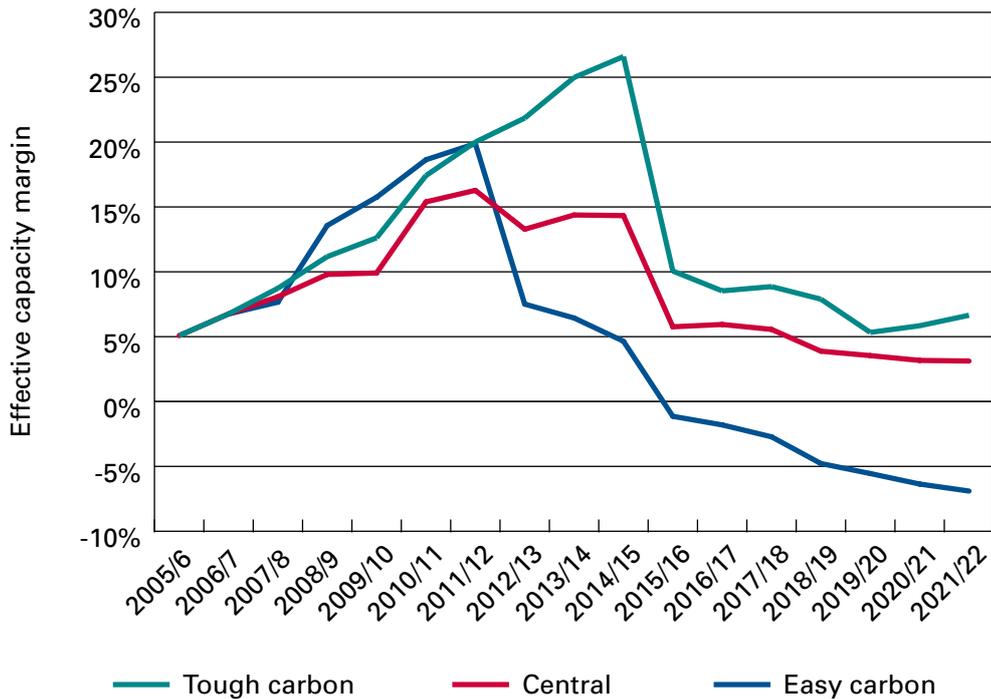
build and also encourages nuclear power station owners to apply for life extension for all of the nuclear AGR plants by five years beyond the scheduled closure date; we assume here that this is allowed by the Nuclear Installations Inspectorate. This scenario would tend also to lead to lower growth in annual gas demand.

4.10.4 In contrast, the “easy carbon” scenario supposes a low carbon price and a limited impact of carbon reduction policies. Electricity demand is at the high end of the inner fan in Chart 4.1. This encourages the LCPD opt-out power stations to run harder and consequently close earlier, either because they run out of hours or because they wear out. All of the proposed new CCGTs are built and some new coal-fired generating capacity is also delivered under this scenario because it is relatively cheap to emit carbon. The carbon price is assumed to be too low to encourage either a high level of renewables build or nuclear life extensions. This scenario would tend to raise the growth rate of gas demand.

4.10.5 The central scenario uses the demand base case shown in Chart 4.1. We assume that LCPD closures take place as described in Table 4.2 above. No nuclear life extensions are included. Delivery of new CCGTs (above what is already under construction) is delayed by two years and only half of the proposed new renewable capacity (above what is already under construction) is built.

4.10.6 These scenarios do not assume any additional plant closures after 2015. It is possible, however, that some coal-fired power station owners will choose not to invest in the installation of equipment such as selective catalytic reduction that would be necessary to meet the further tightening of emissions standards which will be introduced under the Large Combustion Plants Directive from 2016 onwards. These stations would also have to close or reduce their level of operation, opening up a requirement for additional new capacity over and above that which will be needed to fill the gap left by the expected first-stage LCPD and nuclear closures. Looking still further ahead, the first generation of gas-fired power stations in Britain will start to reach the end of their normal operating lives (in the absence of refurbishment) during the 2020s.

Chart 4.3: Effective capacity margin under the three scenarios set out above before prospective new investment is factored in



Source: BERR analysis of National Grid figures¹⁸

All three scenarios show an increase in effective capacity margins in the short term as plant currently under construction comes onstream, followed by a decline after about 2012 as a result of the expected plant closures, and in the absence of any new investment being factored in.

4.10.7 Chart 4.3 shows what happens to the effective capacity margin under these scenarios in the absence of any investor response.

4.10.8 It is worth noting that while, in the absence of new investment, the “tough carbon” scenario delivers the highest level of security, as measured by the effective capacity margin, the amount of new generating capacity delivered is lowest in absolute terms in this scenario. This emphasises the importance of demand as well as supply capacity in determining security of supply in the electricity market.

4.11 Transmission Networks

4.11.1 Generally, the record of the electricity transmission network in Great Britain has been good. For instance, for the seven years commencing 2000, the National Grid transmission

¹⁸ <http://www.berr.gov.uk/files/file41824.pdf>

network in England and Wales experienced an average loss of unsupplied energy of only 533MWh p.a. This equates to a transmission reliability of approximately 99.99983% over the period, measured in terms of the index of unsupplied energy to energy actually delivered.

4.11.2 The operators of electricity distribution networks in Great Britain face price control incentives to reduce the number and duration of interruptions to supply over their network. Since these incentives were introduced, an average distribution service customer would have experienced only four interruptions in total over the last five years (2001-02 to 2005-06). The average duration of such interruptions is about 90 minutes.

4.11.3 Current and future customer connection requirements may result in the need to extend and reinforce the transmission infrastructure into geographic areas of the UK that have historically not required any. The forthcoming substantial changes in the electricity generating fleet are likely also to require large scale investment in and development of the high voltage electricity transmission network. The amount, nature and timing of investment in the development and maintenance of the national transmission and distribution networks is the subject of regulation by Ofgem and NIAUR in discussion with the network owners¹⁹.

4.11.4 Transmission investment requirements are likely to be affected by the type of generation that is being built. Some types of renewable generation will typically be associated with greater transmission investment requirements. For example, wind generation often needs to be sited at the extremities of the network in order to capitalise on optimum weather conditions. In contrast, fossil fuel and nuclear plant can often be located closer to demand and are more likely to be commissioned in areas where there is spare network capacity. In part, this would be in response to Britain's locational transmission charging regime, which has been designed to reflect long-run network costs. These costs are lower for generators in areas which have spare transmission capacity and/or which are near the main centres of electricity demand.

¹⁹ <http://www.ofgem.gov.uk/Networks/Trans/Pages/Trans.aspx>
<http://ofreg.nics.gov.uk/Electricity%20Register.htm>

4.12 Conclusions

- 4.12.1 In the near term, the security of supply outlook in the electricity sector looks robust, with a relatively large amount of new plant under construction. However, in the medium term the electricity generating industry faces a substantial challenge in ensuring delivery of the new generating capacity that will be needed if demand continues to rise. There are uncertainties around future levels of electricity demand and new electricity build as well as the exact timing and sequence of plant closures. In any case, improvements in energy efficiency and demand-side responsiveness would also help to underpin continued security, as well as limiting the need to invest in new generating capacity.
- 4.12.2 There are indications that firms are already considering these challenges and no reason to conclude at this stage that the response will not be adequate. However, this is an area on which the Energy Markets Outlook will continue to focus.

Box 4.1: Modelling the market

An independent study commissioned for the 2007 Energy White Paper²⁰ examined the different security of supply outcomes that might prevail under a “well functioning” and an “imperfect” generation market environment, against a background of two possible states of the world (“base case” and “challenging case”).

In short, the well functioning market environment is an ideal that was modelled to incorporate the following features: far-sighted developers; a liquid forward market for electricity; limited barriers to entry; certainty around the future existence of the EU ETS; absence of supply chain constraints; and a supportive planning regime.

An imperfect market environment contained the opposite features, involving a mixture of government and market failures in addition to developers being unable or unwilling to look far ahead, due in part to uncertainty around the future existence of an explicit carbon price.²¹

Results from the modelling suggest that, even in the worst years of the challenging case, effective capacity margins do not fall below about 3-4%²². This assessment is obviously dependent on various assumptions about how prices and price expectations are set in the market, what level fossil fuel and CO₂ prices are expected to be and the costs of new capacity. However, the modelling indicates that de-rated capacity margins are unlikely to remain at such low levels for any sustained periods of time as higher prices drive investment in new capacity.

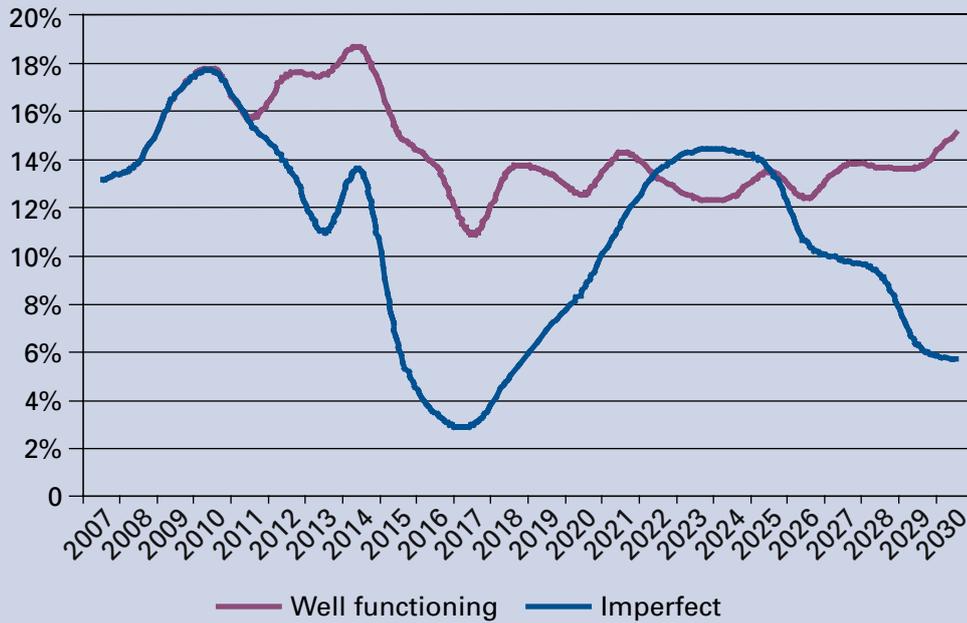
As illustrated below, the annual probability of inadequate generation is more stable in the well functioning market environment than under the imperfect market environment. In the former case, this is because the self-correcting forces that push the generation market back towards a long-run equilibrium are sufficiently timely and responsive to prevent big swings in the effective capacity margin as new projects (including those not yet proposed) emerge in future, as shown below.

20 <http://www.berr.gov.uk/files/file38972.pdf>

21 The ways in which the Government seeks to address these imperfections and bring the market closer to the well-functioning ideal are set out in the Energy White Paper.

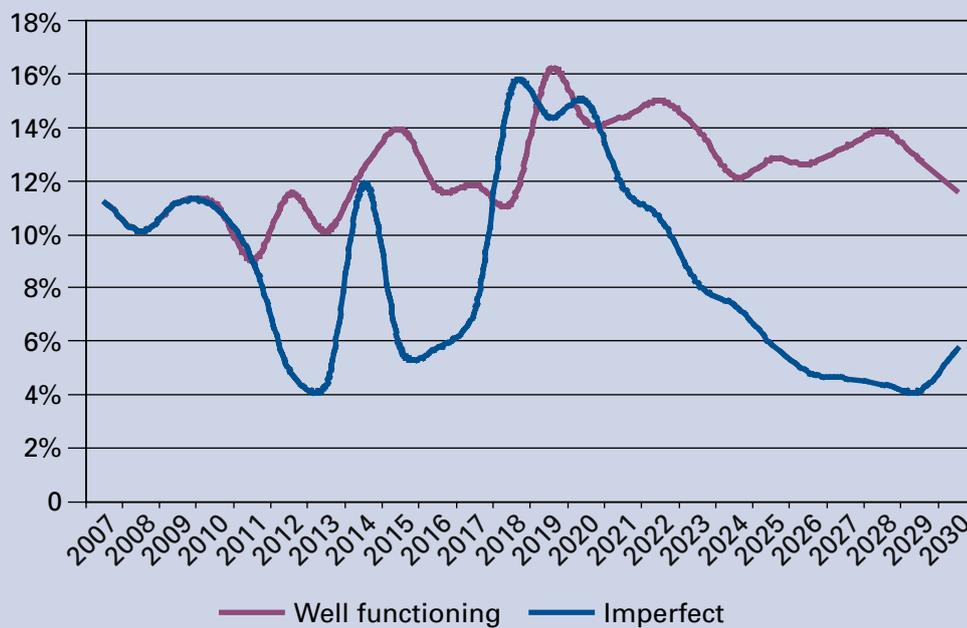
22 It should be noted that Redpoint were using different availability factors in their calculation of the effective capacity margin from those used in the scenarios set out in section 4.9. Their results are not therefore precisely comparable.

Chart 4.4: Future development of the effective capacity margin in the well functioning and imperfect market environments under the base case.



Source: Redpoint Energy

Chart 4.5: Future development of the effective capacity margin in the well functioning and the imperfect market environments under the challenging case.



Source: Redpoint Energy

In the imperfect market environment, market participants tend to have a constrained time horizon. This means that they react to scarcity of capacity rather than to expectations of such scarcity, leading to a more cyclical investment pattern and times of market tightness.

Box 4.2: Electricity supply and demand in Northern Ireland

There are three power stations in Northern Ireland (NI), two of which are gas fired and one which is coal/oil fired and which has 'opted in' to the LCPD. NI has current total installed generation capacity of about 2,756 MW (including renewables). Allowing for availability of generation plant, the current peak demand which can be met is c 2,079 MW with an estimated peak electricity demand expected during 2007-08 of about 1,760 MW. Indigenous renewables account for just under 4% of electricity output. Forecast estimates of future generation capacity margins in NI can be found in the System Operator for Northern Ireland (SONI) 'Generation Seven Year Capacity Statement', the most recent of which covers the period 2005/06 – 2011/12.²³

There are currently proposals to construct a new 450 MW CCGT to commence operation in NI by end 2010. There is also 250 MW of additional wind generation with planning permission which could be expected to come on stream by around the same time, and around a further 1,000 MW of wind generation in the planning system.

The introduction of the all-island Single Electricity Market (SEM) from 1 November 2007 will introduce greater competition in generation and substantially increase the potential generation mix available for supplying NI customers.

Interconnection

The Moyle interconnector links NI with Scotland and has a capacity of 450 MW. The North-South interconnector linking the NI and Republic of Ireland (RoI) networks has a capacity of 600MW. However, net transfer capacity is limited to 300 MW, North to South, mainly because of transmission constraints in RoI.

It is planned to build a second North-South interconnector by late 2012 which will more than double North-South trading capacity. The second interconnector will provide benefits to Northern Ireland, including:

- improved security of supply through network stability and access to additional power supplies;

²³ www.soni.ltd.uk/upload/Gen_SYS_2004_Final.pdf

- greater grid support to allow for additional wind power generation;
- scope for improved competition in the SEM with the opportunity for cost savings to NI and RoI consumers; and
- access for NI generators to a larger market for export opportunities.

Following the installation of the second North-South interconnector, it is proposed to replace the separate generation adequacy standards in Northern Ireland and the Republic of Ireland with a combined all-island generation security standard.

