

BNXS26: Rationale for policy cost and benefit estimates used in MTP Government Standards Modelling

Version 1.0

This Briefing Note and referenced information is a public consultation document and will be used to inform Government decisions. The information and analysis forms part of the Evidence Base created by Defra's Market Transformation Programme.

1 Introduction

There is a need to understand the costs involved in implementing the policy packages contained within the Market Transformation Programme's modelling of energy using products. This will allow for a better judgement of the value of the policies to government, industry and consumers, and assist policy makers in deciding which sectors, products and policies can contribute most usefully to emissions reduction plans. This briefing note sets out the rationale for the establishment of the costings now contained within the Defra's 2009 public consultation document 'Saving Energy Through Better Products and Appliances'.

2 Methodology

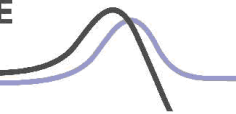
The following costs and benefits were accounted for in developing the costings, in alignment with the principles of Government's Impact Assessments¹ –. Further information on Treasury cost-benefit assumptions is published in The Green Book². Application of these assumptions for Greenhouse Gas Policy Evaluation and Appraisal in Government Departments is in the draft Department for Energy and Climate Change (DECC) and HM Treasury (HMT) publication 'Valuation of Energy Use and Greenhouse Gas Emissions for Appraisal and Evaluation', January 2010³.

All costs and benefits included are marginal values. They represent the 'extra' impact of doing something additional to that which is already being done. Costs are only included where they require activities which are marginal to currently planned, budgeted and implemented policy actions.

¹ <http://www.berr.gov.uk/files/file44544.pdf> (accessed 03/03/2010)

² www.hm-treasury.gov.uk/data_greenbook_index.htm (accessed 03/03/2010)

³ http://www.decc.gov.uk/en/content/cms/statistics/analysts_group/analysts_group.aspx (accessed 03/03/2010)



All present values of the policy package are given in net terms. It is critical to understand what the costs and benefits are of each policy, or package of policies, contained within MTP's modelling. This allows sensible judgement to be made on the actual value of the policy, or policy package. As such present values are expressed in net terms taking into account costs and benefits to the UK economy as a whole, to government, industry and consumers. An example of the breakdown of costs and benefits is given in the illustrative example in this Briefing Note.

All costs and benefits refer to the purchase and usage phases. The additional cost (if any) to end-users for purchasing more energy efficient products is taken into account as well as the benefits of reduced energy consumption in the usage phase. Higher product manufacturing costs are implied to be recouped through increased retail prices of products; end of life costs and benefits, the cost of demonstrating compliance with requirements and of compliance checking are not currently included in estimates.

Cost calculations take into account:

- Increase in non-traded CO₂ emissions (extra heating, as a result of the heat replacement effect) where appropriate; this represents the damage expected as a result of climate change if carbon emissions are not restricted;
- Impacts on air quality (AQ) from more heating being used;
- Product costs to consumers, government and industry. For instance, following the implementation of a mandatory minimum efficiency performance standard for a certain product, the difference in purchase cost between a product that meets the criteria, and one that does not (but would have been purchased otherwise) is the marginal cost to the consumer.⁴

Administrative costs to Government of implementing policies (e.g. the cost of establishing a technical committee to establish revalorised labelling criteria) are difficult to estimate. These costs are also typically relatively small compared to other impacts of these policies and have therefore not been included in estimates.

It is assumed that industry will pass on any costs incurred to consumers unless there are exceptional circumstances.

Benefits calculations take into account:

- Lifetime energy savings for consumers and other end-users, through reduced running costs;
- Benefits realised through the CO₂ savings required to achieve the EU ETS cap (for traded savings ie those related to electricity). This represents the benefits to power suppliers of being able to sell (or not having to purchase) ETS allowances as a result of lower energy demands;
- Benefits realised through non-traded CO₂ savings (ie from direct use fuels).

⁴ Where the product would have a significant lifetime beyond the end of the period being considered (eg in this case 2030) the marginal cost of the product has been discounted so that the lifetime of the cost and the benefit (reduced energy bills) are considered on the same terms.

- Improvements to air quality as a result of less electricity being generated;

All costs and benefits are discounted using standard discounting factors, and the heat replacement effect is accounted for.

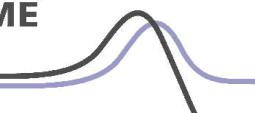
Costs and benefits are converted into monetary terms (for carbon and energy) using the factors referenced in Appendix A⁵.

Marginal product costs have been estimated by MTP technical experts, based on commercial and stakeholder sources.

⁵ Carbon Emission factors are referenced in BNXS01 and Heat Replacement Effect factors are referenced in BNXS05.

MARKET TRANSFORMATION PROGRAMME

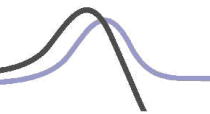
Supporting UK Government policy on sustainable products



Example: The following table gives an illustrative example⁶ for a package of policies:

	Benefits (£m)				Costs (£m)				Net Benefit (£m)
	Net running costs	Carbon (ETS)	Net AQ	Total Benefit	Non-Traded carbon (extra heating)	Consumer costs	Government costs	Total cost	
2009	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2010	0.3	0.0	0.0	0.3	0.0	1.5	0.0	1.5	-1.2
2011	0.7	0.1	0.0	0.8	0.0	1.8	0.0	1.8	-1.0
2012	1.6	0.2	0.0	1.9	0.0	2.7	0.0	2.7	-0.8
2013	2.8	0.3	0.0	3.1	0.0	2.5	0.0	2.5	0.7
2014	5.5	0.7	0.1	6.2	0.0	4.0	0.0	4.0	2.2
2015	8.4	1.0	0.1	9.5	0.1	3.4	0.0	3.5	6.0
2016	11.8	1.5	0.2	13.4	0.1	5.5	0.0	5.6	7.8
2017	15.3	1.9	0.2	17.4	0.1	5.8	0.0	5.9	11.5
2018	18.5	2.3	0.2	21.1	0.1	5.2	0.0	5.3	15.7
2019	21.7	2.8	0.3	24.8	0.2	4.6	0.0	4.8	20.0
2020	25.1	3.2	0.3	28.6	0.2	4.4	0.0	4.6	24.1
2021	28.2	4.3	0.4	32.9	0.2	4.3	0.0	4.5	28.4
2022	31.4	5.3	0.4	37.2	0.3	4.5	0.0	4.7	32.5
2023	34.2	6.6	0.5	41.3	0.3	4.7	0.0	5.0	36.4
2024	37.3	7.9	0.5	45.7	0.3	4.8	0.0	5.1	40.7
2025	39.8	9.4	0.6	49.8	0.3	4.7	0.0	5.1	44.7
2026	42.3	10.8	0.6	53.7	0.4	4.6	0.0	4.9	48.8
2027	45.1	12.5	0.7	58.3	0.4	3.8	0.0	4.2	54.1
2028	47.9	14.1	0.7	62.7	0.4	2.9	0.0	3.3	59.4
2029	50.7	15.9	0.8	67.4	0.4	1.6	0.0	2.1	65.3
2030	57.0	17.6	0.8	75.5	0.5	0.0	0.0	0.5	75.0

⁶ Data taken from GS09 Dishwashers model



Annualised costs and benefits are derived by applying an annualisation formula as follows:

$$\text{Annualised figure} = \text{Net Present Value} * R (1+R)^n / ((1+R)^n - 1)^7$$

R= discount rate (3.5%)

n= number of years

3 Next Steps

Work remains to refine the definition and estimation methodologies of additional costs and benefits, and the impact of technological development on additional costs over time, to ensure an identical approach has been used across different product groups.

Further, costs and benefits are currently presented for the overall policy package for a product or product areas. The breakdown of costs into separate policies within the policy packages has not been possible. It is possible that this will be followed up in future work.

Related MTP information

- BNXS01 – Carbon Dioxide Emission Factors for UK energy use
- BNXS05 – The Heat Replacement Effect

Changes from previous version

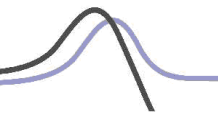
This is the first published version.

Consultation and further information

Stakeholders are encouraged to review this document and provide suggestions that may improve the quality of information provided, email info@mtprog.com quoting the document reference, or call the MTP enquiry line on +44 (0) 845 600 8951.

For further information on related issues visit www.mtprog.com

⁷ <http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/greengas-policyevaluation.pdf>



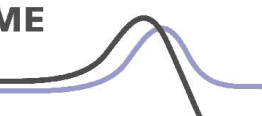
Appendix A

Cost & Benefit Factors – Sources

Factor	Source
Carbon dioxide emissions	BNXS01 – Carbon Dioxide Emission Factors for UK energy use ⁸
Heat replacement effect	BNXS05 – The Heat Replacement Effect ⁹
Energy prices (variable element)	Valuation of Energy Use and Greenhouse Gas Emissions for Appraisal and Evaluation (January 2010), tables 4, 5 and 7 p.44-47 (ie central values used)
Air quality factors	Valuation of Energy Use and Greenhouse Gas Emissions for Appraisal and Evaluation (January 2010), text and table 29 p.69
EU ETS prices (ie traded carbon price)	Valuation of Energy Use and Greenhouse Gas Emissions for Appraisal and Evaluation (January 2010), table 3 p.42
Non-traded carbon price	Valuation of Energy Use and Greenhouse Gas Emissions for Appraisal and Evaluation (January 2010), table 3 p.42
Discount factors	Discount rate of 3.5% - Treasury Green Book rate.

⁸ Please refer to this Briefing Note for relevant factors. These are consistent with the central January 2010 guidance

⁹ Please refer to this Briefing Note for relevant factors.



Energy prices

	Energy price (variable element) (p/kWh)					
	Domestic biomass ¹⁰	Domestic oil	Domestic gas	Commercial electricity ¹¹	Industrial electricity ¹²	Domestic electricity
2009	2.8	2.8	2.0	8.8	8.6	9.0
2010	2.8	2.8	2.1	7.7	6.7	7.9
2011	2.8	2.8	2.2	7.8	6.9	8.1
2012	2.9	2.9	2.2	7.9	6.9	8.1
2013	2.9	2.9	2.3	8.0	7.0	8.2
2014	3.0	3.0	2.3	8.1	7.1	8.3
2015	3.0	3.0	2.3	8.1	7.1	8.3
2016	3.0	3.0	2.3	8.1	7.1	8.4
2017	3.1	3.1	2.4	8.2	7.2	8.5
2018	3.1	3.1	2.4	8.3	7.3	8.5
2019	3.2	3.2	2.4	8.3	7.3	8.5
2020	3.2	3.2	2.4	8.4	7.4	8.6
2021	3.2	3.2	2.5	8.5	7.4	8.7
2022	3.3	3.3	2.5	8.5	7.5	8.8
2023	3.3	3.3	2.5	8.5	7.5	8.8
2024	3.3	3.3	2.6	8.6	7.6	8.9
2025	3.4	3.4	2.6	8.7	7.6	8.9
2026	3.4	3.4	2.6	8.7	7.6	8.9
2027	3.5	3.5	2.6	8.8	7.7	9.0
2028	3.5	3.5	2.7	8.8	7.8	9.1
2029	3.5	3.5	2.7	8.9	7.8	9.2
2030	3.6	3.6	2.7	9.7	8.5	9.9

¹⁰ No central value was available so set to be the same as domestic oil price, following expert discussions within MTP; a conversion factor from DUKES 2008 (http://stats.berr.gov.uk/energystats/dukes08_aa.pdf) was used to convert oil prices from £/litre to £/kWh to derive these factors.

¹¹ Commercial electricity prices were used for all non-domestic products except Motors (ICT, Lighting, Commercial Refrigeration, Air Conditioning, Circulators)

¹² Industrial electricity prices were used for Motors only

Air Quality factors

Air Quality factors (£/GWh) ^{13, 14, 15}					
	Electricity ¹⁶	Domestic Heating	Domestic heating (gas)	Domestic heating (Oil)	Domestic heating (Biomass)
2009	1,100	3,000	0	7,000	94,000
2010	1,122	3,000	0	7,000	96,000
2011	1,144	3,000	0	7,000	98,000
2012	1,167	3,000	0	7,000	100,000
2013	1,191	3,000	0	7,000	103,000
2014	1,214	3,000	0	7,000	105,000
2015	1,239	3,000	0	7,000	107,000
2016	1,264	3,000	0	8,000	109,000
2017	1,289	4,000	0	8,000	111,000
2018	1,315	4,000	0	8,000	114,000
2019	1,341	4,000	0	8,000	116,000
2020	1,368	4,000	0	8,000	118,000
2021	1,395	4,080	0	8,160	120,360
2022	1,423	4,162	0	8,323	122,767
2023	1,451	4,245	0	8,490	125,223
2024	1,480	4,330	0	8,659	127,727
2025	1,510	4,416	0	8,833	130,282
2026	1,540	4,505	0	9,009	132,887
2027	1,571	4,595	0	9,189	135,545
2028	1,602	4,687	0	9,373	138,256
2029	1,635	4,780	0	9,561	141,021
2030	1,667	4,876	0	9,752	143,841

¹³ Based on Defra guidance, AQ factors have been projected to 2030 from 2020 data, based on a 2% p.a. growth rate.

¹⁴ Rounded totals used 2009-2020 for Domestic Heating, Domestic Heating (Oil) and Domestic Heating (Biomass)

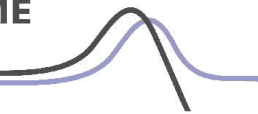
¹⁵ The AQ factors for heating were calculated by use to reflect the average of heating used for HRE

¹⁶ The 2009 figure comes from the statement on page 69 of Valuation of Energy Use and Greenhouse Gas Emissions for Appraisal and Evaluation (January 2010), which states "The damage costs associated with marginal electricity generation are 0.11p/kWh". This was converted into £/GWh, and in accordance with guidance from Defra a 2% annual growth figure was applied to get factors for 2010-2030.

EU ETS

(traded carbon price)

	EU ETS (£/tCO ₂)
2009	21
2010	22
2011	22
2012	22
2013	23
2014	23
2015	23
2016	24
2017	24
2018	24
2019	25
2020	25
2021	30
2022	34
2023	39
2024	43
2025	48
2026	52
2027	57
2028	61
2029	66
2030	70



Non-traded Carbon price

	Non-traded Carbon price (£/tCO ₂)
2009	51
2010	52
2011	52
2012	53
2013	54
2014	55
2015	56
2016	57
2017	57
2018	58
2019	59
2020	60
2021	61
2022	62
2023	63
2024	64
2025	65
2026	66
2027	67
2028	68
2029	69
2030	70

Discount Factor

	Discount factor (%)
2009	1.00
2010	0.97
2011	0.93
2012	0.90
2013	0.87
2014	0.84
2015	0.81
2016	0.79
2017	0.76
2018	0.73
2019	0.71
2020	0.68
2021	0.66
2022	0.64
2023	0.62
2024	0.60
2025	0.58
2026	0.56
2027	0.54
2028	0.52
2029	0.50
2030	0.49