Renewable Energy Association evidence to the Stern Review

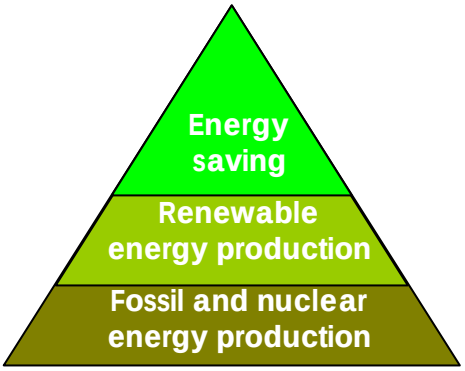
The REA was formerly known as the Renewable Power Association. Its membership is active in across the range of renewable energy resources; in electricity generation, heat production and supply and transport fuel applications. The REA has over 400 members, making it the largest renewable energy trade association in the UK.

This submission gives an overview of what we feel needs to be done in order to move us to a lower carbon future, and goes on to address the impact and effectiveness of the UK's Renewable Energy Policy. It deals with electricity generating renewables and the Renewables Obligation, and heat-producing renewables. Policies to promote renewable transport fuels are currently in the process of development, and therefore this submission deals with the transport sector only briefly.

An energy hierarchy

The REA believes there is a clear hierarchy in energy options, analogous to the waste hierarchy for considering waste management options. A waste hierarchy provides context for evolving energy policy and prioritising of new solutions. It recognises that there is no single answer. We need to deploy a portfolio of many resources to achieve an affordable and sustainable way forward.

An "energy hierarchy" would move through the most to the least sustainable options. In its simplest form the Energy Hierarchy would look like this:



There is scope to follow the waste hierarchy by prioritising further within each of the strata. For example, renewable heat might be the top renewable option due to its ability to deliver high carbon savings at low cost. Within the non-sustainable options, there is currently a debate as to the relative merits of nuclear power. Its carbon footprint is superior to most fossil fuel sources, but it has other side effects, which some believe would justify its relegation lower down the list. Sub-ranking within the three main strata may even differ in different countries.

In practice the needs of energy security support diversity of supply sources, in which case a more parallel approach could be adopted within each layer of the hierarchy.

Our current priorities

It is clear that we are not making as much progress in reducing energy consumption as we should, and the Government runs shy of any proposal which impacts upon individuals' behaviour. For example the Government is even reluctant to enforce speed limits as a means of reducing emissions from road transport.

Energy conservation should be higher up the hierarchy than energy efficiency, although the two are intimately linked. The former is generally accompanied or even driven by changes in behaviour, whilst energy efficiency measures can, and often are negated to some extent by improvements in comfort, or the "rebound effect", i.e. the savings resulting from improved energy efficiency are offset by increases in comfort or increased consumption. Clearly energy efficiency and energy conservation should go hand in hand.

The recently announced energy review will consider, among other things, whether a new nuclear build programme is desirable. The 2003 Energy White paper put energy efficiency and renewables at the fore. We have not even begun to make progress with reducing energy consumption (electricity demand grows at 1.5% per year, and growth in energy for transport is more dramatic still); growth in renewable electricity generation is only just keeping up with growth in electricity demand. It is completely against the principles of an energy hierarchy to not take robust action to curb growth in energy consumption, to have inadequate policies for renewables, and then turn to a new nuclear build programme for salvation.

The impact of the Renewables Obligation

High risks for investors

The Renewables Obligation is a unique policy instrument. It is quite unlike any other form of renewable support used in the world. Whilst it has the potential to be one of the cheapest mechanisms, unfortunately the reverse is true at present. This is primarily due to its risk characteristics.

In the Commission Communication "The support of electricity from renewable energy sources [1]" published two days ago, the UK's Renewables Obligation consistently fairs badly. Whilst it generally gives the highest financial level of support, it comes out as the least effective mechanism. The two figures below illustrate the situation for onshore wind – a good example to use, as it is readily comparable across member states, in a way biomass is not.

[1] **7th December 2005. Commission Communication "The support of electricity from renewable energy sources www.europa.eu.int/comm/energy/res/biomass_action_plan/doc/2005_12_07_comm_biomass_electricity_en.pdf**

The red line on the figure below indicates the payment level for onshore wind, and the blue bar, the generation cost range. The gap between the two is widest for the UK, indicating that payment should be extremely attractive. Therefore one might expect the policy to be effective.

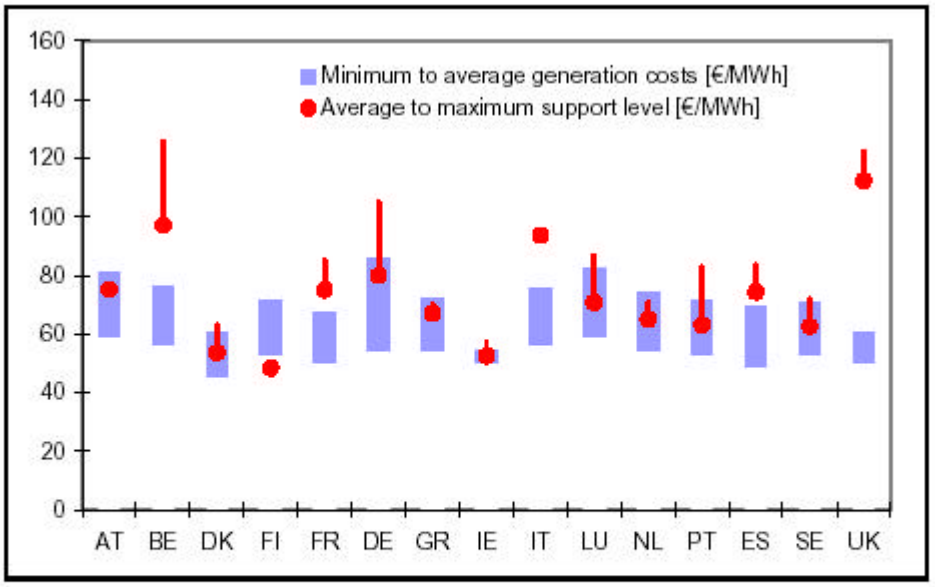


Figure 4:
Price ranges (average to maximum support) for direct support of wind onshore in EU-15 Member States (average tariffs are indicative) compared to the long-term marginal generation costs (minimum to average costs). Support schemes are normalised to 15 years.

Yet the figure below shows that the UK's policy is among the least effective of the EU 15.

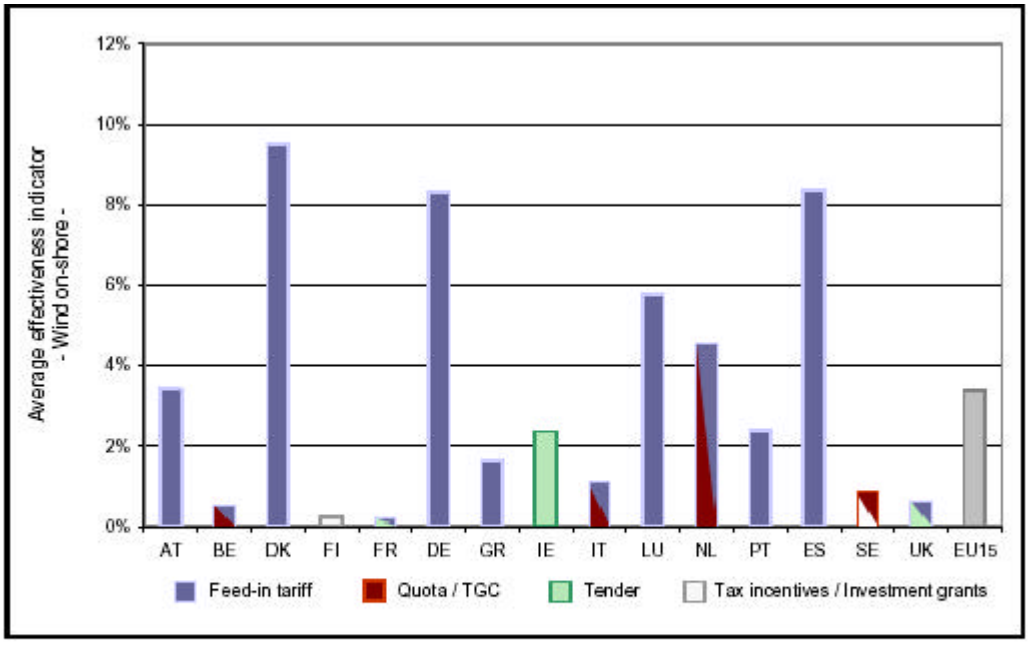


Figure 5:
Effectiveness indicator for wind onshore electricity in the period 1998-2004. The relevant policy schemes during this period are shown in different colour codes.

NB there is clearly a mistake in the colouring of figure 5. The UK column should be

green, with a brown triangle indicating we have moved to a TGC (tradable certificate mechanism).

Whilst not advocating a feed-in-tariff, the commissions report clearly shows that countries that have them pay less for wind energy, yet achieve very much greater rates of deployment. Feed in tariffs are criticised both on the basis of cost and their inappropriateness in the context of a liberalised market structure. The former criticism is questionable, but the latter very valid.

The RO is seen to be superior to feed-in tariff policies by virtue of the fact that it is a market-based mechanism. Unless we can reduce the risks inherent in the policy, its being market based is a hindrance rather than a help.

The fundamental cause of the problem lies with the fact that if the Renewable Obligation percentage quota is entirely fulfilled, the value of the premium for renewable power falls to zero. This is explained in appendix 1. The appendix was written in 2003, but it has very deliberately not been updated for the purposes of this response. It was produced in order to explain the impact of the quotas in the obligation not rising beyond 2010. Government understood the problem and announced in December 2003 that it would increase the quotas by 1% per year, from 2010 to 2015. This took effect in April 2005. At the time the appendix was written the window of increasing quotas was 6½ years, after which the percentage level reached a plateau.

The window between now and reaching the plateau is still too small, at only 9½ years. This is nowhere near sufficient for developers of offshore round 2 wind farms. Thus 7GW of planned renewable capacity will almost certainly not materialise, unless changes are made.

The Government has rued out raising the quotas beyond 2015, probably because of the recent criticism of the obligation by the National Audit Office, and Public Accounts Committee. Civil servants have suggested that instead of setting out a profile of increasing quotas into the future, it is more likely that a decision will be taken to increase the quota on a yearly basis to maintain a "fixed headroom" above the level of achievement in the previous year. Using 2% for illustrative purposes, if by the end of 2015 we had only achieved 10% renewables, then next year the quota would be set at 12% for the following year; if by the end of 2016 when the quota was set at 12%, we had only achieved 10.5%, the quota for 2017 would be 12.5%.

This "fixed headroom" proposal was made in the preliminary consultation, but it was not welcomed by industry. The reasoning behind industry's rejection is explained in the REA's response to that consultation. The relevant paragraphs are appended to this response as appendix 2. The proposal was dropped from the statutory consultation and decisions on future quotas have now been deferred to "the coming year" in the context of the climate change programme review and alongside other relevant policy decisions. Given the time taken for the consultation process, it would appear that no decision could be implemented until a 2008 order at the earliest - by which time the window of rising quotas would only be 7 years.

Customers pay more for renewables than they should

The consequence of the high risk characteristics of the RO mean that customers are paying more for renewable electricity than they should – and that despite the high

prices – many projects are still not able to proceed, as the cost of financing a project is so high.

So whilst the current market value of renewable electricity generation sold on a short-term basis appears high, as illustrated in the table below, the prices available to generators on a long-term basis are significantly lower. Supply companies are paying this high price for renewable projects that were built before the RO was introduced and passing this cost on to their customers, yet renewable generators that want to build a new project will see nowhere near this income for their output. This is because suppliers discount the future values of ROCs significantly – due to the risks inherent in the RO, as described below.

Technology band	Average auction price for six months' worth of output from NFFO contracts, beginning October 2005.
MIW	4.65p/kWh
Wind	9.05p/kWh
Hydro	9.41p/kWh
Biomass	7.43p/kWh
Landfill Gas	9.31p/kWh

Source NFPA website, http://www.nfpa.co.uk/

Reasons for suppliers' discounting the value of ROCs

Banks do not regard ROCs as a secure income stream against which to lend project finance. Therefore generators must seek fixed price contracts with suppliers. However suppliers are reluctant to give long term contracts at fixed prices, because they fear they may be left having to pay out prices which reflect historical ROC values which have since fallen significantly or at worst are worth nothing as the obligation has been fulfilled or potentially even withdrawn due to policy change.

Measures that would reduce these risks are

- Raising the RO quota from 2015-6 onwards – to keep the cliff edge further away[2]
- Implementing the "ski-slope" solution described by Ilex Energy Consulting[3] (this lessens the risk that the value of any particular ROCs will fall to zero, as if the obligation is met, the price of ROCs is smoothed evenly across all market participants thereby falling below the buy-out price, but in a predictable way)

[2] This is explained in document found on **http://www.r-e-a.net/content/images/articles/cliffedge2.pdf**

[3] This can be obtained from the REA website;

http://www.r-e-a.net/article_default_view.fcm?section=1&articleid=1313

Criticism of the RO

In the REA's view Government should put more effort into bringing down the barriers to renewable deployment and following through on its other climate change policies. The EWP, in leaving the nuclear question open, has resulted in a tendency to re-examine whether the overall energy policy is correct, to the detriment of moving forward with the drive for renewables and energy efficiency.

The investment climate for renewables has suffered, in particular from the regular questioning of the Renewables Obligation, most recently by the Public Accounts Committee report, and prior to that by the National Audit Office.

It is most disturbing that the RO is being criticised for features that were inherent in the design of the policy, and which the Government entered into knowingly.

It is self-evident under a "technology blind" policy that the cheaper technologies may be remunerated to an extent over the minimum required to make projects economically viable. It is self-evident, too, that projects which have already been commissioned would be able to command a higher price than new-build projects seeking project financing.

If the Government had wanted to ensure that renewable projects received only just enough remuneration to stimulate their development and no more; if it wanted a policy that delivered a broad range of technologies and kept the cost of financing low, then it could have introduced a policy which gave a stable, robust, and differentiated income stream for different technologies. I.e. something that delivered the same end result as a set of feed-in tariffs.

This model was not chosen, despite feed in tariffs having been adopted widely elsewhere in Europe, as the Government wanted to limit the potential cost to consumers. The Renewables Obligation sets the target volume of renewable electricity required and sets the overall cost of the policy, and the market determines how much volume is delivered for that cost. In contrast under a feed-in tariff policy, Government would set the price, and the market would determine how much volume is delivered. The greater the volume, the higher the total cost to consumers. When the Government introduced the Renewables Obligation, the cost was deemed to be acceptable, and there was cross-party consensus on that issue. A legitimate question is the *value* being achieved in terms of the volume of renewable output being delivered for that cost.

The cost-effectiveness of the RO would be markedly improved by a number of measures, and the REA has been vocal in putting these forward over the last 2 years. The DTI shows little appetite for adopting our proposals. Given the criticisms, the response from DTI, the possible departure of 1 ROC/MWh for wave and tidal by the Scottish Executive and the opening of another energy review, the prospects for investment to flow into projects built under the renewables obligation seem poor.

The Effectiveness of Government policies for renewable heat

Whilst the UK has policies in place for increasing the contribution renewables can make in electricity generation, and a renewable transport obligation has been announced, measures to boost renewable heat production are almost totally lacking. With the exception of a few patchy measures, outlined below, there is no government policy for renewable heat! Broadly speaking a third of the UK's CO_2

emissions come from the production of heat, one third from electricity generation and one third from transport, with the latter dramatically rising.

Renewable Heat - potential to meet policy objectives

- Some renewable technologies are heat-only (or are best suited to heat only applications) for example solar thermal, ground/air source heat pumps and geothermal. Other renewable resources, can be used in a variety of ways, with biomass being the most versatile able to produce electricity, heat and transport fuels.
- Biomass has the potential to deliver material carbon savings today. Using UK resources alone carbon savings of up to 5.6 MtC per annum could be delivered[4]. The REA estimates the contribution biomass could make is 70 TWh/year or 13 MtC saving. Biomass is the most cost and carbon efficient of renewable sources, costing around £25/tC to £30/tC saved.
- Renewable heat technologies bring a variety of environmental benefits. Solar thermal displaces emissions arising from water heating (and space heating) otherwise provided by gas or electricity, as does biomass when used for space or water heating. Heat pumps are energy efficient as they increase the amount of heat output for a given amount of electricity.
- In addition, the use of biomass for energy complements many other environmental and economic policy objectives, from biodiversity to rural employment, as well as complementing many waste management objectives.

Current Policy Initiatives

There was a very limited capital grants scheme for smaller biomass CHP projects, which closed in 2002.

There is a capital grants programme for domestic and community scale renewables, which incorporates solar thermal, biomass heating and heat pumps. This will be replaced by the low carbon buildings programme, which is intended to start in April 2006. The total funding for this programme is £30m over 3 years – less than the two programmes it replaces.

Some biomass boilers benefit from enhanced capital allowances, other heat producing renewables do not.

A reduced rate of VAT is applicable for heat producing renewable equipment.

The Biomass task force

Biomass is the most cost effective and potentially largest renewable heat resource. Unfortunately biomass has been subject to almost continual policy change over the past decade; from the emphasis on gasification rather than conventional technologies under NFFO, to the changes to co-firing under the renewables obligation. More detail can be provided if necessary.

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[4] **Biomass sector review for the Carbon Trust. October 2005.** http://www.thecarbontrust.co.uk/carbontrust/about/publications/Biomass%20Sector_FINAL.pdf

The Government effectively absolved itself of responsibility for this sector just over a year ago, when it set up the Biomass Task Force to make policy recommendations. This task force, led by Sir Ben Gill, had a very high profile. It reported in October 2005. Although there are some good suggestions, the overall report was a disappointment to the biomass sector.

One of the major disappointments was its rejection of a renewable heat obligation as unworkable, whilst acknowledging detailed analysis had not been undertaken. "….in the time available to us, we have not been able to carry out the detailed analysis the Government gave a commitment to undertake in the debate on the Energy Act 2004 and in response to the Royal Commission's report." (paragraph 4.2).

The industry believes that the task force should have recommended that some other body undertake detailed analysis of a heat obligation. The REA believes much more careful thought should be given to policy measures that enable renewable heat providers to access £10/kWh$_{th}$. A number of bodies have proposed a measure that mimics the Renewable (Electricity) Obligation[5], but there may well be other mechanisms and Government should commission a study.

Why a heat obligation?

One problem with the existence of an electricity obligation is that biomass tends to be used preferentially for power generation because of the financial incentive provided by Renewable Obligation Certificates, thus distorting the market.

The REA believes there should be a revenue-based policy measure to stimulate renewable heat for two simple reasons

- It remedies the market distortion for biomass
- It could incorporate other renewable resources, e.g. solar thermal, geothermal, ground and air source heat pumps.

There is also implicit support for a heat obligation in the recently published report "Renewable Heat and Heat from Combined Heat and Power Plants - Study and Analysis Report" recommended that

> "DTI and Defra should consider mechanisms for delivering [industrial and commercial sectors from renewable energy and from CHP]. Further analysis is needed to build on this study and assess the most appropriate form of financial and non-financial support."

The report suggests that the options for financial support "could include mechanisms similar to the Renewables Obligation, and capital grants, amongst other measures." Elsewhere the report mentions levelling the playing field and avoiding the market distortion inherent in having an electricity obligation but no equivalent support for heat. The REA believes that capital grants would do little to address this market distortion, and that only an output-based mechanism, similar to the Renewables Obligation could achieve this important objective. The report quantifies the suggested support;

> "A level of support of around £10/MWh would stimulate savings of around 0.13 MteC by 2010, and of 0.81 MteC by 2020. The cost of introducing such a measure would be around £23 million by 2010, rising to £132 million by 2020. This level of support would also be equivalent to the level of support available

[5] http://www.r-e-a.net/article_default_view.fcm?section=1&articleid=946

> to electricity producing renewables, so levelling the playing field and avoiding market distortion."

At the moment, with support for electricity generating from biomass but not heat, perverse incentives arise. These can be seen most clearly with large scale CHP generators, such as Slough Heat and Power and Sembcorp Utilities, both of which have heat loads and an existing heat-supply network, but which use fossil fuel to provide heat via the heat supply network, and use biomass in the CHP plant in a manner which optimises electricity production at the expense of the overall thermal efficiency of the plant.

The Appendix 3 illustrates how Slough Heat and Power is incentivised by the current arrangements to operate its CHP plant at around 33% efficiency, rather than 45% efficiency. Of course, if used for heat-only, thermal efficiency would be even higher.

The Biomass Task Force has suggested a capital grants programme of £10 - £20m over a period of 5 years for heat-only boilers or the heat element of CHP equipment. For CHP it suggests that grants should be in proportion to the power exported as heat, on the basis that the electricity element is already supported through Renewables Obligation. Firstly it should be noted that other capital grant schemes, e.g. offshore wind round 1, the bioenergy capital grant scheme, the PV Major Demonstration Programme, did not limit access to ROCs. Secondly this approach raises various problems – for example how does one decide which "elements" of a CHP gasification plant qualify as "heat" and which as "power". Inevitably any attempt at this will reduce the level of capital expenditure supported in percentage terms. Furthermore limiting support for CHP in this way is supporting heat at the expense of power, in contrast to the RO, which favours power at the expense of heat.

Transport fuels

The Government's actions so far suggest that it is serious about considering the use of biofuels as a key means of improving transport sector emissions performance.

There is currently a 20 pence per litre **fuel duty rebate** on biodiesel and bioethanol. The duty rebates are not applicable for all transport fuels, and how these might be changed as a result of the recently announced **Renewable Transport Fuel Obligation** is currently being considered by Treasury.

A **Renewable Transport Fuel Obligation** at a rate of 5% of all fuel sales by 2010 was announced by the Secretary of State for Transport, Alistair Darling on 10 November 2005. It is anticipated to begin in April 2008. However it will have a % target level, which only represents around 3.5% by energy as against the EU Commission's target of 5.75%.

Enhanced Capital Allowances for the cleanest biofuel **manufacturing** plant.

Appendix 1

Market influences on the operation of the RO

The Renewables Obligation allows suppliers to buy-out of their obligation at a fixed price (£30 per ROC – index linked). The fund generated from buy-out payments is then recycled back to the industry in proportion to each supplier's level of compliance. This means that ROCs have a higher effective value in the case of a shortfall against the RO Quota.

This relation can easily be plotted mathematically, as illustrated in Figure A. This shows the **cliff-edge in price**, which might be experienced by independent generators. Supply companies would have less exposure, because they would still be able to redeem some or all of their ROCs.

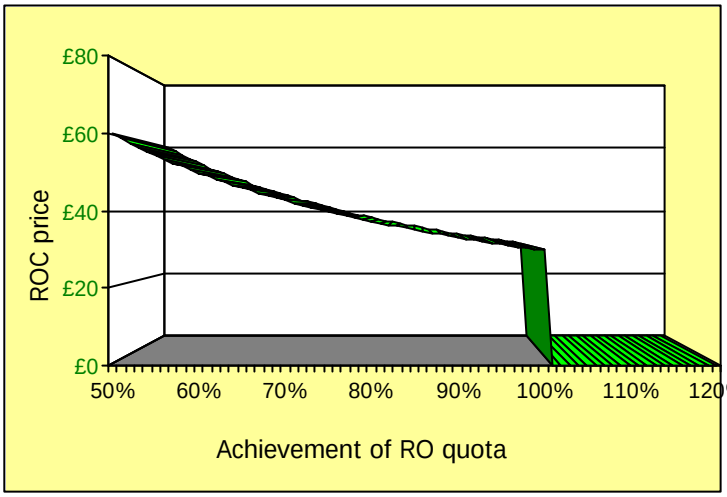
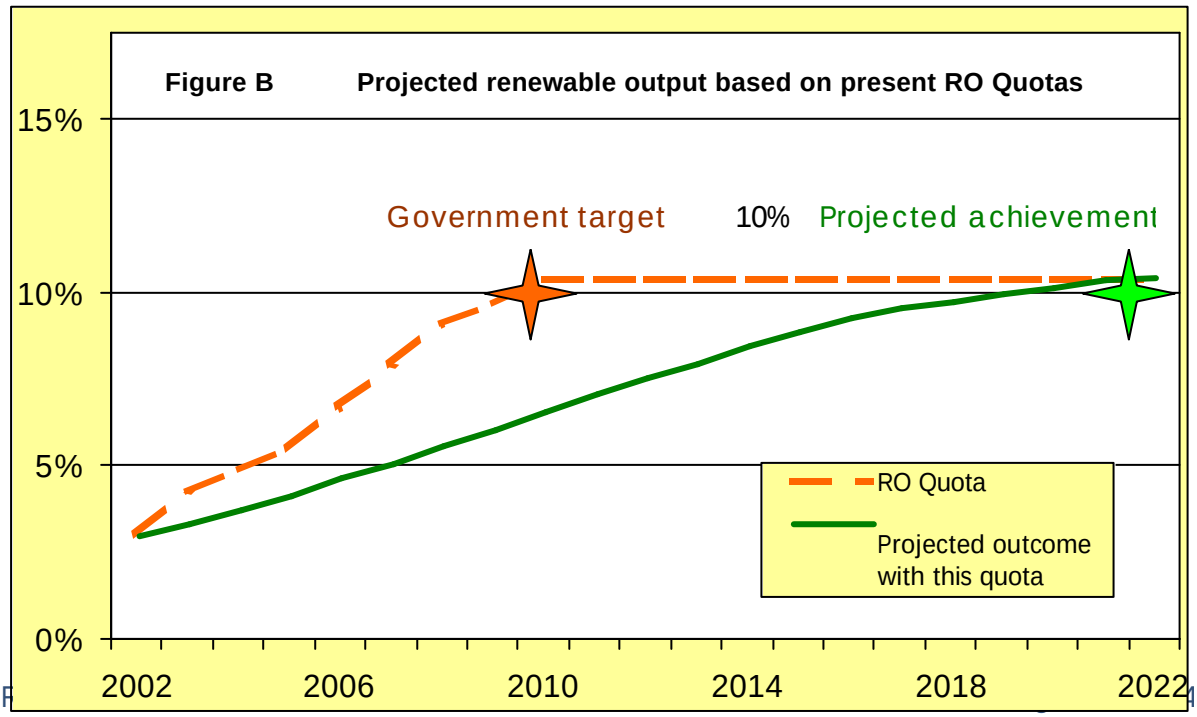


Figure A **Relationship between RO achievement and ROC price**

However, this effect is likely to ensure that **the RO acts as a ceiling on capacity**. It is highly unlikely that any market participant would risk exceeding the RO Quota for fear of the impact on ROC prices throughout the market.

Because markets (usually) act rationally, actual achievement can be expected to remain comfortably below the RO Quota. The level of the shortfall will be affected by the longer-term figures. Most renewables projects have working lives of fifteen years or more, so investors will be considering the returns over that period, by projecting future ROC market performance.

Figure B **Projected renewable output based on present RO Quotas**



Industry analysis (illustrated in Figure B) indicates that **the present Quotas** will result in the 10% target being achieved in about 2022 - **twelve years late**. But a single Government action can transform the situation:

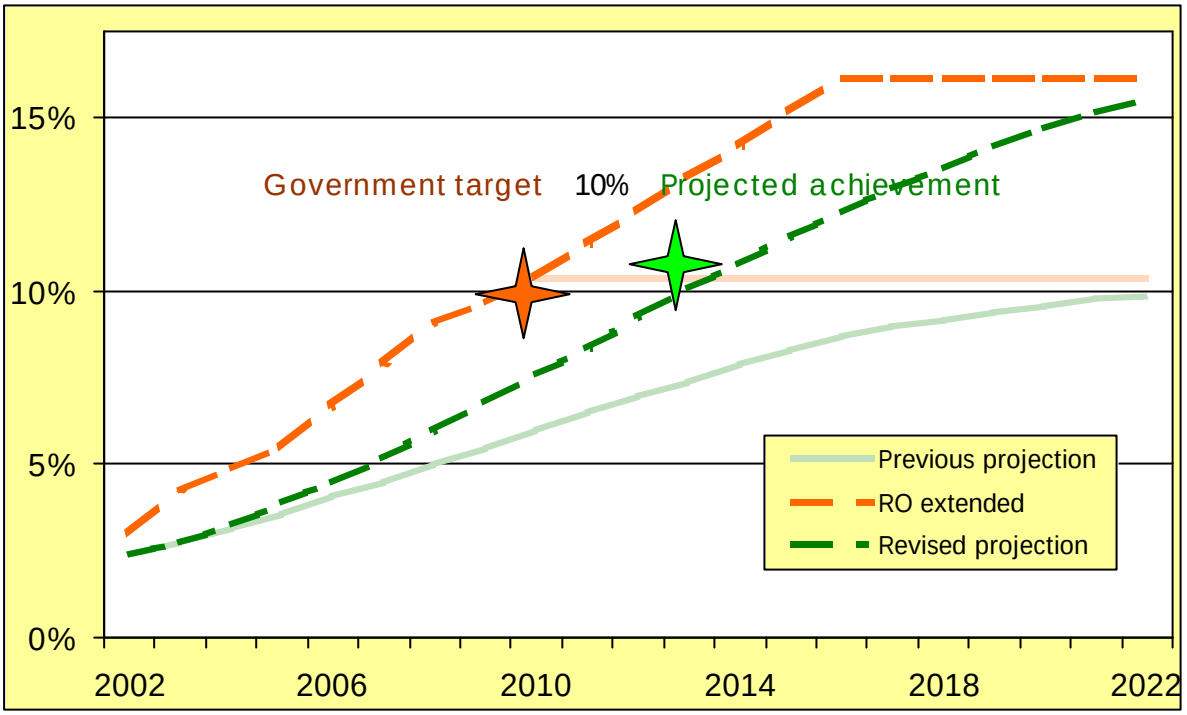


Figure C **Projected renewable output based on extended RO quotas**

An alternative projection in Figure C shows what would happen if the **Quotas are extended now** to 2016. This transforms the situation. We now miss the 10% target by two years - perhaps only one when you add back the contribution from RO-ineligible renewables. This change therefore represents a **dramatic improvement in economic efficiency**, especially as the RO costs consumers the same, whether the target is met or not.

This figure also shows that the two scenarios diverge as early as 2004. The **change must be made now** if it is to succeed. We can already say that without extending the RO Quota now, the 2010 target will be missed.

In fact the industry would prefer to see the quotas set all the way to the end of the Obligation in 2027, and as a minimum to 2020. These would lead to even better results than that shown above. The discussions leading up to the publication of the White Paper suggest that the Government is reluctant to set quotas that far ahead. The RPA has therefore suggested an alternative approach to give the Secretary of State the ability to annually update rolling quotas for the 10, 12 or 15 years ahead.

Because of the supply and demand issues discussed above, this quota review would need to permit only neutral or upward adjustments. We would urge the Government to set the quotas as far ahead as possible, in recognition of the fact that they influence investment decisions about projects with 15 to 25 year lives. **Rising quotas beyond 2010 must be set now**.

Appendix 2

Fixing the headroom – why the proposal was rejected

The following paragraphs are extracts from the REA's response to the preliminary consultation on the 2005-6 Review of the Renewables Obligation.

When first introduced, the RO was a highly innovative measure to *create a market* for renewable electricity. It differed from its predecessor, the NFFO, and other forms of support policy, such as feed-in tariffs, because it has defined achievement aims[6], a positive feedback mechanism for prices and no banding for technologies.

The expectation was that the lowest cost resources would be deployed first, but that if the exploitation of these were constrained, the buy-out recycling mechanism would act to increase the value of renewable electricity to the point where the next lowest cost resource would then begin to be deployed to continue the progress towards the annual quotas.

Because all renewable electricity is equally priced, it is possible that some projects might receive more revenue than they 'need'. But evidence suggests that this is rarely the case, as most schemes require the full support of the Obligation to secure finance and operate successfully. However, the cost to consumers is capped, at the sum of the buy-out multiplied by the volume of renewable electricity required.

Three years after initiating this policy, the government seems to be questioning the basic principles set out above. This loss of faith is premature. The costs to consumers have not changed, and the obligation is starting to show signs of working.

Indeed, to move away from these fundamental principles at this stage would deeply undermine confidence in the RO. One of the key challenges to delivering the targets is bringing private investment in to fund the construction of new renewable generating capacity. The income from ROCs (in what is an entirely legislatively driven market) is required to repay these investments.

Altering the fundamental principles

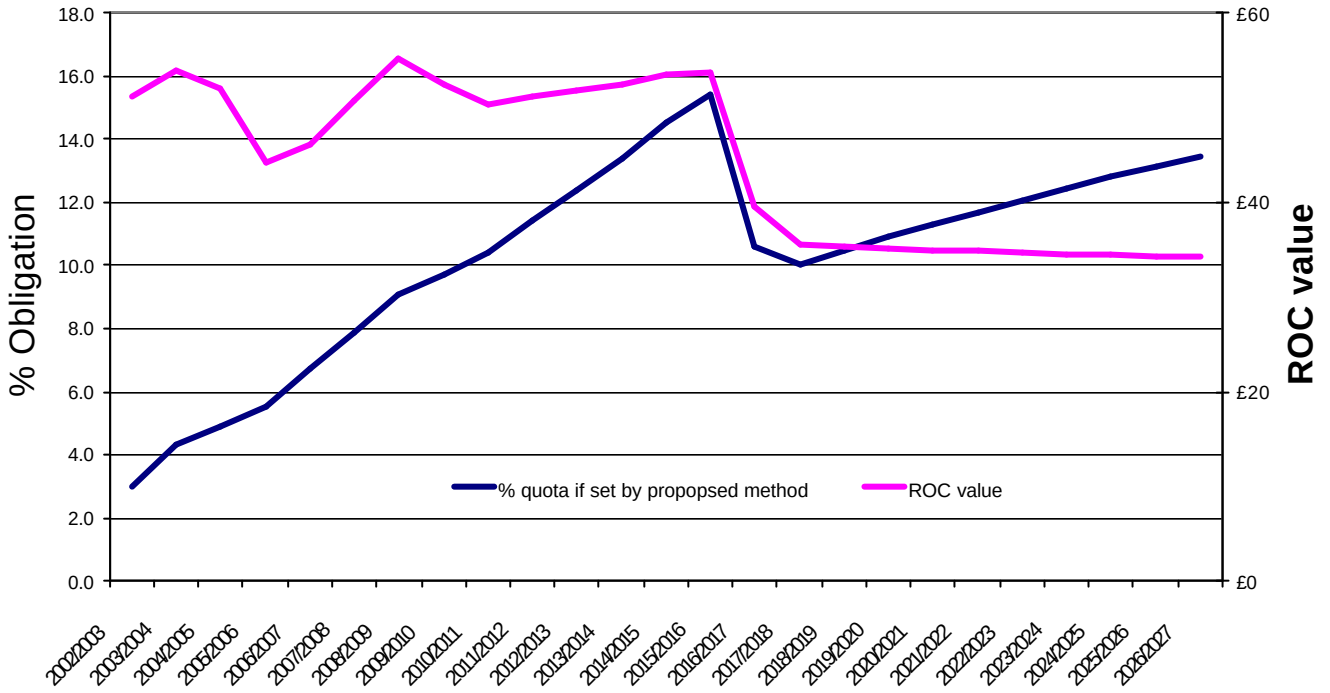
The proposal to progressively reduce the level of support to the lower cost technologies (and to NFFO projects) would have the effect of 'banding' the Obligation. This undermines the 'technology blind' principle with which the RO was established. There may be a case for reducing the level of support in the future if underlying power prices increase permanently, for example because of carbon trading, but this could be done while maintaining the technology neutral approach.

The proposal to **fix the level of headroom** at a certain percentage above the level of renewables achieved has the effect of removing the link between the percentage quota and the target level of renewable electricity required. It would have the effect of fixing the price (similar in fact to an un-banded feed-in tariff) but would lose the positive price feedback of the recycling mechanism that, at no extra cost to the consumer, provides a greater incentive for marginal technologies/projects.

[6] The percentage quotas

The figure below illustrates how quota levels would evolve and ROC prices would settle if the proposal in the consultation document were adopted. It assumes that renewable electricity output grows at 2TWh per year (the case to date) and beyond 2015-16, the quota is set at 2% above the actual percentage of renewable generation achieved in the previous year.

It can be seen that the percentage quota falls very far short of the 20% aspirational target, and the ROC price effectively becomes a slowly decreasing feed-in tariff.



Appendix 3

Case study for the benefits of support for renewable heat

Slough Heat & Power Ltd operates one of Britain's longest serving and most flexible power stations. The company has converted what was originally a coal-fired power station to run predominantly on wood chips and non-recyclable packaging materials. The facility can now make enough renewable electricity to supply both Europe's largest trading estate, and much of the surrounding area, making it the largest renewable fuelled power station in the UK.

The facility comprises two fluidised bed boilers and a 37.5MVA passout steam turbine, and can operate as a CHP plant providing electricity and also steam for the Trading Estate's district heating scheme. The fuel input to the facility is 90% biomass, and so the value of the electricity mainly comes from the sale of ROCs, as well as the energy value of the power and LECs.

Operationally, the options are either to extract the maximum possible renewable electricity, or to operate in CHP mode and produce less electricity but additional renewable heat. In summary, the choice is whether to produce 18MW of steam or 5.4MW of extra renewable electricity. The following table shows a simple model of these options.

	Heat & power	Electricity only
Electrical output MW_e	30.6	36.0
Steam output MW_{th}	18.0	0.0
Process efficiency	45%	33%
No support for renewable heat	**Hourly revenue**	
Value of electricity @ £70/MWh	£2,142	£2,520
Value of steam @ £10/MWh	£180	£0
	£2,322	**£2,520**
Renewable Heat supported	**Hourly revenue**	
Value of electricity @ £70/MWh	£2,142	£2,520
Value of steam @ £21/MWh	£378	£0
	£2,520	**£2,520**

ROCs almost treble the value of the electrical output, so without a corresponding mechanism to reward the value of renewable heat, the most economic option is to turn all green steam into electricity, and run a separate gas boiler to satisfy the district heating requirements.

But look at the third line of the table. Slough Heat and Power is being encouraged to operate one quarter less efficiently than they could. If heat were properly valued, the boiler steam could be used more efficiently used to provide both power and heating requirements directly. This would give 45% efficiency (increasing to over 80% efficiency for a heat only scheme) instead of converting the biomass at around 33% efficiency into electricity only. Additionally, operating in CHP mode benefits from improved turbine efficiency (with slightly more electrical output), and saves all of the auxiliary costs and energy requirements of operating a separate gas fired boiler to provide heat requirements.