The Atomic Clock

How the Coalition is gambling with Britain's energy policy

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SUMMARY

- Twenty years after electricity privatisation, the Coalition is seeking to artificially fix the price of electricity in an effort to support more wind energy and kick-start building of new nuclear energy plants.

- As part of this rejection of a liberalised energy market, a new carbon price floor will be introduced. This can be considered as a Treasury revenue-raising tool that will raise energy prices for both consumers and industry without guaranteeing new nuclear plant.

- Prices are likely to more than double by 2030. The number of households in fuel poverty could rise to nearly 8.5 million households by 2030 – a third of all households. Energy intensive industry, such as steel, cement and heavy manufacturing, will also face higher bills.

- Nuclear generating capacity could fall by 75% in the next few years. Any further delays in approving new nuclear plant will mean this plant will not make a net contribution to UK electricity supply before 2025, at the earliest.

- The Coalition's new energy plan does not replace the loss or diversity of over 12,000MW of old but vital coal and oil 'baseload' and 'peaking' capacity which must close by 2016 due to EU rules. Last winter, coal plants shouldered nearly 50% of electricity demand.

- Large scale subsidy for renewable energy is not delivering a return for taxpayers. Irrespective of large scale new capacity of onshore and offshore wind coming online in 2010, renewables' share of electricity generation remained flat between 2009 and 2010.

Recommendations

- The Coalition should revise its 'capacity payments' mechanism to guarantee some of this under sentence 'baseload' plant is maintained and available when required while new nuclear and clean coal is under construction.

- The Government risks filling the nuclear delay 'gap' with yet more gas-fired plant (CCGT). Even with the welcome possibility of shale gas, this is a dangerous short-term development which could make the UK dependent on gas for over 80% of electricity generation by 2025.

- The carbon price floor will provide benefits to existing nuclear generators but will not be effective in incentivising new nuclear build from all atomic investors; it will merely push up bills at a time of austerity.

- A carbon price floor and its trajectory should be delayed until the first new nuclear power station is close to commission. In this time the Government should campaign for an EU-wide carbon price floor so that the UK does not endure higher energy prices than in the rest of the EU.

1. INTRODUCTION

Low cost, reliable and abundant energy is essential to the future competitiveness of British industry. The Coalition wants to see a manufacturing-led economic recovery but this will only be forthcoming if energy prices are competitive by international standards. Unilateral energy taxes, delays to new generating plant and a lack of generation diversity will help drive up costs.

In 2010, total electricity supply in the UK was 384 terrawatt hours (TWh), an increase of 1.1% on 2009. Demand is forecast to more than double by 2050 as we shift more transport and heating onto the electricity grid. On top of that, intermittent renewables, particularly wind will need more conventional power plant back-up.

Britain's installed and available electricity generating capacity in 2010 was 90,000 megawatts (MW). Almost 12,000 MW of diversified capacity is to shut over the next five years as coal and oil plants close to meet new EU rules. Older nuclear power stations, built in the 1960s and 1970s and representing 7000 MW are also set to close bringing this total plant closure to nearly 20,000 MW by 2020. Consequently £110 billion of investment is now needed to build the equivalent of 20 large power plants, to upgrade the grid and to 'green' the energy sector to meet EU targets.

The 'market' for electricity, established 20 years ago after privatisation, is now largely undermined because there is no way it can deliver the expensive decarbonisation the Coalition wants. Today, investment instead is driven by central planning and subsidies, which will be set to meet the wishes of developers, particularly the 'Big Six' energy companies.

This oligopoly, in which four large continental companies are dominant,[5] will enjoy an arm-lock on this and future governments. Prices will rise and economic growth will be held back in the attempt to meet EU green energy targets. The monopolisation of the power market, over 20 years since electricity privatisation, must now be urgently re-addressed.

New analysis in this pamphlet shows the Coalition's four part policy to deliver the needed energy investment and to deliver on ambitious green energy targets risks raising the number of UK households in fuel poverty towards 8.5 million (a third of the total) by 2030. Its unilateral carbon price floor will primarily tax the 75% (and growing) of the UK electricity generating grid dependent on coal and gas and will push UK energy prices far higher than those in the rest of the EU. The cost of this tax will be passed to consumers and energy intensive industries.

The price floor also risks another 'dash for gas'. That will result in over 1 billion tonnes of economically recoverable UK coal reserves becoming 'stranded' as the market for indigenous coal production collapses before new clean coal plants are ready.

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5 One of which, EDF Energy, is effectively French state-owned.

There is an alternative. The Coalition must now move to approve a fair and balanced nuclear power delivery strategy which rewards all new atomic power stakeholders. It should approve and encourage more baseload energy diversification, including early delivery of new efficient and cleaner coal plants. Its strategy to deliver more green energy must show more value for money before all consumer confidence in the weather-dependent renewables sector is lost.

There is energy security in energy diversity but the stakes of getting this wrong and risking a high cost, unstable and undeliverable energy strategy as Britain's economy struggles to grow could not be higher. The atomic clock is ticking for the Coalition on energy policy.

2. BRITAIN'S NUCLEAR LOVE-HATE AFFAIR

A history of false starts

In 1956, Queen Elizabeth II flicked a switch and the first nuclear generated electricity surged into British homes from the Magnox reactor at Calder Hall. This was the world's first large scale nuclear power station. A decade later, several Magnox stations were producing power. But there still had not been enough investment in new electricity generating capacity. In the winter of 1964-65, power outages deprived homes and businesses of electricity.

The new Labour Government of 1964 was committed to establishing a new national planning regime to help smooth the construction of new power stations. New Advanced Gas-Cooled reactors (AGRs) emerged from this process (alongside new coal plants). This was possibly the worst energy policy decision taken in the UK between 1945 and 1990. The average length of time to build reactors was 10 years and it was almost 20 years before their output matched their planned capacity. It had also been hoped that these reactors would be the basis for a new technologically-based export industry. However, no AGR export

order for this British technology ever materialised. Dungeness B (AGR) which commenced construction in 1965, is the single most disastrous engineering project undertaken in Britain. It took 17 years to commission the first reactor and the second was not ready until 1985. Including interest during construction the plant cost of the order of £7.5bn in 2010 money terms; ranking as one of the world's most expensive nuclear plants and also one of the most unreliable.

In 1973 the then Conservative Government rejected a plan by the Central Electricity Generating Board (CEGB) for 32 new Pressurized Water Reactors (PWRs) (totalling a huge 41,000MW) to be ordered by 1982. The plan had been based on the CEGB's forecasts for future electricity demand growth (which turned out to be grossly exaggerated).

Following the OPEC oil shock of the mid 1970s and the new Labour Government's 'Plan for Coal', the inconsistencies of UK energy policy had, by 1980, left the CEGB planning only one new reactor, at Sizewell, in Suffolk. This plant did not finally come on line until 1995, 15 years after inception and following a prolonged public inquiry.

In late 1979, David Howell, the new Conservative Secretary of State for Energy, delivered a carefully worded statement to the House of Commons. It was widely reported as a call for a programme of one new nuclear power station a year for 10 years, with the first order for new PWRs to be placed in 1982. If delivered, such a project would deliver up to 20,000MW (20GW) of new baseload capacity, thus dramatically reducing Britain's then dependence on home produced coal and the National Union of Mineworkers which was the bugbear of Conservatives who wanted payback for the 3 day week and the 1974 election defeat.

Closer textual scrutiny revealed that Howell had said nothing of the kind. What he had said was that the Conservative Government would encourage the CEGB to consider such a possibility. The official statement had been couched in language designed to bolster the drooping morale of the British nuclear industry. But the Government had taken care to leave itself an escape route.

Within a year, facing a deep recession, an oversupply of coal and falling electricity demand, both the Government and the CEGB were vehemently disavowing any commitment to a programme of new nuclear power stations, or any decision on specific plant models.

Since the commissioning of Sizewell B in 1995, the British energy landscape has changed radically. In particular, the "dash for gas" created a major new source of generation.[6] A milestone was passed in 2010 when the UK became over 50% dependent on gas for the generation of electricity (see Figure 6). Today, over a third of all the gas used in the UK is for the generation of electricity.

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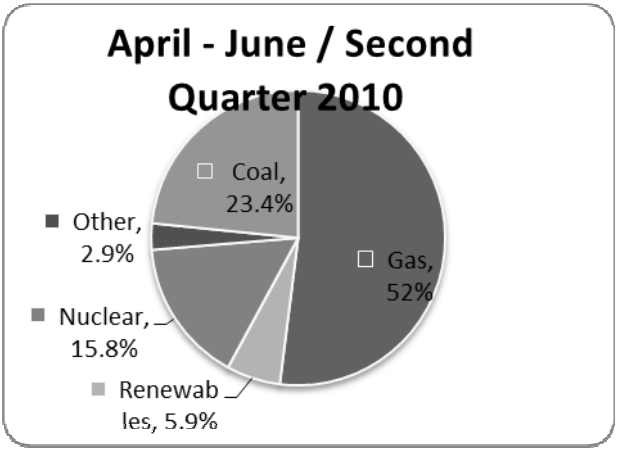
[6] The "dash for gas" was the result of a number of factors which converged in the 1990s including the lifting of an EU Directive which had restricted the use of natural gas in power stations to generate electricity; the low cost, quick to build and flexible nature of natural gas plants; the then abundant indigenous gas from North Sea reserves; electricity privatisation and the consequent demise of the CEGB; and emerging environmental pressures (gas being a less carbon-intensive fuel, compared with coal, when used to generate electricity).

Figure 1: More than 50% of UK electricity is now regularly generated by gas-fired power plant (CCGT)

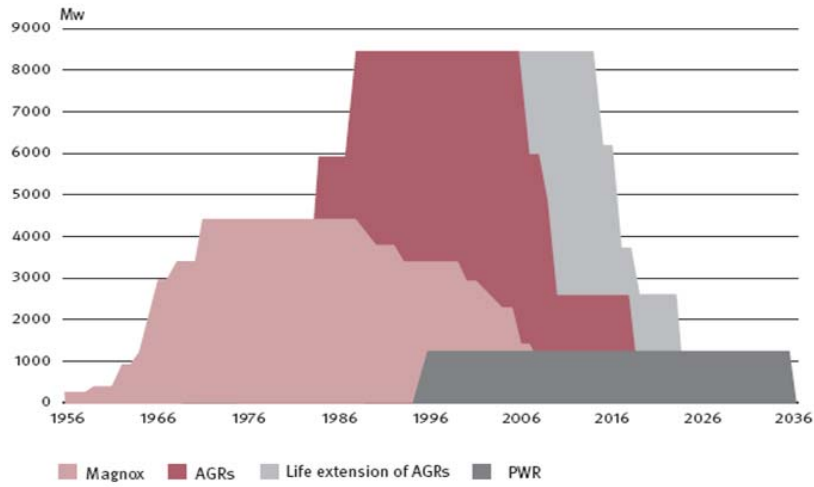


Source: DECC Energy Statistics, Quarter 2, 2010

Since 2004 there have been a plethora of ministerial statements in favour of new nuclear power stations for reasons of both energy security and to attempt to meet strict carbon reduction targets as part of UK adherence to climate change policies. However, progress has been very slow. Today, out of the approximately 90,000MW of potential electricity generation, only 11000MW is provided by our ageing nuclear plant with none under construction. Over 85% of this nuclear plant is owned by Electricité de France (EDF Energy), following that company's acquisition of British Energy in 2009.[8] EDF's UK nuclear capacity could fall to under 3,000MW by the end of the decade.

[8] The remaining smaller nuclear plants are operated by Magnox Ltd.

Figure 2: Three generations of nuclear power in the UK



Source: CBI

Current Coalition policy on nuclear energy

From the point of view of the nuclear industry, there were plenty of ministerial initiatives and warm words in the 1960s, 70s and 80s. But very little action. EDF and others have now expressed interest in building up to five new nuclear plants on existing nuclear sites. But are we in danger of facing a similar failure of will to deliver new nuclear plant?

It is certainly true that the Coalition has been clear about its intentions. For example, in December 2010, the Minister for Energy told the Commons Energy and Climate Change Select Committee, "We have identified sites that would allow for 16,000MW of nuclear… we believe there is interest in building 16,000MW of nuclear power." This is a herculean aspiration. The nuclear industry's ability and desire to deliver on this will depend on whether the Government can create the fair environment in which new nuclear build can take place by all interested stakeholders, not just EDF.

Figure 3: Estimated new nuclear build schedule and scale in the UK

Developer	Site	Type	Capacity (MW)	Proposed start
EDF Energy	Hinkley Point C	EPR x 2	3340	2018 & 2019
EDF Energy	Sizewell C	EPR x 2	3340	2020 & 2022
Horizon*	Oldbury B	EPR x 2 or AP1000 x 3	3340-3750	2022
Horizon	Wylfa B	EPR x 2 or AP1000 x 4	5000	2020
NuGeneration*	Sellafield	Not yet stated	3600	2023

* Horizon is a consortium made up of E.ON and RWE npower; Nugeneration is a consortium made up of Iberdrola, GDF-Suez – Scottish and Southern Energy have recently withdrawn from this consortium; EPR is the European Pressurised Reactor.

Source: World Nuclear Association

The Coalition has unveiled a four part strategy to deliver its new policy ambitions to deliver new nuclear and other low carbon energy options. This will introduce four new pricing and emission limiting mechanisms that will fix the electricity price in favour of renewables and new nuclear plants in the hope that this will attract new investment in electricity generation. It should be noted that each of these mechanisms will also force up the price that electricity producers charge consumers due to the UK's largely fossil-fuel based grid.

Pricing Mechanism One: the Carbon Price Floor

A minimum carbon price floor is to be introduced. All coal, gas and oil-fired power stations will be forced to pay a pollution tax to the Treasury from 2013. This would immediately affect the 75% (and growing) of today's electricity generating grid which is made up of coal, oil and gas-fired power plants. Generators will pay a fixed and rising price for every tonne of carbon they emit.

A carbon price floor is intended to encourage generators to invest in low carbon technology in the short-to medium-term. In the 2011 Budget Statement the Chancellor confirmed a UK carbon price floor starting in 2013 at £16t/CO2 rising to £30t/CO2 by 2020 and then rising to £70t/CO2 by 2030 (all in real 2009 prices). The policy will raise £740 million in 2013 increasing to £1.4 billion in 2015, according to the Treasury, making it the second biggest new revenue gain for the Exchequer in that year after increases to North Sea oil and gas taxes.

Pricing Mechanism Two: Contract for Difference – Feed in Tariff

Contract for Difference – Feed in Tariff (Cfd-FIT) is another incentive to low carbon generators. It sets the price of electricity on long-term contracts at a level high enough for nuclear and renewable energy investors to see a return on the large investments that need to be spent on new builds.

This will mean the Government, possibly through a new agency, has to commit to pay a premium for low carbon electricity, whether it be generated by nuclear power, new coal or gas plants with carbon capture and storage, or renewable energy. This cost will be in turn met by consumers and industry through higher energy bills. How Government will set the price for low carbon electricity, particularly from new nuclear plants, is still unclear.

The CfD-FIT starts paying out once electricity is being generated. This means that the nuclear construction risk is in theory with the company. However, a few years ago EDF Energy claimed it could build a new nuclear plant against a market price. It has since pushed for a carbon price floor and it has also lobbied hard for the CfD FIT. EDF is in a strong position to drive the contract's terms in its favour and against those of its competitors. Given that the other two EPR nuclear power plants being built in Europe (Olkiluoto in Finland and Flamanville in

France) are seriously over-budget and late in construction, there must be serious concerns that the nuclear companies will demand a higher strike price to make up for that construction risk.

Pricing Mechanism Three: Capacity Payments

'Capacity payment' subsidies are to be paid to the builders of, for example, new gas-fired power stations to provide baseload back-up. These new fossil fuel plants are considered vital to cover or shadow the vast amount of weather-dependent (and thus intermittent) renewable energy which is being planned.

Pricing Mechanism Four: Emission Performance Standard

The Emission Performance Standard (EPS) will limit the amount of carbon a power plant may emit to ensure no new high-carbon electricity plants – such as unabated coal or oil – are built. However, a revealing paragraph in July's Electricity Market Reform White Paper states that the Secretary of State will have the power to disregard the EPS in times of "energy supply emergencies" and allow coal plant, for example, to operate at high load without carbon capture technology switched on to provide additional electricity. DECC's preparation for possible future supply problems is revealing.

The new energy White Paper, 'Planning our electric future' was laid before Parliament in July 2011 with a detailed text but a clear and basic priority: the delivery of new UK nuclear plants as quickly as possible. Delivery of more renewables and successfully meeting renewable targets is now a secondary mission as public confidence in this sector slumps to new lows. Of concern is that the legislative timetable has slipped to May 2012 for the introduction of the Bill.

Costs of the Pricing Mechanisms

The Department of Energy and Climate Change (DECC) has admitted that the combination of Capacity Payments and CfD-FITs could double electricity prices by 2030. In an attempt to play down the costs of the above measures, DECC today claims that by 2030 the average annual electricity bill would rise from £455 to £653 (in real terms), an increase of 43.5%. However, DECC admits that by 2026-30 it expects the unit price of electricity will rise from £118 per megawatt hour to £179/MWh, an increase of 52% over 20 years. Increased costs from transmission and distribution will further increase prices.

On that basis electricity bills would rise on average by £225 to £748. When inflation is factored in, electricity bills would double to about £1,000 by 2030. Additional costs resulting from a carbon price floor of £70t/CO2 in 2030 could help push average electricity bills beyond £1,100 by 2030.

If the natural trajectory of the carbon price floor is taken, then by 2020 the floor price will have increased electricity bills by over 15% on top of the increases necessitated by CfD-FITS and capacity payments as set out above. The carbon floor price could therefore increase electricity bills by £50 to £60 and rising by 2020 as generators pass on their increased costs.

Translating forecast energy price rises through DECC's Fuel Poverty Action Group's criteria that a 1% increase in energy prices leads to another 44,000 households falling into fuel poverty, over seven million households will be in fuel poverty by 2020 and nearly eight a half million households could be in fuel poverty in 2030.[10]

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[10] Households are considered by the Government to be in 'fuel poverty' if they have to spend 10% or more of their household income on energy bills.

Figure 4: Projected electricity price rises and consequent fuel poverty figures to 2030

Year	Electricity Bill (£)	% increase due to CfD-FITS and carbon price floor from 2013	No. in fuel poverty (millions of households)
2011	455	0	5.5
2020	680	38	7.2
2030	823	67	8.4

Source: Author's calculations based on fuel price trajectory resulting from Electricity Market Reform and carbon price support

The cost implications for consumers, energy intensive industry and victims of fuel poverty could be considerable. This is further explored in Chapter 6.

3. THE UK'S MODERN ENERGY CONUNDRUM

The Coalition's energy policy objectives are ambitious and detailed. In order to cater for forecast increasing demand (though the National Grid envisages slower demand growth), achieve the decarbonisation of the electricity sector by 2030 and reduce greenhouse gas emissions by at least 80% by 2050, DECC estimates that £200 billion must be invested by the energy sector by 2020.

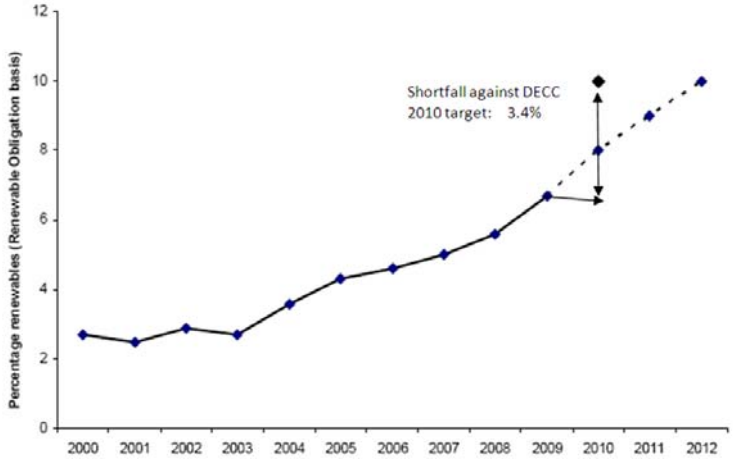
Following years of political prevarication (at best) in regard to new nuclear power stations, a new political consensus has emerged, broadly supportive of new nuclear power development in the UK following the move by the Labour Government in its 2008 Energy White Paper to reverse previous nuclear hostility. The Conservative Party hesitated but then committed its support. It is now widely accepted that carbon and energy security targets can best be met if nuclear investment is supported. However, because of the delay in supporting new nuclear build in the past, the route to achieving these targets is both challenging for consumers and potentially damaging for the UK economy, particularly energy intensive industry.

Slow progress with renewables

The UK is committed to consuming 15% of *all* energy from renewables by 2020. Yet, despite the considerable public subsidy dedicated to their support and development, partially sourced from consumers' electricity bills, renewable energy represented just 5.9% of UK grid supply in the second quarter (Q2) of 2010. This was blamed by lower than expected wind speeds and lower rainfall levels affecting hydro plants. Wind was down by 11.3% on Q2 2009, and hydro by 32%.

DECC failed to get close to its interim target to supply 10% of electricity from renewable energy sources by the end of 2010. It told the Commons Public Accounts Committee in November 2010 that it was not expecting to reach this target until 2012. To reach its legally binding 2020 target would mean that around 33% of all electricity consumed would be provided by renewables; more than a tripling of their share in eight years. This appears impossible on present trends.

Figure 5: Share of renewables



Source: Commons Public Accounts Committee/DECC Energy Statistics, 2011.

Renewable energy and carbon reduction targets

Tony Blair committed the UK to the most onerous and over-ambitious target of any EU member state for renewable energy growth and carbon emissions reductions. These now threaten economic growth and are contributing to rising fuel poverty. At the EU level carbon reduction targets involve a 20% reduction in carbon emissions by 2020 compared with 1990 levels and 80% reductions by 2050. But the US, China and India are not committed to similar targets so there is no global consensus to act in tandem. It can now be concluded that the EU's attempt to lead globally in this area has failed. In light of the UK's unique challenges in the energy space it should now move to abandon and revise both its renewable energy growth/consumption and carbon reduction targets.

The growing dependence on gas

On top of renewables' failure to significantly increase their market share of electricity generation is the steady growth of new gas-fired power stations. When gas and coal capacity is combined, then the UK becomes 75% dependent (and growing) on fossil fuels for electricity generation.

This looks set to increase further in the next decade as more gas-fired power stations come on line at the same time as 25% of older electricity generating capacity is due to close between 2015 and 2020. This includes old coal and oil plants which do not conform to the EU's Large Combustion Plant Directive (LCPD)[11] on emissions grounds and older nuclear plants as

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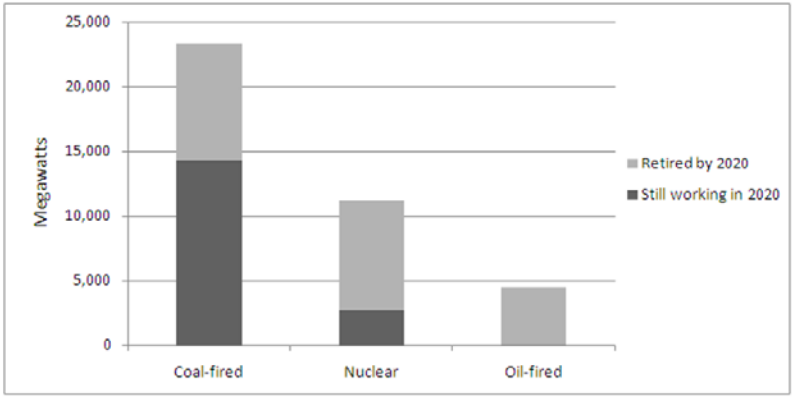
[11] The LCPD is an EU Directive which limits the operating of plants which have not retrofitted sulphur and nitrogen oxide reduction technology. These coal and oil plants have been granted 20,000 hours of operation between 1 January 2008 and 31 December 2015.

shown in Figure 8. New DECC figures show that three large coal plants (representing 8% of UK generating capacity) could close as early as 2013 due to them burning fuel for too many hours, especially in the extremely cold winter of 2010/11.[12] Another EU rule, the Industrial Emissions Directive (IED) will place extra pressure on modernised and more efficient coal plant by 2020.

Figure 6: Expected generation closures by 2016

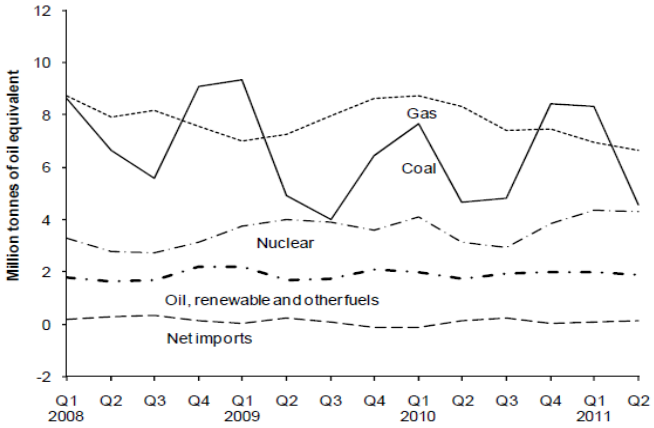


Source: DECC Energy Statistics.

Importantly, these coal and oil plants have provided vital supplies in recent years to meet baseload and peak electricity demand.

[12] The coal plants at Cockenzie, Kingsnorth and Tilbury could close as early as spring 2012, spring 2013 and summer 2013 respectively due to them having used up much of their operating time allowance.

Figure 7: Fuel used for electricity generation 2008 – 2011



Source: DECC Energy Statistics

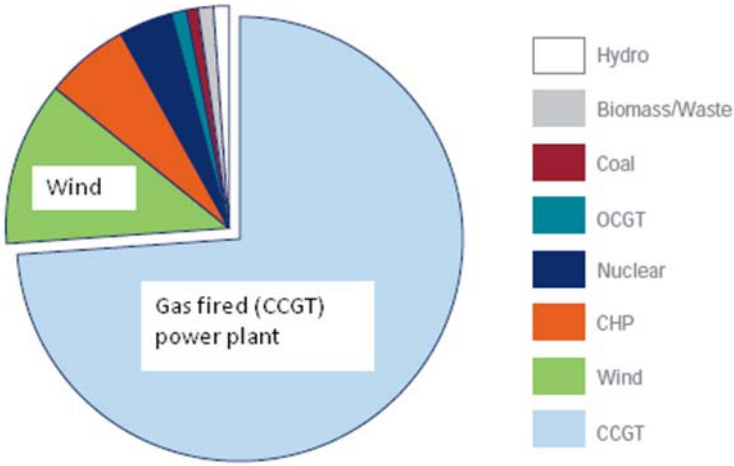
It is still not clear whether the Government intends to implement the LCPD or to derogate. Similarly, older nuclear plants which date from the 1960s and 1970s are also set to close, though a new carbon price floor could make it economically beneficial for their operators to keep them open for longer (although this could raise safety concerns, especially in light of Fukushima).

If the Government abides by the LCPD, and the nuclear closures proceed, then the UK will lose a diversified mix of nearly 20,000MW of alternative baseload capacity to be replaced by yet more gas in the short term.

According to National Grid data on contracted connection agreements, some 19,500MW of gas fired CCGT plant is in development and planned to be online by 2016, with an additional 12,600MW either under construction or consented; 32,000MW in total. Since the new Coalition was elected in May 2010, over 7,100MW of new gas plant has been consented, with a further 3,300MW awaiting approval.

In comparison, since 1990 there have only been small investments in retrofitting anti-pollution technology to coal and refurbishing nuclear plant. There has also been an increasing volume of wind, supported by Renewable Obligation Certificates (ROCs). However, nearly 75% of the generation investment between 1990 and 2010 has been for CCGT plant.

Figure 8: UK generation investment by technology since 1990



Source: Digest of UK Energy Statistics, DECC

UK gas production is rapidly declining. Total indigenous UK gas production in the second quarter of 2011 was 24.8% lower than in the corresponding quarter of 2010.[13] DECC estimates that imports could represent 70% of gas supply by 2020 and 80% by 2025. There is also increasing competition for shipborne

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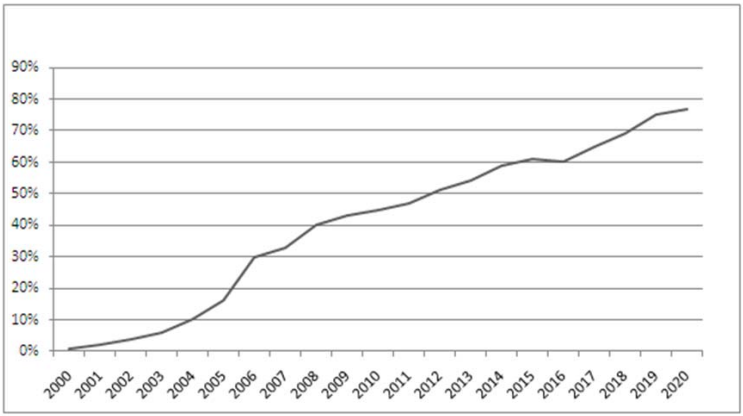
[13] DECC, *Energy Statistics – Quarter 2 2011*, 29 September 2011.

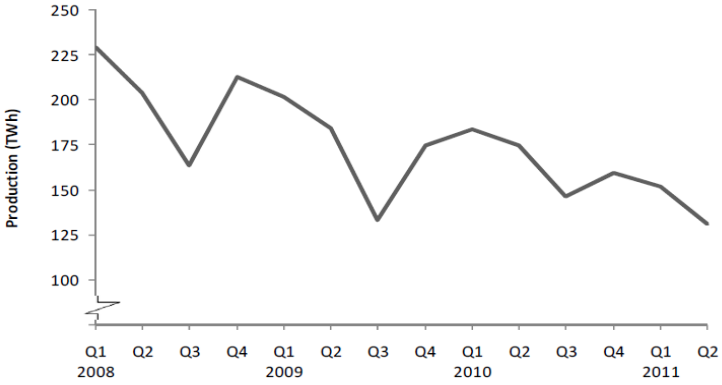
liquefied natural gas supplies (LNG), with Asian countries such as Japan often willing to pay higher prices than other Western countries. LNG imports in the second quarter of 2011 accounted for almost two thirds of total gas imports. This is the first quarter where LNG imports have exceeded pipeline imports.

Figure 9: Imported proportion of UK gas supplies 2000 – 2020



Source: National Grid, Gas Transportation Ten Year Statement, 2009.

Figure 10: Decline of UK natural gas production 2008 – 2011



Source: DECC Energy Statistics 2011

4. WHY THE NEED FOR NEW NUCLEAR?

11 March 2011 at Fukushima will assume popular notoriety for nuclear power in a similar manner to 26 April 1986, at Chernobyl and 28 March 1979 at Three Mile Island. The disruption of the 4,700MW Fukushima 1 nuclear plant's water cooling system, caused by a vast tsunami, triggered large explosions and leaks of radiation. However, the plant at Fukushima was so old that its problems are almost irrelevant to future investments in today's much more advanced nuclear technology.

Indeed, that a large 40 year old plant did not have a serious meltdown from such a shock highlights the plant's robustness against the freak tsunami.

Nuclear power is well established as an internationally proven low carbon technology. Its total lifetime carbon releases are comparable with other low carbon technologies such as wind power.[15] Above all, nuclear energy provides secure, large-scale,

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[15] Lifetime carbon releases include all emissions including those associated with construction and decommissioning of nuclear plants, and with uranium mining, transportation, enrichment, fuel manufacture and spent fuel storage.

baseload electricity, unlike weather-dependent low capacity wind energy or solar.

As part of a diverse energy mix it reduces dependence on imported energy and consequent exposure to price volatility (such as with gas and coal imports) and protects UK supplies in the event of fuel supply interruptions overseas. It can also help smooth prices over the longer term. These benefits will be lost to the UK as older nuclear plants close.[16]

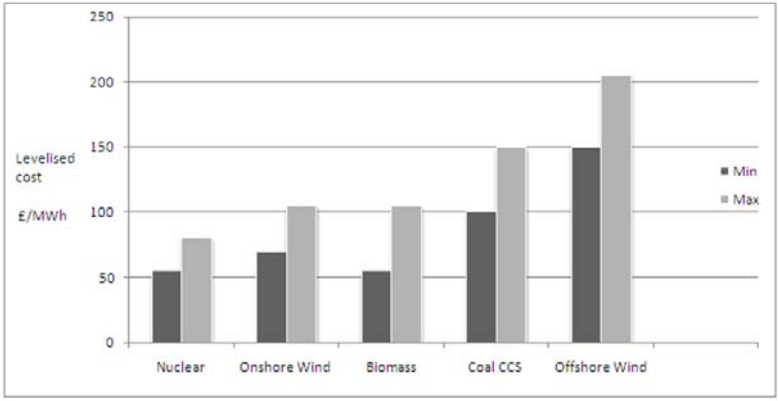
Figure 11: Nuclear Plants operating in the UK and planned closure dates

Plant	Type	Capacity (MW)	First power	Expected closure
Oldbury	Magnox	217	1967	End 2012
Wylfa 1&2	Magnox	980	1971	End 2012
Hinkley Point B	AGR	1220	1976	2016
Hunsterston B	AGR	1220	1976 & 77	2016
Dungeness B	AGR	1090	1983 & 85	2018
Hartlepool	AGR	1160	1983 & 84	2019
Heysham A	AGR	1160	1983 & 84	2019
Heysham B	AGR	1230	1988	2023
Torness	AGR	1250	1988 & 89	2023
Sizewell B	AGR	1188	1995	2035

16 France has successfully managed a significant nuclear energy programme. 58 nuclear plants were built between 1965 and 1985 to reduce French dependence on imported oil and on coal and today provide over 63,000MW of French electricity generating capacity. Nearly 85% of electricity comes from nuclear power, insulating the country from fossil fuel price volatility. In 2008, EDF claimed that a typical domestic customer in France paid £332.50 per year for electricity while the figure was £442.07 in Britain. France has recently launched a programme of refurbishment as some of its plants approach the end of their lives.

And it is one of the cheapest low-carbon electricity generation technologies on a levelised cost basis. For the same power generation, and $C0_2$ abatement, transmission infrastructure cost and longevity, nuclear power is seven times cheaper than building offshore wind turbines and three times cheaper than building onshore wind turbines. A modern 1800MW nuclear plant would deliver a load factor of over 85% with near zero emissions. This is compared to offshore wind which has a load capacity factor of around 30% due to weather dependency as shown in Figure 13. Onshore wind endures lower load capacities of 17% to 24%. As a result, an extra 2000MW+ more of installed offshore wind capacity is needed to match the equivalent nuclear output but this is still hard to manage as lulls and surges in output cannot be predicted by grid managers.

Figure 12: Comparative costs of electricity generation



Note that this chart does not take into account the lifespan advantages of nuclear plant where nuclear plants outlive wind turbines by more than two to one.

Source: Parsons Brinkerhoff, *Powering the Nation*, 2010

Furthermore, the lifespan of a modern nuclear power station can be up to 50 years, compared to a typical onshore wind turbine which has a life expectancy of around 20 to 25 years.

The effects of marine corrosion and increased maintenance costs could further reduce the economics of offshore wind.

A public backlash is gathering against wind energy and wind developers as data highlighting the sector's low load performance, paralleled with the non-performance related financial benefits for developers and landowners who site turbines becomes more available. Although Britain has a relatively good wind resource it is not uniform across the country. Analysis has shown that less than one third of onshore wind energy developments in Scotland achieved a load capacity of 30% or more, in Northern Ireland only 25% did so; in Wales the figure was less than 20%; while in England the figure was just 15%[17]

Figure 13: Load factors for UK wind energy in 2010

	Load Factor	Number of wind schemes
Wind Offshore	**29.6%**	**12**
Wind onshore (UK total)	**21.5%**	**206**
England	**20.8%**	**89**
South East (inc London)	22.1%	4
Yorkshire and the Humber	21.8%	11
North East	21.5%	17
East Midlands	21.2%	10
Eastern	20.9%	15
North West	20.0%	22
South West	17.7%	10
Wales	**19.0%**	**25**
Scotland	**21.7%**	**66**
Northern Ireland	**23.9%**	**26**

Source: DECC Energy Trends – September 2011

[17] OFGEM (Office of Gas and Electricity Markets)

Wind generation and other weather dependent low carbon generation have a low load capacity value because the likelihood of them meeting peak demand is impossible to manage due to their unpredictability. For solar this becomes more acute as it is dark during winter evening peaks in energy demand.

The low load performance means that there are more wind farms than necessary to produce a given output.[18] Consequently, building more rather than fewer better located schemes clearly increases the resource costs of equipment and land required to produce a given output and raises the point that wind farms are being too generously subsidised if the present arrangements, as demonstrated here, clearly support low efficiency wind farms.

Public and policy confidence in wind farm efficiency can consequently be increased by making onshore wind farm developers divulge wind data to local communities before turbines are erected.[19] This should be combined with a 30% minimum capacity load threshold for all new onshore wind farm developments. Existing wind farms which receive subsidies but achieve load capacities well below 30% could be scaled down or withdrawn. One approach could be to offer a proportion of

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[18] The load factor describes the amount of electricity generated from wind farms compared with the amount that such turbines would have generated had they been available for the whole of the calendar year and running continually and at maximum output throughout the calendar year.

[19] Before wind turbines are erected developers install anemometer masts to measure wind speeds but this data does not have to be provided to planning inquiries and local communities, irrespective of consumers' bills subsidising these schemes.

the full subsidy for developments achieving load factors between 25% and 30%; a lower proportion for those achieving a load factor between 25% and 20% and nothing below that. Rewarding this output and performance would increase the incentive for wind developers to focus on high performance schemes on the best sites in the right topography and meteorological locations; thus better addressing the failing case for wind energy in the UK.

The inability to manage wind energy's unpredictable and increasing contribution is causing major balancing problems for National Grid which is increasingly asking wind companies to shut down and constrain output because it cannot be absorbed when it isn't needed. National Grid is now spending millions of pounds compensating wind companies due to an inability to take their erratic output and in order to prevent grid overload.[20] These extra costs will be met by consumers.

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[20] 'Wind farm is paid £1.2m not to make electricity', *The Sunday Telegraph*, 18 September 2011.

5. SECURING NUCLEAR'S RENAISSANCE

Any major source of low carbon energy will initially be more costly than traditional power generation from fossil fuels. But, based on levelised costs (i.e. with any market or technology specific incentives removed), nuclear power is cheaper than the other large-scale low carbon alternatives including coal and gas with carbon capture and storage (CCS).

But nuclear power stations are very expensive to build because of the large upfront costs and the long construction period. Their payback periods of 30 years or more are substantially longer than that of other generation technologies. These are also beyond the horizon of any reasonable certainty of costs, market structure, or policy interventions.

Confidence is essential. If the private sector is to make the necessary investment, then the Coalition must do all it can to understand the concerns and needs of all nuclear stakeholders while also taking into account the interests of wider society. Among the issues that need to be clarified are logistical questions, including those over waste disposal; and planning issues.

Waste

Effective arrangements to manage and dispose of the waste that will be produced by new nuclear power stations in the UK must be finalised. In particular, a government commitment to develop a geological disposal facility is needed before investments decisions for the first new reactor are taken.

The nuclear industry has accepted the Government's proposal that there should be an independently administered fund to cover the cost for final storage of nuclear waste. But no agreement has yet been reached on the price. Government will need to finalise this as a priority.

Planning

A repeat of the delays and planning inquiry marathon at Sizewell B in the 1980s and other UK plants must be prevented at all costs: new nuclear power stations traditionally have long lead times[21] as various regulatory, environmental and development consents (including reactor approval) must be met before construction begins. They take a long time to build (particularly compared to other generating technologies like CCGT) but have longer operating lives. Delivery of a new planning regime is needed that removes uncertainty and minimises delays for developers and investors.

In the Localism Bill, the Government will abolish the Infrastructure Planning Commission (IPC). Planning decisions will then be taken by the Secretary of State with advice from a new Major Infrastructure Planning Unit (MIPU) with the aid of

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[21] In the US, the average nuclear plant construction is reported to have increased from 66 months in the mid-1970s to 116 months between 1995 and 2000 – almost 10 years.

National Planning Statements. The NPSs are intended to set out national policy on key strategic planning topics, including energy policy areas. This is intended to provide certainty for potential investors.

For example, in an evidence session to the Commons Energy and Climate Change Select Committee, representatives of the 'Big Six' energy companies warned of inevitable reduced momentum for new nuclear investment if Royal Assent to the Electricity Market Reform legislation was not granted by early 2013. This would cause a loss of confidence with a possible loss of investor interest. This loss of interest could also spark another dash for gas among energy providers.

Despite this, DECC announced a six month nuclear development delay following Fukushima. Britain's new nuclear programme is therefore now at least 18 months behind schedule. A legislative roadmap in place for new nuclear by mid 2011 has been delivered with the new White Paper but unease amongst some atomic stakeholders, particularly Horizon, remains on a number of fronts.[22] EDF Energy has already indicated it will not build its first new UK reactor by 2017 as earlier pledged.[23] DECC now states that it expects the first new nuclear plant in 2019.[24]

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[22] 'Second firm could abandon UK nuclear building programme', *The Guardian* 8 October 2011.

[23] EDF breaks promise by delaying reactor 'until UK needs it' *The Times*, 21 July 2011.

[24] DECC*, The Carbon Plan: delivering our low carbon future*, December 2011.

Another key issue to boost and maintain confidence will be the strategic need for grid reinforcement for new nuclear. If new nuclear power stations are to make a timely contribution to meeting demand, it will be vital that consents for grid connection (including new lines and any required transmission infrastructure reinforcements) are available on the same timescales as power plant and other associated consents. This could apply to the new plant proposed at Hinkley Point.

Cost and schedule overruns of the UK's nuclear plants

Between 1965 and 1995 the UK's nuclear programme suffered several severe cost and time overruns:

- Dungeness B was the first AGR plant to be ordered in the UK in 1965. It was expected to be operational by 1970-71 but construction and commissioning delays and operational problems meant that it did not finally officially complete commissioning until the mid 1980s. Its costs eventually exceeded budget by five times.

- Heysham A had a slightly better experience: a seven year delay and a budget which almost doubled during construction.

- Sizewell B, the UK's first PWR plant was announced in 1979. A public inquiry then took almost four years. Construction did not start until 1988. However, as building only started after all the appeal process had been completed, costs exceeded budget by "only" 40% and part of this was due to Sizewell B being the first of a kind (FOAK) with the anticipated benefits to come from replication.

Figure 11: Nuclear generation construction delays in the UK

Plant	Construction start	Estimated finish	First Power	Delay (years)
Hinkley Point B	1967	1972	1976	4
Hunterston B	1967	1972	1976	4
Dungeness B	1965	1971	1983	12
Hartlepool	1968	1974	1983	9
Heysham A*	1970	1976	1983	7
Torness	1980	1987	1988	1
Sizewell B	1988	1995	1995	0

* The first reactor at Heysham commenced operations in 1983 and the second reactor followed in 1984. However, initial production levels were very low, and full commercial operation was only declared in 1989, 13 years late.

Cost overruns were also commonplace for second generation nuclear plants in the UK and US. The US Energy Information Agency found that for plants constructed between 1966 and 1977, actual realised costs were 209% to 280% higher than estimated.

5. THE CARBON PRICE FLOOR

"We're not going to save the planet by putting our country out of business.... so let's at the very least resolve that we're going to cut our carbon emissions no slower but also no faster than our fellow countries in Europe."

George Osborne, Conservative Party Conference
October 3 2011

The Coalition hopes a new UK carbon price floor can significantly help deliver its new nuclear ambitions and carbon reduction commitments. But this is uncertain and has potential negative consequences for prices and other indigenous energy assets.

All carbon emitting energy generating companies are allocated carbon allowances. These cover every tonne of carbon emissions, and are intended to reward and incentivise those who invest in clean energy while penalising heavy polluters. This is presently operated through the European Union Emissions Trading Scheme (EU ETS). In the present phase of the EU ETS 7% of UK allowances can be auctioned.

The ETS imposes annual targets for CO2 emissions on each EU country, and then in turn each country allocates a national allowance across those companies whose factories and plants are the major emitters of CO2 – power utilities, steel manufacturers and other heavy industrial enterprises.

Nearly 12,000 industrial installations across Europe have had annual carbon emission reduction targets set for them under National Allocation Plans (NAPs) for each EU country. The 7,300 companies that own the installations are allocated a number of allowances, called EU Emissions Allowance (EUAs), matching their respective targets.

Each EUA gives the company the right to emit one tonne of carbon dioxide. Companies that don't use up all their allowances, that is, emit less than they are entitled to, can sell them. Companies which exceed their emissions target must offset the excess emissions by buying EUAs, or pay a fine.

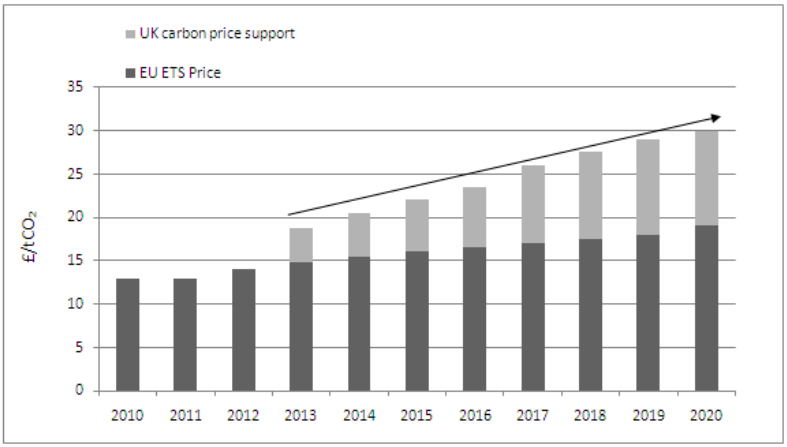
The EU ETS is designed to address market blindness to environmental issues by forcing carbon-intensive industries to pay a premium for their emissions. But, beyond encouraging fuel switching between coal and gas, it is argued the scheme has yet to produce a carbon price high enough to make costly low carbon investment viable. Carbon allowances for the EU ETS are currently trading in the spot market at just over €8/tCO2 with forecasts predicting an even lower price, possibly halving in 2012.

But in the 2011 Budget, the Chancellor announced a new unilateral top-up to guarantee a set price for carbon – the carbon price floor – to start in 2013, so that in the UK (and only in the UK), the carbon price floor will be £16t/CO2, rising to £30t/CO2 by 2020 and £70t/CO2 in 2030, irrespective of the ETS price in the rest of the EU.

Importantly, the carbon price floor will not reduce EU carbon emissions. This new floor price will have no impact on the total number of permits available in the EU. Every tonne of carbon that is 'priced out' of the UK will simply be emitted elsewhere in Europe at lower cost.

But, the carbon price floor will have a significant impact on UK consumers' bills: 75% of UK electricity generators are currently fossil fuel-based (gas, coal and oil) and the carbon price floor is a significant extra tax on these generators. In contrast, as nuclear plants are zero carbon, they will not be subject to a carbon penalty.

Figure 14: Projected UK carbon price floor trajectory to 2020



Source: HM Treasury, March 2011

The UK's unilateral carbon price floor will increase the supply of carbon permits in the rest of Europe as the UK carbon market will no longer use them. The consequence of this is that the EU ETS price is likely to fall by up to 20%, especially during a low emissions period, such as a period of reduced energy demand such as a recession. The difference between the UK carbon price

and the EU ETS could then be considerable (possibly double the ETS price by 2020) and directly affect UK competitiveness as continental energy prices will be significantly lower. It also makes investment in low carbon energy technology unattractive as carbon emitting plant ironically becomes cheaper to run across Europe.

A more effective EU ETS or a higher UK carbon price floor?

The EU ETS model has provided a visible and clear common framework to guide European energy operational (coal/gas) investment choices. Many of the companies operating in the UK, such as RWE, E.ON and Scottish Power, are active in several European countries and take the carbon price emerging from the EU ETS as a main input for investment decisions. Survey results suggest that for low-carbon investment and innovation activities, the EU ETS is vital. By reducing the value of carbon allowances in the rest of Europe the UK policy could cause heavy emitters to save money and hold back from cleaner investments such as carbon capture and storage (CCS) and nuclear.

The difference between European and UK carbon prices will offer considerable carbon arbitrage opportunities with potentially large unintentional consequences. This could lead, as explained, to a much lower carbon price on the continent as compared to the UK, thus creating an uneven playing field for UK industry as EU competitors enjoy less taxation on their emissions and consequently lower energy bills. This could lead to a serious loss in competitiveness for UK energy intensive industries.

The impact on decisions on investment in new nuclear stations could also be counter-productive. Once investments in a set of nuclear power stations have been committed, any changes to the carbon price floor scheme (or trajectory) could have

dramatic impacts on the overall balance sheets of investors; and on their ability to repay loans. Instead of encouraging new nuclear investment, the Chancellor's proposals could actually deter them as the carbon price floor trajectory will be subject to a vote each year as part of the UK's Finance Bill. This ultimately undermines its credibility as a long-term guarantee. Therefore the CfD FIT is really the key tool to securing new nuclear investment and build.

A political campaign by MPs or parties opposed to the trajectory as a result, for example, of unpopular rising bills faced by constituents and industry and the Government's inability to carry the vote would be disastrous for the policy and investor confidence. The policy would lie in tatters.[26] Australian politics is today dominated by those in favour and against that country's new carbon price floor with the Australian Liberal Party finding much support for its opposition to the plan. It has pledged to scrap the Government's proposal if elected at the next election, as seems possible. The use of climate policies as stealth revenue generators is not sensible, because the credibility and stability of climate policies are underpinned by their perceived legitimacy with the public, which can change quickly.

Who benefits from a new UK carbon price floor?

The imposition of a UK price floor for carbon will significantly benefit those companies who already have large low carbon nuclear assets in the UK. For EDF, the carbon price floor represents a significant boost for the profitability of its existing

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[26] Dependence on annual votes in Parliament to approve 'escalator' taxes have a chequered past. John Major's Fuel Price Escalator lasted just under seven years after the Blair Government abandoned it due to the fuel protests in 2000.

and largely ageing portfolio of eight nuclear plants. Of all the 'Big Six' companies, EDF has the only nuclear portfolio, with some exposure to coal but little gas (CCGT) as shown in Figure 15.

Figure 15: Capacity of the 'Big Six' energy companies (MW, 2011)

COMPANY	Coal	CCGT (gas)	Nuclear	Oil	Renewables
EDF	4020	819	8733	-	135
E.ON	4840	4554	-	1300	454
Centrica	-	4319	-	-	220
Scot/Southern	4345	688	-	-	1988
RWE	4607	4239	-	2338	274
Scottish Power	3456	1915	-	-	1105
Drax*	3870	-	-	-	-

*Though not one of the 'Big Six' the 3870MW Drax coal plant provides 7% of UK electricity for onward sale by suppliers. It co-fires coal with some biomass.

Source: *Power Stations in the UK – May 2011,* DECC

The high UK carbon price floor incentivises EDF to keep existing and increasingly old nuclear plant open for longer, irrespective of future commitments to new build: it has already announced two plant life extensions. On the other hand, it encourages the closure of fossil fuel plants: EDF has previously announced plans that it will close its two 2,000MW coal plants at Cottam and West Burton before 2020, thus ending the company's UK involvement in generating electricity from coal. Importantly, the Weightman report into UK nuclear safety following Fukushima does not recommend that existing UK nuclear plants are stopped from having further life extensions.[27]

These scenarios throw into question the Coalition's assertion that no subsidy is being given to nuclear power. A carbon price floor reaching £30t/CO2 in 2020 and rising to £70t/CO2 in 2030 – the

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[27] *Japanese earthquake and tsunami: Implications for the UK nuclear industry,* Office for Nuclear Regulation, September 2011.

Treasury's policy – could result in annual windfall profits for nuclear operators of £50 million per annum to 2030; or £1billion over the 2013-2026 period though many analysts believe this figure to be very conservative.[28] This is based on the average number of hours that the UK's existing nuclear power stations are expected to operate at for the remainder of their operational life based on the present decommissioning timetable.

Cross border energy flows

Britain imports around 3% of electricity through its 2,000MW interconnector with France. The majority of this electricity is derived from EDF-owned nuclear power stations in northern France. Imported electricity will not be subject to the carbon price floor so it will consequently further incentivise full use of the interconnector, which in recent years has been underused.

By 2012, interconnection capacity for the UK electricity market is expected to increase by around 1,500MW, with new links to the Netherlands and Ireland commissioned. According to the National Grid this could increase by a further 4,000MW by 2020. This could mean that electricity generated from coal and gas plant in Europe could be entering the UK market without facing the carbon price floor taxes faced by UK coal and gas generators. But, the Government stated in its carbon floor price consultation that electricity for export generated by UK coal and gas plant will face UK carbon taxes. The proposal to apply carbon taxes to electricity exports but not to imports will lead to severe market distortion. While this capacity might still be relatively small compared to overall UK generation, it is likely to

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[28] Hansard, Commons Written Answer, 11 August 2011, Justine Greening MP to Martin Horwood MP ' Nuclear Power: Finance'.

be much larger in relation to ongoing coal-fired capacity and generation in the early 2020s.

Interconnectors are likely to be used more at peak periods, precisely the periods at which coal-fired generation, in the UK or Europe, will be providing marginal supply. Imported electricity, including electricity generated from coal, will thus displace UK generated electricity from some UK coal production. Imports of electricity from fossil fuel sources on the continent would be effectively subsidised which is a perverse effect with significant competition implications.

A high carbon price floor risks creating a huge advantage for one company in light of its existing fleet of nuclear plants, whilst penalising those companies – such as RWE and E.ON – with large exposure to coal and gas generation but who also wish to build new nuclear plants. It will make generating electricity from coal, oil and gas more expensive; the cost increases inevitably being passed on to the consumer and energy intensive industry. It could also lead to yet another 'dash for gas' and undermine successful and growing British coal mining operations which are planning for new 'clean coal' markets and opportunities.

Importantly, the looming introduction of the carbon price floor will also encourage the early closure of coal plant which was set to close by 2016 due to EU rules. Generators are keen to use up their LCPD operating permits before the price floor increases running costs from 2013.

Effect on UK coal production and coal reserves

Coal production in Britain is a growth industry. Output has increased by some 8% over the last three years with a commensurate increase in employment and investment. UK coal output in 2010 was 1.6% up on 2009 at 18.2 million tonnes,

supplying over a third of total coal demand; the rest being made up of imports. This home production provides a vital price 'hedge' against the near 30 million tonnes of imported coal. The introduction of a carbon price floor will bring this growth to a halt, and then reverse it, perhaps dramatically as coal burn quickly declines. Investment will largely cease. It will lead to premature mine closures, loss of jobs and loss of other economic benefits including access to vast energy reserves. UK produced coal will be replaced by imported gas (or imported coal), just as new clean coal plants potentially come on line. As the Government calls for the UK to wean itself off fossil fuels the carbon floor price support could well lead to yet more gas fired generation.

Effect on investment in fossil fuel generation

The carbon price floor could lead to a renewed dash for unabated gas. This may result in carbon reductions but will emphatically not lead to a decarbonised electricity supply. This could lead to long-term carbon 'lock-in' with a large volume of unabated gas-fired plant being available in 2030 and for many years beyond, operating at high cost.

At the same time, the carbon price floor will act as a major disincentive to investment in existing coal-fired generation plant to meet the requirements of the Industrial Emissions Directive (IED) which would allow it to operate beyond 2020. As a result, this plant is likely either to have closed by the early 2020s or to be operating on very low load factors.

The end of coal?

The consequence of minimal investment in either existing or new coal-fired plants is a very low level of coal burn from the early 2020s onwards.

First, there will be the potentially dramatic effect on coal production and future investment in coal production which could mean the end of access to deep coal seams as economic and long-life collieries close. Consequently, economically recoverable British coal reserves, estimated at a considerable one billion tonnes, would then become 'stranded'.[29]

Second, it would have serious implications for the security of our energy supply. Coal plants met nearly 50% of electricity demand in the winter of 2010-11 and in the fourth quarter of 2010 electricity generated by coal was up 32.6% compared with the same quarter in 2009 – see Figure 7.[30] But with no coal plant to provide flexible baseload energy in the future, the reliance on gas would be considerable – particularly on a cold, still high pressure winter day, the sort of weather conditions that typically occur two or three times every year when the portfolio of generation must meet maximum demand: dependence on gas-fired plant may well exceed 80% under such circumstances.

By 2020 around half of the gas consumed in the UK will be used to generate electricity making the UK one of the world's most gas hungry and dependent states, with huge exposure to volatile global import prices.

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29 Association of UK Coal Producers.

30 DECC Energy Statistics.

7. CARBON TAXES AND THE CONSUMER

"People are concerned as to whether we are trying to go beyond anything which is achieveable at a price that they don't know they can afford to pay. We have got to persuade people that the low carbon economy is good for business, delivers security of supply which helps our affordability and to be absolutely clear that we are delivering this in the cheapest way to consumers. That message has clearly not got across."

Charles Hendry MP, Minister for Energy, interview with Energy Live News, 27 September 2011

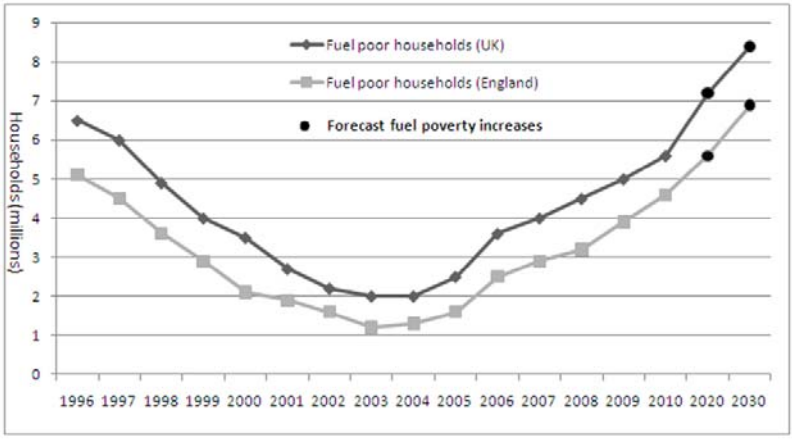
British households are spending a higher percentage of their income on energy costs. And this will only get worse: overdependence on one fossil fuel, on subsidy-reliant intermittent renewables and a new carbon floor price will, combined, significantly increase energy costs for consumers and the energy intensive manufacturing sector.

The threat of fuel poverty

Households are classified to be in 'fuel poverty' if they have to spend 10% or more of their household income on energy bills.

High oil prices, declining UK gas production and the slow but sure reduction of the global gas glut will inevitably put upward pressure on gas prices. This in turn increases electricity prices to be met by the consumer. Since the start of the year wholesale gas prices have risen by 40% and electricity by 30%. Any interruptions in gas supply from foreign suppliers will also cause a spike in prices, which again are eventually met by the consumer.

Figure 16: Households in fuel poverty, 1996 – 2030



Source: DECC Fuel Poverty Advisory Group and author's forecast calculations incorporated from page 12.

Higher energy prices means greater fuel poverty as more households struggle to pay energy bills.[32] Between 2004 and 2008 the number of households in fuel poverty more than doubled, from 2 million to 4.5 million. It has been calculated that this is now over 6 million households. These dramatic increases

[32] DECC's Fuel Poverty Action Group states that a 1% increase in energy prices leads to 44,000 more UK households falling into fuel poverty.

in fuel poverty were largely caused by rising fuel prices, which rose by an average of 80% between 2004 and 2008. The carbon price floor the Government has set from 2013 will increase prices of both coal and gas generation of electricity further and according to Government figures cause the number of households in fuel poverty to be rising by between 80,000 and 300,000 a year as a result.[33]

DECC targets on fuel poverty have already been missed and are now hopelessly unrealistic. In 2004 the Labour Government set itself a target to eradicate fuel poverty in England by November 2016. The carbon price floor and other Electricity Market Reform (EMR) policies now make this target impossible to achieve. Though one effective way of tackling fuel poverty is energy efficiency measures, by far the most effective method is securing lower energy generating costs. A carbon price floor will unfairly hit those already trapped in fuel poverty.

The impact on industry

The UK's energy-intensive industries already face some of the highest energy prices of any major economy as, unlike many competitors, UK industry faces many environmental tax 'add-ons' and few exemptions. Latest analysis from DECC, published in July shows that UK and EU climate policies have already added around 20% to the price of electricity currently being

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[33] Calculation based on the Government's estimate of the carbon price floor impact on an average medium-sized household electricity bill between 2013 and 2030. See *Carbon price floor: support and certainty for low carbon investment*, Impact Assessment, page 18, Scenario 3, Table 8, HM Treasury, December 2010.

paid by large industrial users, and this impact is set to rise to around 40% (possibly higher) by 2020.[34]

Energy intensive industry in Germany, for example, enjoys opt outs and tax exemptions to help keep its costs down. German intensive industries, for example, benefit from a substantial reduction in the cost of the EEG renewable tariff on their electricity supplies which is currently levied at a standard rate of €35/MWh but only €0.5/MWh for large industrial users. No such discount is available to UK industry. DECC's impact analysis suggests that renewable subsidies will be adding around £20/MWh to the price of electricity to large industrial users by 2020.

A UK carbon price floor, on top of existing 'green' energy taxes, could be disastrous as it would represent a further unilateral raising of costs, irrespective of carbon prices in other competing EU states. In response to the 2011 Budget, Karl-Ulrich Kohler, Chief Executive Officer of Tata Steel Europe said, "the introduction of the UK carbon price floor represents a potentially severe blow to the sustainability of UK steelmaking."[35] Tata Steel employs 20,000 people in the UK and represents the lion's share of Britain's steelmaking sector.

The Government's carbon price floor consultation acknowledges that the following energy intensive sectors will be 'most impacted' by a carbon price floor: aluminium production,[36]

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[34] 'Provisional estimates of the impacts of energy and climate change policies on energy prices and bills of energy intensive users' DECC, July 2011.

[35] *City AM* 3 May 2011 'A green tax that risks economic sustainability'.

[36] In November 2011, Rio Tinto announced the closure of the Lynemouth aluminium smelter with a loss of more than 500 jobs due to energy costs and emerging legislation.

cement production, chemicals – industrial gases, fertilisers, clays and kaolin, glass manufacture, iron and steel manufacture, lime production, malt production, non woven textiles and paper manufacture and wood-board manufacture. The consultation paper also concedes, "there might be a reduction in profit margins for these sectors, assuming businesses cannot pass on the extra electricity costs they face and have to absorb them entirely… In reality businesses are likely to pass on some of these costs to consumers."[37]

The Energy Intensive Users Group estimates that 225,000 people work in these and other similar sectors producing products essential to the economy. Importantly these are the sectors which will be required to generate Britain's much vaunted green jobs growth as they are responsible for the manufacture, construction and assembly of wind turbines, electric cars, glass, ceramics and advanced insulating materials for low-energy housing.

It follows that high energy prices could lead some energy-intensive companies to relocate overseas; and could deter other foreign investment in the UK. This relocation of investment or production to countries without such high carbon taxes or constraints would result in an overall increase in global emissions (known as carbon leakage) and a loss of employment and economic activity for the UK.

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[37] *Carbon price floor: support and certainty for low carbon investment*, HM Treasury, December 2010.

8. CONCLUSION

A sense of urgency is required. Self-imposed delays following Fukushima and the White Paper have meant that the schedule for new nuclear plant commissioning is late. This could push the commissioning of the UK's first nuclear plant since 1995 back to 2020 and beyond.

It is crucial that momentum is not lost and that Government does not allow the process to become either diverted or distracted by the Fukushima aftermath.

Efficient markets need to remain at the centre of energy policy but in light of the over-ambitious targets there is a fear that these can only be achieved by more central planning and highly subsidised plant.

Since electricity privatisation in 1990, the UK has pioneered competitive and open energy markets. These have served the UK well in terms of investment in affordable energy.

Breaking the 'Big Six' dominance and boosting competition

However, energy diversity and liquidity has not been achieved. Unclear strategic objectives by a plethora of changing energy Ministers (14 since 1997) has led to an over-reliance on gas.

Refusal to award planning permission for more efficient and cleaner coal plants (DECC's refusal to approve the proposed new Kingsnorth coal plant scared off many investors) and a lack of support for new nuclear power across all parties reflected a political failure to plan ahead and take decisions.

Today, 80% of UK electricity generation is owned by companies that control 90% of electricity sales to households. Of encouragement is Scottish and Southern Energy's decision to sell all of the company's electricity supply on the wholesale spot markets in the future in an effort to boost liquidity and encourage smaller suppliers thereby fostering competition.[39] This is the first time that such a move has come from any of the 'Big Six' suppliers. If more widely adopted, and supported by policy, it could and should allow for new entrants into the energy market, bringing more competition for consumers.

Maintaining market integrity and efficiency should be a primary goal of the new White Paper to ensure that Government objectives are met in the most economically efficient manner possible and at least cost to consumers and industry as the economy remains fragile and economic growth negligible. It remains unclear where market forces can rule alongside capacity payments and CfD FITs. But measures can and must be implemented to boost energy diversity and stop the Big Six generating and then selling their own power which has led to a collapse in consumer trust. Such a move could allow for the development of a highly competitive central electricity trading 'pool'. This would break the energy oligopoly which has emerged where the Big Six largely control the vast majority of

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[39] 'SSE looks to customer service' *The Daily Telegraph*, 13 October 2011.

generation and sales. It is vital to re-balance the electricity sector where assets have become heavily remonoplised. Under such a plan any company would be able to buy and sell electricity at a clear and transparent price and thus go some way to restoring elusive consumer trust.

Capacity payments

The Coalition has put forward proposals to introduce a capacity mechanism to encourage the construction of new reserve baseload (likely CCGT gas) plants to ensure adequate generating capacity to back-up and shadow weather dependent renewables (eg wind power).

These proposals are still being consulted on but as they stand they risk significantly distorting the market. In the short term the Government should consider extending capacity payments to some of the 12000MW of baseload and peak-load coal and oil plant under sentence to be closed by the EU Large Combustion Plant Directive by 2016. This could also apply to older CCGT plant. This would cover UK electricity supply through the period when an energy gap may occur and before new nuclear and cleaner coal plants arrive. If derogation from the Directive is not secured, and this plant not retained, then operators will close these power plants and seek to quickly redevelop them, possibly as yet more gas plant. Capacity payments which are just geared towards rewarding new gas plant to shadow intermittent renewables risk smothering new technologies such as renewable energy storage.

Approving the first coal-fired CCS plant

The Government must now move to announce full details and award contract for the first of the proposed four commercial scale fossil fuel plants to be demonstrated with carbon capture and storage. The first one should be coal-fired and not gas. This

development will provide some confidence to the UK coal mining sector which requires certainty for long-term investment in valuable UK coal reserves to supply future anticipated long-term markets.

The collapse of the project to retro-fit CCS technology to the large Longannet coal plant in Scotland has damaged sector confidence. Doubts have always existed as to the viability and value for money of retrofitting hi-tech CCS technology to a 38 year old power plant such as Longannet. Other viable and new clean coal projects can fill the gap left by the collapse of the Longannet CCS scheme.

Carbon price support will not help deliver new nuclear plant

The carbon price floor mechanism will in effect be a tax to raise revenue for the Treasury. The Government must reconsider its imposition from 2013 and delay its introduction to 2016 and its trajectory until 2018/2020, depending on when the first new nuclear plants come online. This will help maintain confidence and support from all new nuclear investors, not just EDF, who enjoy significant existing nuclear assets. It is important the Government retains a wide portfolio of atomic investors both to boost nuclear research and development in the UK and widen the credibility of its policy.

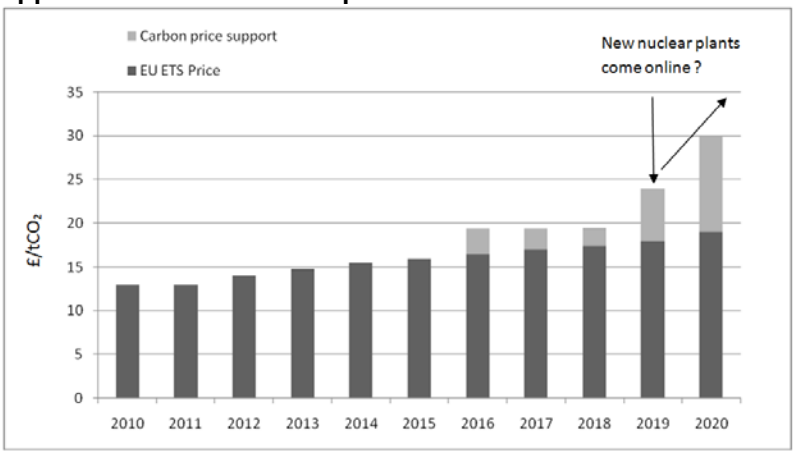
The EU has set emissions reduction targets through the EU ETS and this should remain the central mechanism for determining UK carbon prices until 2016, at the earliest. Introduction of a carbon price floor over and above the EU ETS in 2013 will materially impact on the price of UK electricity across all sectors and significantly reduce the carbon price in Europe. Early introduction of the floor in 2013 will have a significant impact on prices for UK consumers (and so competitiveness) for UK industry relative to other EU countries. It could also result in a

greater level of input from overseas of fossil fuel generated power which will not face the UK carbon price floor and remove any energy export possibilities for the UK as new interconnectors open and expand. It would lead to significant windfalls for existing nuclear operators as already highlighted.

To minimise these impacts, the price floor should be targeted at encouraging new nuclear power stations and clean coal plants. It should therefore only be introduced at a non-adjusted rate from 2016. It should commence a trajectory only and when the first new nuclear power plants come on line later this decade and not, as the Government proposes, in 2013. Importantly, new clean coal power plants with carbon capture and storage should, if the DECC meets its CCS demonstration programme schedule, be proposed and under early construction by this time.

The primary intention of the carbon price floor policy is to try and boost investor confidence in low carbon technology by providing certainty and in effect a long term guarantee for the future. But it doesn't. Some critics have asked why is a carbon price floor necessary when low carbon energy will receive a guaranteed electricity price through the CfD FIT?

Figure 19: A carbon price support trajectory should only be applied when new nuclear plants come online



A requirement for annual parliamentary support in the Finance Bill could result in the carbon price floor trajectory being changed or even abandoned, especially if the EU ETS carbon price is significantly lower and MPs revolt. Does a change of Government guarantee the policy continues? The carbon price floor could actually reduce investment in low carbon energy as investors avoid this risk. By delaying the introduction of the carbon price floor trajectory, the Government could use this valuable opportunity to push for an EU wide carbon price floor so that UK energy intensive users and the generators are kept on a fair and level playing field with their EU competitors.

Rewarding output and not availability

The Government should consider the CfD FIT (the Government's preferred low carbon incentive mechanism) is paid on output from renewables like wind rather than on their availability. This will ensure that investors are most likely to deliver the Government's decarbonisation targets by delivering a maximum load level of low carbon output to the market. For CfD FITS to be paid on availability rather than output is an insult to hard

pressed consumers who are being asked to subsidise low load weather dependent wind. Rewarding availability results in the development of weather dependent renewable projects providing low load output but still securing maximum funds through availability payments. CfD FITs for wind energy should also be structured to reward all despatchable energy and not paid for being constrained off.

Political support

There have been signs of renewed scepticism about nuclear power by some Liberal Democrat members of the Coalition. The Deputy Prime Minister's comments in Mexico in late March 2011 in a widely reported briefing to journalists[41] suggesting new nuclear plants may never be built in light of Fukushima are troubling given increasing investor concern in this vital sector. The Coalition should be reassuring investors, not heightening investor uncertainty.

Without this political clarity, Britain's long overdue decision to embrace, support and deliver a series of large new nuclear plants on schedule will be unachievable. Instead, Britain risks becoming yet more dependent on foreign gas and unmanageable renewable energy to generate electricity. Consequently, Britain's 26 million households, who spend around £20 billion a year on energy will face higher bills at a time of falling household income.

Both the Chancellor and the Minister for Energy have acknowledged that consumer confidence in the Coalition's energy strategy is failing as households and industry struggle to

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[41] Nick Clegg MP, 'Britain's proposed nuclear plants may not be built', *Daily Telegraph*, 29 March 2011.

acknowledge DECC's assertion that future benefits of electricity market reform will include consistent lower bills and better security of supply. For the first time since the 1970s issues surrounding energy policy will help determine the outcome of the next general election and consequently shape British politics for a generation, when it is hoped new nuclear power stations will be a new and welcome feature of the UK energy landscape.

The stakes for the Coalition of getting energy policy wrong could not be higher.

GLOSSARY OF TERMS

AGR:	Advanced Gas-Cooled Reactor
BCM:	Billion cubic metres
CCC:	Committee on Climate Change
CCGT:	Combined cycle gas turbine (gas fired power station)
CEGB:	Central Electricity Generating Board
CCS:	Carbon Capture and Storage
CfD:	Contract for Difference
CCS:	Carbon Capture and Storage
DECC:	Department of Energy and Climate Change
EMR:	Electricity Market Reform
EPS:	Emissions Performance Standard
EPR:	European Pressurised Reactor
EUA:	EU Carbon Allowance
EU ETS:	European Union Emissions Trading Scheme
FOAK:	First Of A Kind
IEA:	International Energy Agency
IED:	Industrial Emissions Directive
IPC:	Infrastructure Planning Commission
LCPD:	Large Combustion Plant Directive
MWh:	Megawatt hour
NPS:	National Policy Statement
OFGEM:	Office of Gas and Electricity Markets
OPEC:	Organisation of Petroleum Exporting Countries
PWR:	Pressurised Water Reactor
ROCs:	Renewable Obligation Certificate
TWh:	Terrawatt hour

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One third of all households in the UK will be in fuel poverty by 2030 unless the Coalition rapidly moves to encourage new nuclear plant. In addition we also face the closure of diverse coal and oil generating plant (to meet EU rules), as well as older nuclear plant in the run up to 2020. Nearly 20000MW of diverse generating capacity (out of a total of 90000MW) will close between 2016 and 2020.

The Coalition must now quickly approve more diversified baseload capacity – not just gas – but with a particular emphasis on enabling new nuclear plant to be built by a variety of atomic investors.

In addition, the carbon price floor should be re-examined as it only provides benefits to exisitng nuclear generators; will push up bills for households and energy intensive industry at a time of austerity; and will result in over 1 billion tonnes of economically recoverable UK coal reserves becoming 'stranded' before new clean coal plants are ready.

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