OFFICE OF GAS AND ELECTRICITY MARKETS

ASSESSMENT OF THE BENEFITS FROM LARGE-SCALE DEPLOYMENT OF CERTAIN RENEWABLE TECHNOLOGIES

April 2005

Final Report

Prepared by:

Cambridge Economic Policy Associates Ltd and Climate Change Capital

CAMBRIDGE ECONOMIC POLICY ASSOCIATES

Climate Change Capital™

EXECUTIVE SUMMARY

This report has been prepared by Cambridge Economic Policy Associates and Climate Change Capital for Ofgem as a contribution to its thinking on renewable technologies.

We have been asked by Ofgem to assess the benefits to be derived from the large-scale deployment of certain renewable technologies. The technologies in question are onshore wind, offshore wind, and three marine technologies (tidal lagoon, wave and tidal stream).

The detailed methodology is set out in Section 2. In summary, for each technology we have:

1. Developed and used a financial model to estimate the trajectory of unit costs (progress curve) in the period to 2020 as cumulative installed capacity increases, using three methodologies to project costs forward.
2. Translated the results of the above into an assessment of the benefits (in terms of unit cost reductions) as aggregate installed capacity increases; and
3. Estimated the £./MWh premium over the cost of new CCGT plant that must be paid to each technology to enable it to earn the required return on capital[1] (the 'environmental premium').

Due to a lack of robust differentiating data, the models for wave and tidal stream technologies have been combined.

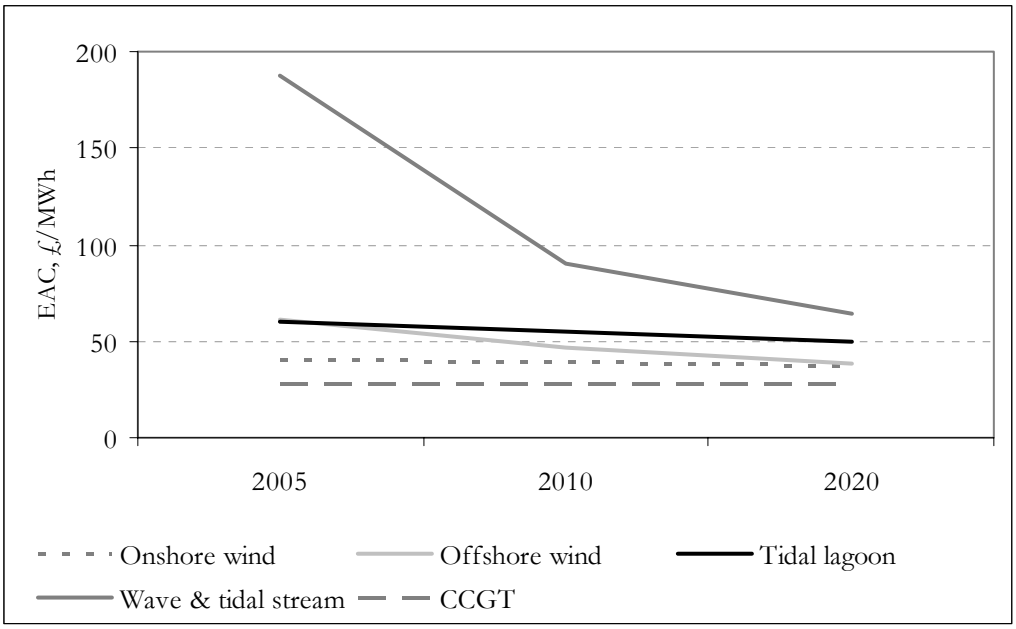
The estimation of progress curves is a useful way to consider the likely evolution of renewable energy production costs, and therefore the magnitude of environmental premia required to induce investment in those technologies. However, progress curves are inherently uncertain, particularly for pre-development technologies such as marine renewables. It is therefore important not to over-interpret the results or to draw conclusions that attribute greater robustness to the analysis than is warranted.

The most robust part of the analysis is the estimation of the current unit equivalent annual cost (EAC). The estimated base case current unit EAC for onshore wind is around £41/MWh, £62/MWh for off-shore wind, £60/MWh for tidal lagoons and £187/MWh for both wave and tidal stream technologies. These are central estimates for a 'typical' project. Actual costs will vary significantly.

The 'best estimate' of the evolution of unit costs derived from the progress curves estimated in this report (Section 4) for each renewable technology considered and CCGT (assumed to be the marginal conventional technology) are summarised in Figure A.

[1] *Here i.e. 10% or 12%*

Figure A: Summary of best estimates of unit cost evolution



The unit costs associated with each of the technologies are expected to decline as aggregate installed capacity increases. However, none of the technologies are projected to be able to compete with conventional generation, absent an environmental premium, if conventional generation valued at market prices.

Figure B summarises, for each of the technologies, our estimate of the environmental premium in 2005 and 2020 assuming a growth of installed capacity consistent with achieving the government's renewable energy targets.

Figure B: Summary of estimated environmental premia, total subsidy required and CO_2 abatement costs

		Onshore wind	Offshore wind	Tidal lagoons	Wave / tidal stream
2020 assumed aggregate installed capacity, GW	Global	190.0	42.0	1.26	0.55
	UK	10.4	11.6	1.26	1.11
Environmental premium, £/MWh	2005	12.22	33.47	32.23	159.12
	2020	9.32	10.50	22.05	35.85
CO_2 abatement cost, £/tonne	2005	30.54	83.67	-	397.80
	2020	23.24	26.26	55.13	89.63

The environmental premium in 2020 is £9.32/MWh for onshore wind, £10.50/MWh for offshore wind, £22.05/MWh for tidal lagoons and £35.85/MWh for wave/tidal stream. Figure B also shows the implied CO_2 abatement cost for each technology. In 2020, the abatement cost for onshore wind is £23.24/tonne, £26.26/tonne for offshore wind, £55.13/tonne for tidal lagoons and £89.63/tonne for wave/tidal stream. By contrast, the

current CO_2 price on the EU Emissions Trading Scheme (ETS) market is around EUR17.25/tonne (with the range since launch in January 2005 around EUR8-17.50.)

It is important to stress that the unit 'environmental premium' plus the wholesale energy price will not equal the cum-ROCs price for renewable energy. With the current ROC scheme, the ROC premium is determined by the cost of the marginal (most expensive) renewable capacity. This premium accrues to all intra-marginal producers. Therefore, total payments to induce investment in a diversified portfolio of renewables will be much higher than the sum of the environmental premia estimated above. The report sets out crude estimates of the ROC premium required if the portfolio of technologies shown in figure B is to be realised by 2020.