

REF

RENEWABLE ENERGY FOUNDATION

Response of the Renewable Energy Foundation to the 2005-6 Review of the Renewables Obligation¹

INTRODUCTION

The Renewable Energy Foundation is a not-for-profit organisation and a registered charity. The purpose of the Foundation is to commission research and publish data leading to a full and informed debate with regard to the potential for renewable energy, and to thus ensure that deployment of renewables is balanced, effective, and truly sustainable.

The Renewable Energy Foundation has responded to previous DTI consultations, on the Renewables Obligation and on Carbon Capture technologies, and these documents are available on our website (www.ref.org.uk). Our position, which is also set out in our manifesto document, *Renewable Energy: The Need for Balance and Quality*, is critical of the Renewables Obligation, and highlights the need, as we see it, for a qualitative dimension to be brought into the system. To summarise this view, we consider that the unbanded structure of the RO is counter-productive, and that more should be offered to those technologies which themselves have more to offer. The Renewable Energy Foundation believes that the greatest single flaw in current renewable energy policy is the failure to offer any degree of favourably differential reward to firm renewable generators.

Consequently, the long-term trend encouraged by present policy is towards destabilization of the overall electricity system, higher costs, and higher prices. This is needless and in our earlier consultation submission to the DTI we have suggested that the Renewables Obligation should be enhanced to encourage firm generation.² Our proposals have included limiting the number of ROCs available for randomly intermittent capacity and the introduction of a banded structure in which new classes of ROC are created.

Specifically, to avoid needlessly running into the balancing problems, now widely documented in Germany, research must be commissioned on the ability of the UK system to absorb randomly intermittent power, without excessively wasteful and expensive balancing operations by fossil plant. Beyond this calculated limit, no stochastically intermittent generating capacity should be accredited for the issue of

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² For the full statement see, Renewable Energy Foundation and Incoteco, *2005–2006 Review of the Renewables Obligation* (28 Oct. 2004). Submitted to the DTI, and available from <http://www.ref.org.uk>.

ROCs. This limit would only be lifted if the generator can ensure, through energy storage or by some other technical solution, that the power can be delivered according to demand, in a market-friendly and predictable manner.

Secondly, we proposed that all renewable generation systems that are able to provide firm capacity, should be rewarded by a “firm” ROC (fROC).

Of even greater value would be renewable capacity that is not intermittent at all. Hydropower falls into this category, when rainfall and sound management allow, and we recommend that it should be included in the RO system both for its own sake and also to establish a benchmark of quality.

Such power has a comparable “quality” to that from fossil plant. In its nature, it is likely to be more expensive than either intermittent power sources, and it is right that the ROCs needed to finance such capacity should reflect this premium aspect.

We propose to dub this type of ROC the Premium ROC, or pROC, and recommend its consideration and early adoption.

The value of both of these “quality” ROCs can be enhanced either by a separate component for fRocs and pROCs, with a higher buy-out price, or by requiring that a percentage of the RO be met by any combination of fROCs, pROCs, where 1 ROC = an appropriate fraction of an fROC and a smaller fraction of a pROC.

The Renewable Energy Foundation is therefore disappointed that the current review of the RO so firmly rules banding of this type out of consideration, but understands that the DTI is concerned with destabilising the market, and is investigating other alternatives, such as time delimited ROC eligibility, which may have some of the virtues of banding.

However, the Foundation remains concerned that the present system is suppressing the development of a broad-based renewables industry, and is in fact counterproductive. As is well known, windpower, mostly onshore, is the dominant renewable technology. There are currently some 17,000 MW of wind generators (8,000 turbines approx) bidding for connection to the Scottish grid, according to NGT, a quantity equivalent to the capacity currently installed in the world's leading windpower nation, Germany. But Scottish peak demand is just 6,000 MW, and the interconnectors running south to England add up to a mere 2,200 MW. In default of a grid enlargement program of Soviet scale and character, only a fraction of the wind projects currently under consideration in Scotland can be incorporated. NGT estimates the cost of this grid expansion alone to be £250,000 per installed MW. In view of this, and in all probability, the vast majority of the proposed wind development effort in Scotland will fail, and a considerable quantity of otherwise potentially fertile capital and motivation will have been dissipated.

This curious imbalance towards one technology is a direct outcome of the character of the RO.. We regard this as unfortunate, since if we are to set an economically compelling example to the developing world we should be hoping for investment into a broad range of technologies which would not only contribute to a robust energy supply, but also reduce our emissions at a reasonable price. While the RO

has created much activity, the consequences of this development are not always desirable. The development of land-fill gas was a useful contribution, and should be applauded, but the future looks less productive, and the economic contextual circumstances of BETTA have ensured that the RO drives capital in just one not entirely credible direction, wind energy, which offers minor and very costly emissions abatement. **Consequently, the UK will be placed in the awkward position of claiming moral leadership in global policy to reduce greenhouse gases, while manifestly failing to present the enviable economic prospect which alone can induce emulation.**

It is not a gesture of despair, but constructive realism, to note that the UK can achieve nothing of any purely *quantitative* significance. According to DTI figures successful attainment of the 2010 renewable electricity target (33.6 TWh) will save 9.2 million tonnes of CO₂, which is 1.7% of the UK's current total (550 million tonnes), and 0.0000004 of the global total, which stands at around 24,000 million tonnes. Obviously, in-so-far as the UK has any role in averting climate change it will be judged not by the proximate ends achieved, but by the success with which it showcases low-carbon *means* of exemplary *quality*.

However, it is precisely this qualitative dimension that the Renewables Obligation lacks. The root problem is a too narrow a definition of a cost, one which fails to distinguish between technologies of differing merit. Consequently, so-called "low cost", "near-market" technologies of low merit, are rewarded as generously as others which though still more expensive are redeemed by a much higher intrinsic value, for example the generation of dispatchable power. This has ensured that the money necessarily seeks the cheapest ticket to the support stream, with little concern with long term value. Now that opportunities for land-fill gas generation are all-but exhausted, that bargain ticket is onshore wind power.

Unfortunately, it is not clear that this vigorous and in our view over-focused activity is in the public interest. Randomly intermittent wind energy, as the experience of Germany and Denmark proves conclusively, is at best a supplementary generator. E.ON Netz, one of Europe's largest grid operators and one of the world's most experienced in the matter of wind, has, as is well known, stated in unambiguous terms that wind is a fuel saver only. In practice no firm generating plant can be closed or rebuild avoided as the result of building of even very large numbers of wind turbines. While everyone agrees that wind has something to offer, the scale on which it can contribute must be reassessed. Onshore development in Denmark is now stagnant, and in Germany a debate is continuing between the wind power lobby, and the electricity Transmission System Operators, who are exasperated at the lack of realism in the Green half of Chancellor Schroeder's Red/Green coalition. Wolfgang Clement, the Federal Finance minister, is, by contrast, now openly sceptical of wind's future, and the CDU, who seem likely to form the next government, will probably reform the country's renewable energy policy. Obviously, the wind power industry in Europe is troubled, yet this is the technology into which the UK is pouring its scarce financial resources and annually an ever larger sum of consumer subsidy.

Perhaps it would all make, in the final analysis, some sort of sense if by altruistic action the UK could reduce emissions in a globally significant way. Certainly, the public has been largely convinced, by NGOs such as Greenpeace and Friends of the Earth, that the UK's own program can in and of itself make an important difference, but as we have seen, the numbers tell a different story. The best we can hope for is that China, or India, or any of the numerous populations now quite understandably striving for longer and more prosperous lives, will look at our example, acknowledge the financially prudent ingenuity with which we have reduced emissions, move to do likewise, and buy our technology and expertise.

But so long as the artificial market created by the Renewables Obligation remains in its present form even this modest though genuine contribution to global emissions reduction strategies will elude us. Instead, the world's fourth largest economy will simply become the dumping ground for any technology sufficiently cheap to permit ready access to the ROC stream. Indigenous innovation will slow to a crawl, and if able to move at all will relocate to other more favourable economic environments.

The Renewable Energy Foundation subjects its own position to constant review and criticism, and in pursuit of this corrective external opinion. Our view, as expressed above is that the RO is not creating a favourable environment for innovation, and consequently we have on this occasion commissioned a significant UK innovator, the engineer Jim Oswald C.Eng, of the Oswald Consultancy Ltd.,³ to comment on the RO Review Consultation document. While we had originally intended to subsume his report into our own statement, we believe that his views merit submission in their entirety, and we do here while noting that they do not necessarily represent the position of the Renewable Energy Foundation, though at many points there is a clear consilience. In particular we draw attention to the following conclusions drawn by Mr Oswald:

- The current RO appears likely to suppress innovation, but **ROCs which are a function of half hourly electricity price would encourage enterprising technology development** and lead to the successful establishment of growing renewable businesses within the UK.
- **Fixed term ROCs would provide the government with flexibility** whilst giving the investment community financial assurance.

As this consultation document was in the final hours of its preparation both the Renewable Energy Foundation and Mr Oswald became aware that Ernst & Young have published an analysis which also expresses concern that the current support mechanisms may not be stimulating the creative innovation needed to move the UK towards a lower carbon economy.⁴ We note this in order to emphasise that the views outlined in this text are part of a growing disquiet.

³ Oswald Consultancy Ltd, Coventry University Technology Park, Puma Way, Coventry, CV1 2TT. 024 76236080. Email: jim@oswald.co.uk.

⁴ http://www.ey.com/global/content.nsf/UK/media_-_05_06_13_DC_-_choking_carbon

**COMMENTARY ON THE RENEWABLES OBLIGATION REVIEW 2005–6, BY JIM OSWALD,
FOR THE RENEWABLE ENERGY FOUNDATION**

Stimulus to Technical Development and Innovation, Question 1

Paragraph 2.17 states:

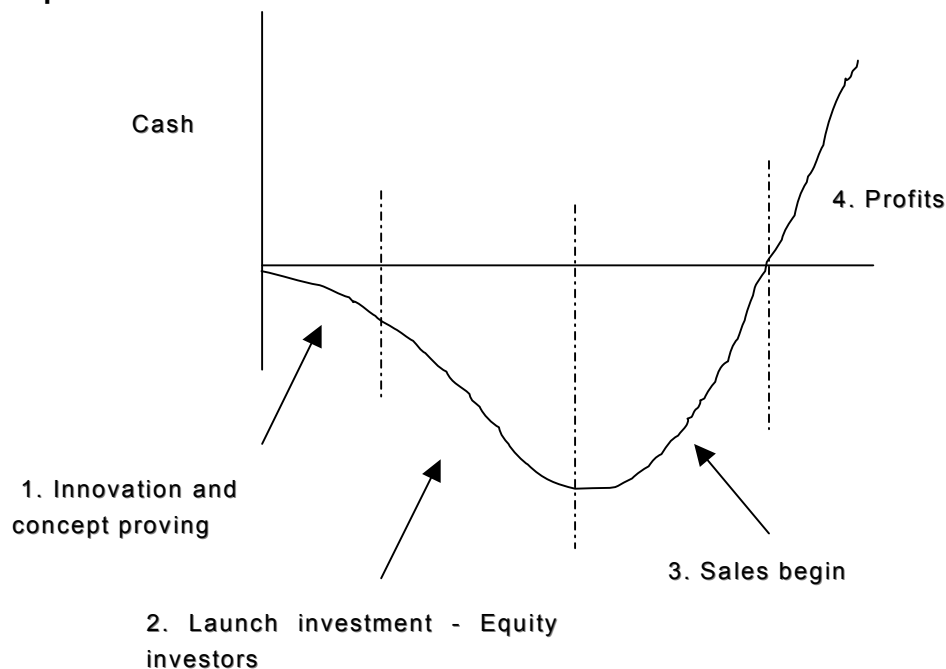
The Government is nonetheless keen to ensure that, within these constraints, as far as is possible, the Obligation assists the development of longer-term renewable technologies.

The effect of the RO on development of longer term renewable technologies is vital to ensure the UK establishes a mix of high quality generation systems. A mixture of systems provides a more even delivery of energy into the grid: it ensures different options are developed and improves security of supply. Many renewable technologies deliver power intermittently, some do this on a predictable basis, and some do it less predictably such as wind. Electricity has more value if it can be turned on and off and it has more value if it can be predicted.

The challenge is to ensure that new innovations are made, developed and evolve into successful businesses in their own right. To do this, entrepreneurs need to see that rewards are there for better renewables: better in terms of predictability and control.

We need to consider innovation, technical development, investment and how businesses grow into success stories. Graph 1 shows a typical plot of cumulative cost flow for any business starting a new venture.

Graph 1



A new technical innovation leading to the establishment of a business goes through the four stages shown in Graph 1.

Stage 1 is the time when the innovative idea germinates. It is the time of creativity, some early proving of the idea and the building of a business plan. It does not cost a great deal as few people are involved. However, it is highly risky time and the majority of innovations do not go beyond this point. They fail for a multitude of reasons including technical failure, competition effects or lack of professional management. This is accepted as part of the risk of starting a new venture. To support renewable technologies, the Carbon Trust provides some support during this phase.

Should a venture emerge from this phase and remain promising it will require significantly more investment which is often provided by external private equity firms or individuals. Cash is required to complete product development and testing, paying for capital outlay (perhaps production tooling), hire extra staff and to fund the cash flow during early company sales. Before investing (in phase 2), the external investor requires a knowledge of a number of things to be convinced; the most important of these is clear definition of the market and rewards for investment. Exciting new technologies offer a better widget, a widget that provides more than existing products, and can command a premium on price. This premium of price provides the incentive to invest: it covers and hopefully rewards for the costs and risks that have been taken. The price premium will often disappear as the business grows and other competitors provide alternatives. Hopefully, by this time the business has grown sufficiently strong that it can go one and develop other even better products.

New renewable technologies will need to follow such a pattern and will need to see a price premium for developing better quality renewable systems: systems that offer either predictability, control or both. Without this price premium the lowest cost renewable energy (typically wind) will dominate and spend on development will not be rewarded.

The Value of the RO to New Technologies

The RO system rewards suppliers of renewable energy and it is recognised that in the next few years this will concentrate on rewarding wind. The revenue provided by the RO to wind turbine generators approximately triples their revenue. This substantial income stream is provided whenever the electricity is supplied with no regard to whether it is predicted nor whether it occurs when demand is highest. The potential earnings are clear to business investors and wind is being chosen as the renewable solution. Wind is a fully developed technology, it is available now and the UK has, in some areas, a good wind resource. However, wind is not the best technology possible: it cannot be controlled to deliver electricity when customer demand is highest, it simply delivers when the wind decides to blow. There is a gap in the market; the current offerings can be improved on. There is an opportunity for businesses to develop something better than wind: a system that can be predicted and controlled.

Traditional fossil fuel generation stations are very aware of the variation in electricity demand during the day. At peak times the market price for electricity is high and some generators build and install plant specifically for these times. Although these plants run for only a few hours per day they obtain high prices for the electricity and form successful businesses. A similar arrangement is needed with renewables: in other words, there needs to be a price advantage for better technologies, ones that can deliver when demand is high. Such an arrangement would provide incentives for new technologies and stimulate innovation, business start ups and allow the UK to establish world leading industries which could provide jobs and renewable generation equipment around the world.

However, the existing RO system does not allow price advantage for a renewable technology that is better than any other. It rewards them equally. This removes the reason for start ups to exist, and will prevent private venture capital entering growing start ups. It will stifle innovation and prevent the UK from taking a lead in the world. The UK will remain an importer of other countries' technology.

Options to Improve the RO

It is clear, then, that the RO system could be improved and used to encourage business start ups. The question is how should this be achieved.

The consultation document discusses how technologies other than wind could be targeted for support, including CHP, mixed wastes and landfill gas. There are two problems with this approach one is that it is prescriptive and will need constant readjustment as technologies advance, the other is that the DTI can only prescribe support to technologies which it knows about. It does not know of some of the best technologies because they have either not been conceived yet or they are confidential to entrepreneurs attempting to develop them. Rather than prescribe, the DTI should establish a framework that establishes rewards that encourage delivery of better quality renewable systems. The rewards will be seen as opportunities by innovators and provide freedom to find the best solutions.

Imaginative options for arranging the framework are required. However, it seems that this should reward technologies that deliver when electricity demand is highest. One method would be to link the RO value to the half hourly price of electricity. Under this arrangement the sale of renewable electricity would earn the generator the value of the electricity plus a multiple of the electricity value. The peak day-time price of electricity is several times higher than the night time prices. Many new technologies would be encouraged by this including, those which can be turned on and off, storage technologies and those which peak during the day such as solar and perhaps tidal. It would encourage technologies that reduce the strain on the rest of the grid when demand is highest. This would ease the demand on existing fossil fuel generation plant which otherwise has to run at part power as spinning reserve.

Linking the value of ROCs to the half hourly price of electricity removes the need for continual legislative adjustments and rewards developers of renewable systems that

actually meet customer demand. It will encourage development of systems which are better than wind, encourage an entrepreneurial culture in the UK leading to world class technologies, and to the establishment of businesses in the UK. The burden on the remaining fossil fuel power stations will be reduced these will operate closer to full load where their efficiency is highest and carbon emission lowest.

Fixed Term ROCs

In this part I discuss Section 2.17, Q1 and fixed term ROCs. Para 1.1 of the consultation document states:

As set out in the Energy White Paper, the Government believes that renewable sources of energy will be increasingly able to meet our energy needs whilst being both economical and carbon free.

As renewable energy systems become more established, they will be more able to compete with fossil fuel plant. This implies that the need for the RO will diminish over the years. How quickly is uncertain, but it seems prudent that the government include some flexibility into the RO system whilst maintaining assurance to the investment community that support will not be suddenly withdrawn. Renewable obligations of fixed term, like government bonds, provide flexibility to government and yet can be seen by the investment community as offering sound guarantees. Different terms could be applied to different forms of generation thus giving the government an ability to factor and adjust rewards for better quality technologies.

CHP, Q31 to Q38

Combined heat and power systems can be installed in buildings to provide local heating and electricity needs. However, the heat and electricity load demand varies with activities of building occupants and time of day: heat is needed in the building before workers arrive yet electricity is required once they arrive. Matching heat and electricity production is a challenge to the system designer and operator.

Table 1 shows an illustrative example of how heat and electricity demand vary throughout one day.

Table 1

Time	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00	00:00
Heat demand	0	0	0	10	7	5	4	4	4	0	0	0	0
Electricity	0	0	0	1	10	8	7	7	7	4	0	0	0
Ratio heat/elec	0	0	0	10	0.7	0.6	0.6	0.6	0.6	0	0	0	0

CHP systems are currently installed in businesses which require constant levels of heat and constant levels of electricity. Paper mills are one such example: steam is used to process the paper and electricity is required to drive the mills.

Today CHP investments are chosen for return on investment. The income from CHP is heat and electricity, and electricity is considered about three times more valuable than heat. A typical investment appraisal currently gives a payback of approximately 5 years, which is longer than most businesses are prepared to wait. Using the RO system to encourage CHP would reduce the payback time and could make a great difference to commercial decisions.

However, if the RO were to provide levels of support equivalent to those experienced by wind generators, effectively tripling their income, then CHP payback would become extremely attractive and demand might even take off faster than the supply base could deliver.

Consideration needs to be given to how such CHP systems would be operated in practice. Operators run these plants to optimise income and paybacks. If the RO systems were providing such high levels of revenue on electricity generated then some operators would choose to run plant at full load almost continuously and simply dump excess heat to atmosphere. It would be impossible to police hundreds of small generation plants spread over the country. This unfortunate abuse of the RO could be limited if the ROCs for CHP were time limited. For example a 3 year RO would provide revenue in the first years of operation when returns are needed the most but once the RO period had expired there would be no incentive for the operator to operate the system wastefully.

CHP Advantage in the UK

A CHP subsidy within the UK may disadvantage competitors with the EU. For example, one of the biggest costs in running a paper mill is energy. Today, these mills use CHP plants to provide the heat and electricity for continuous paper production. CHP is economically viable because paper production runs 24 hours a day, 7 days a week and heat and electricity demand remain constant over this time. The DTI should consider the legality of providing UK paper mills with ROCs (which appear to be more valuable than electricity) thus making UK mills more competitive than European mills.

The RO and Potential for Abuse

As experience grows and the quantity of renewable energy systems increases the possibility for abusing RO may arise. Considerable sums of money will be involved and some business may choose to exploit the spirit of the RO. The opportunity for exploitation under CHP has been mentioned but two other observations are made here.

- Ensuring all suppliers equally miss their renewable obligations may bring business benefit. For example consider 10 suppliers, all supplying 100 units of energy, and all missing miss their obligation under the RO by the same percentage. In this situation the buy out fine is the same for each supplier. The money collected under buy out is returned to the suppliers who provided ROCs, but these would be the same suppliers who missed their RO and they missed it in equal measure and hold the same number of ROCs. In other

words they would each have the same money returned as they were charged and the net cost would be zero. This introduces the possibility for a secondary market developing which works to maximise business returns without carbon reductions being necessary. Business measures could include transferring existing renewable assets between generators to 'redistribute the balance' to best financial gain.

- A dominant renewable supplier may use market share to inflict damage on smaller competitors. Consider the cliff edge on price, as described in Para 2.19 of the consultation document. This occurs if all generators meet their ROC requirements and there are no buy-out charges in any one year: the value of ROCs fall to zero. Alternatively, if one dominant supplier chooses to oversupply renewables they can oversupply ROCs to the market and the value of ROCs falls to zero. Such an event reduces the main revenue stream into the renewable generators and could endanger their survival of some businesses. Dominant competitors who understand this may strive to cause such an event and cause business failure within smaller competing businesses and thus allowing them to purchase the renewable assets of the failed business at attractive prices. This in turn makes them more dominant.

The government needs to be aware of the potential for misuse of the RO and guard against dominant suppliers taking advantage of the spirit of the RO.

Conclusion

- ROCs which are a function of half hourly electricity price would encourage enterprising technology development and lead to the successful establishment of growing renewable businesses within the UK.
- The ROCs could be fixed term and provide the government with flexibility whilst giving the investment community financial assurance
- Applying the RO to CHP could excessively enhance the returns on investment
- Consideration needs to be given to the operation of the CHP to ensure that plant is operated efficiently and not just to maximise ROC income.
- Applying the RO to existing CHP systems could disadvantage competitors within the EU.
- The government needs to monitor abuse of the RO.