

EU wide extrapolation of UK cost of biofuels calculations
Malcolm Fergusson, December 2011

The two reports by the IISD (1) calculate the cost of biofuels mandates to consumers and the taxpayer in Germany and the UK, respectively. These reports have produced figures for expected differences in production costs in 2020, assuming compliance with EU 10% 'biofuel' targets. This Excel spreadsheet contains calculations for extrapolating these figures to the EU 27 level.

To achieve this, total demand projections and a petrol/diesel split for 2020 were derived from the European Commission's annual *Energy Trends* forecasts. Intermediate years were then interpolated on a straight line basis from the 2010 baseline. For the 10% split scenario, the levels of bioethanol and biodiesel were then calculated on a simple 10% of energy content basis from petrol and diesel respectively, and converted to litres. The B7 limit scenario followed the same track for the early years until the 7% energy content ceiling was reached, at which point the ethanol percentage was allowed to increase more rapidly to maintain the 10% energy content basis overall. The cost difference in pence per litre from the UK's Impact Assessment was then applied to each fuel for each of the four fuel price scenarios set out.

The following Excel spreadsheets contain the data sets and calculations made. Final EU wide costs for 2020 and cumulative 2010 to 2020 are given in the sheet 'EU time series' (see Sheet 9). Final UK costs 2010-2020 are contained in Sheet 8 'UK time series'.

(1) Rauch A & M Thöne, Biofuels – At What Cost? Mandating ethanol and biodiesel consumption in Germany, FiFo Institute for the Global Studies Initiative (GSI) of the International Institute for Sustainable Development (IISD), Geneva, Switzerland, November 2011, <http://www.globalsubsidies.org/research/biofuel-subsidies-germany>

Charles C & P Wooders, Biofuels – At What Cost? Mandating ethanol and biodiesel consumption in the United Kingdom, for the Global Studies Initiative (GSI) of the International Institute for Sustainable Development (IISD), Geneva, Switzerland, August 2011, <http://www.globalsubsidies.org/research/biofuel-subsidies-united-kingdom>

www.berr.gov.uk/files/file48653.pdf
www.berr.gov.uk/files/file51365.pdf
www.decc.gov.uk/en/content/cms/statistics/projections/projections.aspx

ARUP-Cenex study on Electric Vehicle penetration by 2020
 Communication on DECC Fossil Fuel Price Assumptions

Spring 2008

UK projections at: Annex C of most recent projections

Demand for Petroleum products 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016

DUKES 2010

Aggregate energy balance, ktoe	(Tables 1.1, 1.2, 1.3)		
-Transport, Road, Petroleum Products	42846	41331	39696
Value in 2009 (GBP billion)	49.12	57.115	51.745
VAT and duties (GBP billion)	31.28	32.665	33.47

Chapter 3 PETROLEUM PRODUCTS

Table 3A Estimated consumption of road transport fuels by vehicle class

	1995	2000	2005	2008
Motor spirit:				
Cars and taxis	93%	95%	97%	97%
Light goods vehicles	7%	4%	2%	2%
Motor cycles etc	1%	1%	1%	1%
DERV:				
Cars and taxis	21%	27%	32%	34%
Light goods vehicles	15%	21%	23%	22%
Heavy goods vehicles	55%	44%	37%	36%
Buses and coaches	9%	9%	9%	7%

Source: AEA Energy and Environment

Table 3B: Consumption of Biodiesel and Bioethanol in the UK

Unit: Million litres

Year	Biodiesel	DERV	Biodiesel as % Diesel share	Bioethanol	Motor Spirit	Bioethanol as % Motor Spirit share	Biofuels as % of road fuels
2003	19	20,906	0.1%	0	27,393	0.0%	0.0%
2004	21	22,181	0.1%	0	27,025	0.0%	0.0%
2005	33	23,233	0.1%	85	25,608	0.3%	0.2%
2006	169	24,286	0.7%	95	24,672	0.4%	0.5%
2007	347	25,476	1.4%	152	24,045	0.6%	1.0%
2008	886	25,686	3.5%	206	22,709	0.9%	2.3%
2009	1,044	25,084	4.2%	317	22,027	1.4%	2.9%

Source: HM Revenue and Customs

See Table 3.6 for 2005-09 motor spirit and Derv consumption figures.

See also biofuels notes sent to Tom, Chris with text extracts

And can get the calorific values, densities, etc. from this too.

Short and long term carbon values can be found in:

http://www.decc.gov.uk/assets/decc/what%20we%20do/a%20low%20carbon%20uk/carbon%20valuation/1_20100610131858_e_@@_carbonvalues.pdf

2017 2018 2019 2020

Discount rate 3.50% (page 19)

Sheet 3 Vol and Energy Calculations

Energy content of fossil and biofuels (MJ/l) (page 19)

	Energy Content (MJ/l)	% of fossil fuel	
Petrol	32.84		
Bioethanol	21.28	64.8%	<i>use the % as more accurate</i>
Diesel	36.57		
Biodiesel	33.10	90.50%	<i>use the % as more accurate</i>

N.B. Figures on percentages more accurate - used in preference to raw values

Volume equivalent blends

Volume (%)		Energy (MJ)			Volume Factor	Volume required to replace 1l petrol energy content				
E Petrol	Bioethanol	32.84	21.28032	TOTAL		Petrol	Bioethanol	Marginal difference	Ratio	
10	90%	10%	29.556	2.128032	31.68403	1.036484	0.932836	0.103648	-0.067164	0.103648
					3.6%					

Volume (%)		Energy (MJ)			Volume Factor	Volume required to replace 1l petrol energy content				
B Diesel	Biodiesel	36.57	33.09585	TOTAL		Diesel	Biodiesel	Marginal difference	Ratio	
7	93%	7%	34.0101	2.31671	36.32681	1.006695	0.936226	0.070469	-0.063774	0.070469
					0.7%					

Energy equivalent blends

Volume (%)		Energy (MJ)			For correct blend in energy terms (noting the need to Share of bioethanol by energy)	
E Petrol	Bioethanol	32.84	21.28032	TOTAL		
14.64	85%	15%	28.03222	3.115439	31.14766	10.00%

Volume (%)		Energy (MJ)			For correct blend in energy terms (noting the need to Share of bioethanol by energy)	
B Diesel	Biodiesel	36.57	33.09585	TOTAL		
10.94	89%	11%	32.56924	3.620686	36.18993	10.00%

Share of fuel demand

	Petrol	Diesel	volume		energy		
	38%	62%	Bioeth	Biodies	Bioeth	Biodies	
Need	3.80%	6.20%	14.64	10.94	10	10	Base case
Have	6.04%	3.96%	23.29	7	16.44	6.38	With B7 blend wall
Can do some other cases?							

Quantities of petrol and diesel in the UK

Sheet 4 2010 and 2020 Quantities

Road transport demand (from DfT impact model)

	Units	2010	2020-Low	2020-Central	2020-High	2020-HighHigh
Diesel	TJ	943046.708	1065573.45	1047910.4	1018910.254	993319.7152
Petrol	TJ	775932.044	660157.594	649214.7545	631248.2157	615394.0402
TOTAL	TJ	1718978.75	1725731.05	1697125.155	1650158.47	1608713.755

	Units	2010	2020			
			Low	Central	High	HighHigh
Diesel	Mt	21.58	24.38	23.98	23.32	22.73
Petrol	Mt	17.35	14.76	14.51	14.11	13.76
TOTAL	Mt	38.93	39.14	38.49	37.43	36.49
Diesel	M.litres	25,787	29,138	28,655	27,862	27,162
Petrol	M.litres	23,628	20,102	19,769	19,222	18,739
TOTAL	M.litres	49,415	49,240	48,424	47,084	45,901

From Annex C of UEP calculations (DECC via DUKES)

	Units	2010-Baseline	2020-Low	2020-Central	2020-High	2020-HighHigh	2020-Baseline
Petroleum (road)	ktoe	39,936	37,043	36,429	35,419	34,528	40,308
Biofuel-5	ktoe	1,017	4,175	4,107	3,994	3,895	1,863
TOTAL	ktoe	40,954	41,218	40,535	39,413	38,423	42,171
<i>% Bio-fuel5</i>		2.5%	10.1%	10.1%	10.1%	10.1%	4.4%
Petroleum (road)	TJ	1,672,053	1,550,933	1,525,189	1,482,919	1,445,619	1,687,612
Biofuel-5	TJ	42,597	174,798	171,936	167,240	163,095	78,004
TOTAL	TJ	1,714,650	1,725,731	1,697,125	1,650,158	1,608,714	1,765,616
<i>% Bio-fuel5</i>		2.5%	10.1%	10.1%	10.1%	10.1%	4.4%

Petroleum (road)	M. litres	47,899	44,106	43,374	42,172	41,111	47,993
Biofuel-5	M. litres						
TOTAL	M. litres	47,899	44,106	43,374	42,172	41,111	47,993
% Bio-fuel5		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Petroleum (road)	Mt	37.73	35.06	34.48	33.52	32.68	38.15
Biofuel-5	Mt	0	0	0	0	0	0
TOTAL	Mt	38	35	34	34	33	38
% Bio-fuel5		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 3B: Consumption of Biodiesel and Bioethanol in the UK

Unit: Million litres

Year	Biodiesel	DERV	Biodiesel as % Diesel share	Bioethanol	Motor Spirit	Bioethanol as % Motor Spirit share	Biofuels as % of road fuels
2003	19	20,906	0.1%	0	27,393	0.0%	0.0%
2004	21	22,181	0.1%	0	27,025	0.0%	0.0%
2005	33	23,233	0.1%	85	25,608	0.3%	0.2%
2006	169	24,286	0.7%	95	24,672	0.4%	0.5%
2007	347	25,476	1.4%	152	24,045	0.6%	1.0%
2008	886	25,686	3.5%	206	22,709	0.9%	2.3%
2009	1,044	25,084	4.2%	317	22,027	1.4%	2.9%

Source: HM Revenue and Customs

Conversion Factors

		toe	41.868 GJ				
	(TJ/mill.l.)		ktoe	41.868 TJ			
		Petrol	Bioethanol	% bio	Diesel	Biodiesel	
CV	MJ/l	32.84	21.28032	64.8%	36.57	33.09585	90.5%
Spec. vol.	litres/t	1362			1195		DUKES p221
CV-net	GJ/t	44.7			42.9		DUKES p223
CV-gross	GJ/t	47.1			45.6		DUKES p223

0.789 1.2674271

Petrol and diesel mixes for 2010, 2020

		2010	2020	
% Petrol		45%	38%	
CV	MJ/l	34.91	35.16	
Spec. vol	litres/t	1,269	1,258	
		kg CO₂	kg CO₂	kg CO₂
		per tonne	per kWh	per litre
Gases				
Natural Gas			0.184	
Liquid fuels				
LPG			0.214	1.495
Gas oil	3190		0.252	2.762
Fuel oil	3216		0.266	3.172*
Burning oil	3150		0.246	2.532
Naptha	3131		0.237	2.159*
Petrol	3135		0.240	2.303
Diesel	3164		0.250	2.639
Aviation spirit	3128		0.238	2.226
Aviation turbine fuel	3150		0.245	2.528
Solid fuels				
Industrial coal	2301		0.308	
Domestic coal	2506		0.296	
Coking coal	2931		0.346	

All emission factors are based on a Gross Calorific Value basis

*DECC estimates

"Technical Assumptions"

	kgCO ₂ /litre (lifecyc)	MJ/litre	tCO ₂ /TJ	litres/tonne	litres/tCO ₂	conversion factor	
diesel	3.06	36.57	83.80	1362	326	83.80	0
petrol	2.75	32.84	83.80	1198	363		0
biodiesel		33.10		1132	361		
bioethanol		21.29		1324	561		

DfT IA Model

		2010	2020				
		Central	Low	Central	High	HighHigh	
Fossil Fuel Price							2009 prices?
Petrol	ppl	36	32	40	57	70	2009 prices?
Diesel	ppl	39	34	44	63	78	
Biofuel Price							2009 prices?
Bioethanol	ppl	50	43	45	51	56	2009 prices?
Biodiesel	ppl	72	69	73	83	96	
Spread (volume)							2009 prices?
Bioethanol-petrol	ppl	14	12	5	-7	-14	2009 prices?
Biodiesel-diesel	ppl	33	35	29	20	19	
Spread (energy, per litre of conventional fuel)							2009 prices?
Bioethanol-petrol	ppl	41	35	30	21	16	2009 prices?
Biodiesel-diesel	ppl	41	42	37	29	29	
Spread (energy, per litre biofuel)							
Bioethanol-petrol	ppl	27	22.9	19.2	13.6	10.6	64.80% of energy equiv, v/v
Biodiesel-diesel	ppl	37	38.0	33.6	26.2	26.1	90.50%

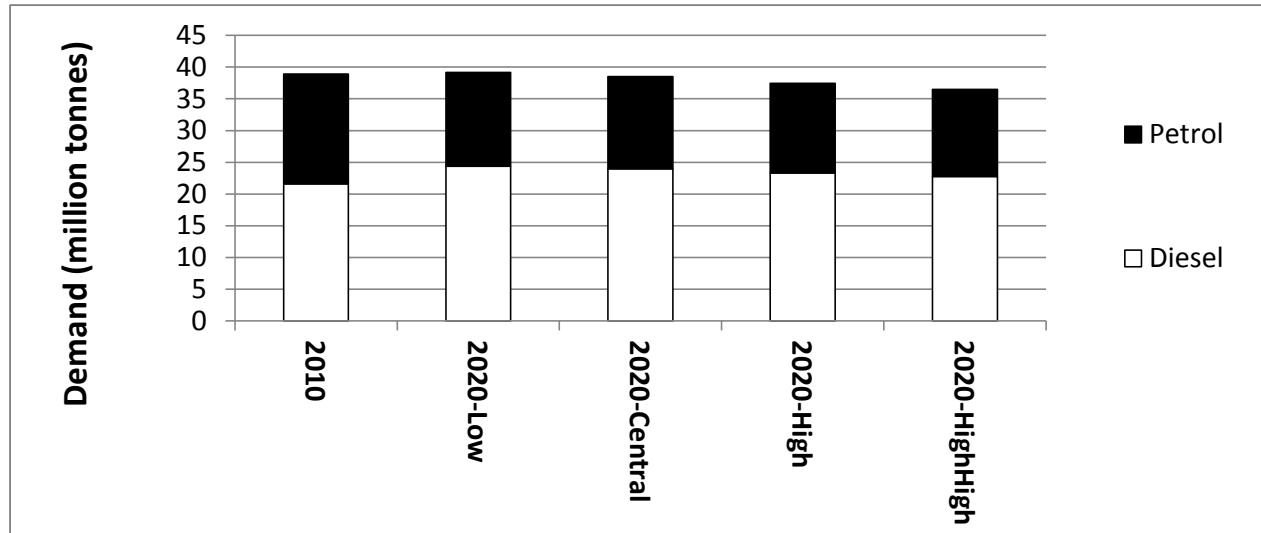
Projections of additional costs of biofuels

Road transport demand (TJ, from UEP via DfT IA - these are equivalent)

Sheet 6 DfT IA graphs

		2010	2020-Low	2020-Cent	2020-High	2020-HighHigh
Diesel	Mt	21.58	24.38	23.98	23.32	22.73
Petrol	Mt	17.35	14.76	14.51	14.11	13.76
TOTAL	Mt	38.93	39.14	38.49	37.43	36.49
Petrol %		45%	38%	38%	38%	38%

Seems to include bio-fuel5 stuff too
 Bioethanol Biodiesel
 only blend only blend
 26.52 16.05



Million litres

(2020 = central pricing estimate)

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Bioethanol: to meet 10% of petrol	0	0	85	95	152	206	317	566	814	1063
Biodiesel: to meet 10% of diesel-b	19	21	33	169	347	886	1044	1237	1430	1623
Bioethanol: with biodiesel limited	0	0	85	95	152	206	317	728	1138	1549
Biodiesel: limited to B7 in 2020	19	21	33	169	347	886	1044	1133	1221	1310

2020 Central Price requirements

Energy content (TJ)	Biofuel 10% Mlitres		Biofuel B7 limit Mlitres		Annual change (M litres, equal case)	
	2003	2004	2003	2004	Mlitres	k tonnes
Petrol	649214.75	64921.475	3050.7753	102882.98	4834.654	249 187707.7
Diesel	1047910.4	104791.04	3166.2894	66829.54	2019.273	193 170437.6
TOTAL	1697125.2	169712.52		169712.52		

Table 3B: Consumption of Biodiesel and Bioethanol in the UK

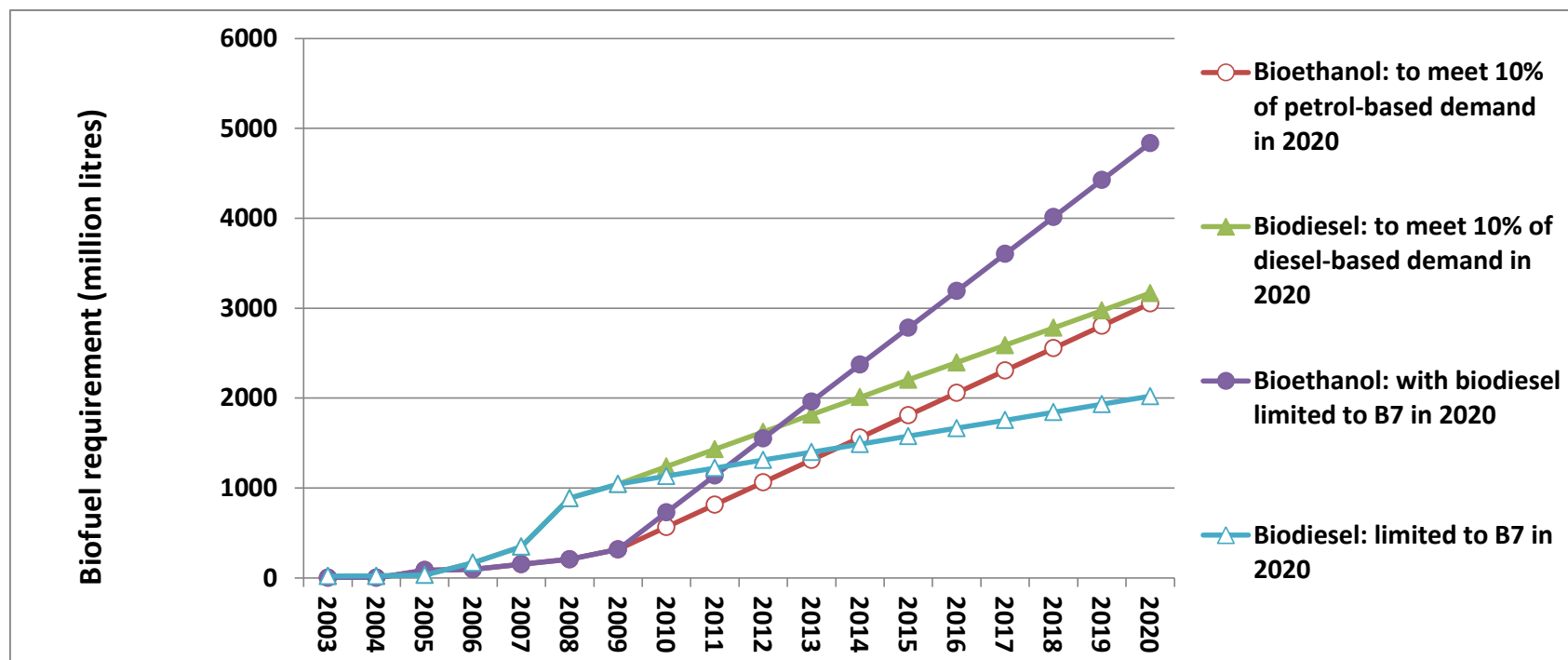
Unit: Million litres

Year	Biodiesel	DERV	Biodiesel as % Diesel share	Bioethanol	Motor Spirit	Bioethanol as % Motor Spirit share	Biofuels as % of road fuels
2003	19	20,906	0.1%	0	27,393	0.0%	0.0%
2004	21	22,181	0.1%	0	27,025	0.0%	0.0%
2005	33	23,233	0.1%	85	25,608	0.3%	0.2%
2006	169	24,286	0.7%	95	24,672	0.4%	0.5%
2007	347	25,476	1.4%	152	24,045	0.6%	1.0%
2008	886	25,686	3.5%	206	22,709	0.9%	2.3%
2009	1,044	25,084	4.2%	317	22,027	1.4%	2.9%

Source: HM Revenue and Customs

2013	2014	2015	2016	2017	2018	2019	2020
1311	1560	1808	2057	2305	2554	2802	3050.775
1816	2009	2202	2395	2587	2780	2973	3166.289
1960	2370	2781	3192	3603	4013	4424	4834.654
1399	1487	1576	1665	1753	1842	1931	2019.273

Pet prod			
	Mlitres	10% B7 scen	
Petrol	19769	1977	3133
Diesel	28655	2865	1827
TOTAL	48424	4842	4960



Additional cost, £million ¹	2020			
	Low	Central	High	HighHigh
Each biofuel meets 10% by energy	1,902	1,648	1,244	1,149
Biodiesel limited to B7 ³	1,876	1,604	1,185	1,040

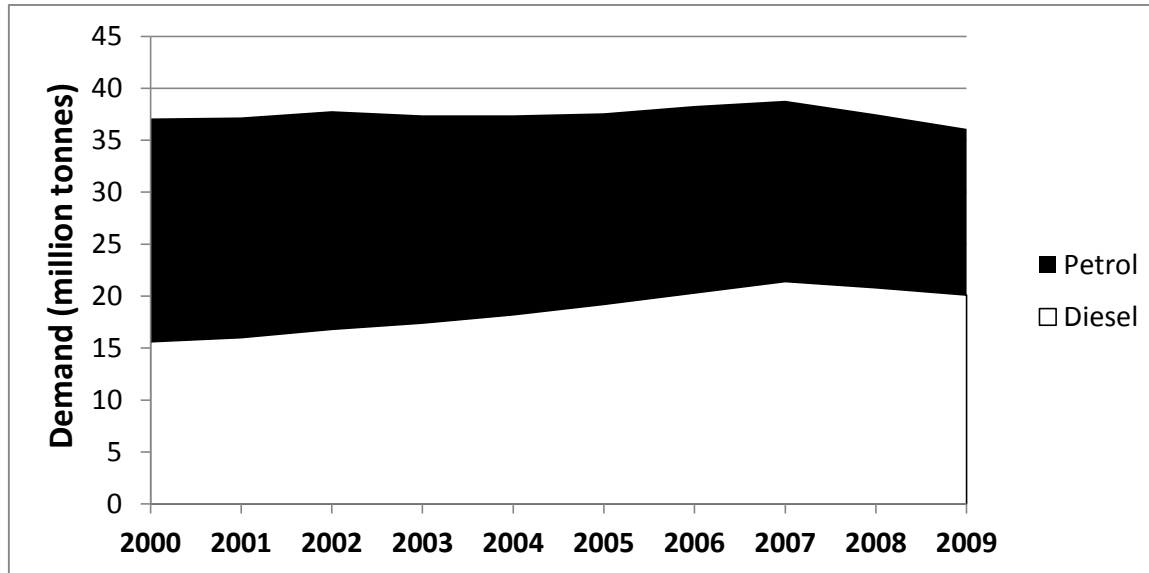
¹ Additional cost of meeting 2020 10% by energy mandate compared to no biofuels counterfactual

² Assumes 10% of the energy content of projected petrol demand in 2020 is met by bioethanol and 10% of the projected diesel demand by biodiesel

³ Biodiesel limited by blending wall, deficit met by increased bioethanol production such that total energy content of biofuels remains constant

Road transport demand (Mt, TSO, 2010))

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Diesel	15.6	16	16.8	17.4	18.2	19.2	20.3	21.4	20.8	20.1
Petrol	21.5	21.2	21	20	19.2	18.4	18	17.4	16.7	16



Sheet 7 1st EU scaleup

	ktoe	Tj	ratio
Total UK Road Fuel 2020	37454	1567824	
Total EU27 Road Fuel 2020	315528	13208002	8.424414
	0.118703		
Result: (first approximation)	2010	303242	

Source: EU ENERGY TRENDS TO 2030 , 2009 edition

Additional cost, £million ¹	2020			
	Low	Central	High	HighHigh
Each biofuel meets 10% by energy ²	16,023	13,883	10,477	9,683
Biodiesel limited to B7 ³	15,801	13,515	9,980	8,758

Shares of fuel	2010	2020	2030	2010	2011	2012	2013	2014
Petrol	35.2	31.4	29.3	37.4%	37.1%	36.9%	36.6%	36.4%
Diesel	58.9	58.9	58.9	62.6%	62.9%	63.1%	63.4%	63.6%
Biofuel	3.9	7.4	9.4					
Other	2.0	2.3	2.4		0.1	0.2	0.3	0.4

Source: European Energy and Transport Trends to 2030, DG Tren total ktoe 303242 304471 305699 306928 308156

2020 fuel split

Petrol	111065.9
Diesel	185846

2015	2016	2017	2018	2019	2020
36.1%	35.8%	35.6%	35.3%	35.0%	34.8%
63.9%	64.2%	64.4%	64.7%	65.0%	65.2%
0.5	0.6	0.7	0.8	0.9	1
309385	310614	311842	313071	314299	315528

New time-track of Cost

Sheet 8 UK time series

Total consumption (Mlitres)	2010	2011	2012	2013	2014	2015
Bioethanol: to meet 10% of petrol-based demand in 2020	565.5	814.1	1062.6	1311.1	1559.6	1808.2
Biodiesel: to meet 10% of diesel-based demand in 2020	1236.9	1429.9	1622.8	1815.7	2008.7	2201.6
Bioethanol: with biodiesel limited to B7 in 2020	727.7	1138.4	1549.1	1959.8	2370.5	2781.2
Biodiesel: limited to B7 in 2020	1132.7	1221.3	1310.0	1398.6	1487.3	1576.0

Scenario	Fuel	Price diff 2010	2010	2011	2012	2013	2014	2015
Low	P->E	27	26.3699459	25.9899327	25.6099195	25.2299063	24.8498931	
Central	P->E	27	25.9915234	25.2330877	24.4746521	23.7162164	22.9577807	
High	P->E	27	25.4318947	24.1138303	22.7957659	21.4777015	20.1596371	
HighHigh	P->E	27	25.1376152	23.5252713	21.9129274	20.3005835	18.6882396	
Low	D->B	37	37.0754339	37.1747976	37.2741612	37.3735249	37.4728885	
Central	D->B	37	36.6378225	36.2995747	35.9613269	35.6230792	35.2848314	
High	D->B	37	35.9001709	34.8242715	33.7483721	32.6724728	31.5965734	
HighHigh	D->B	37	35.8865597	34.7970491	33.7075386	32.618028	31.5285174	

0.1 0.2 0.3 0.4 0.5

Scenario	Split	2010	2011	2012	2013	2014	2015
Low	10% each	609	745	879	1013	1144	1274
Central	10% each	609	735	857	974	1085	1192
High	10% each	609	720	821	912	991	1060
HighHigh	10% each	609	718	815	899	972	1032
Low	B7 limit	613	753	890	1023	1154	1282
Central	B7 limit	613	743	866	983	1092	1195
High	B7 limit	613	728	830	919	995	1059
HighHigh	B7 limit	613	724	820	901	966	1017

2016	2017	2018	2019	2020	
2056.7	2305.2	2553.7	2802.3	3050.8	25423.13
2394.5	2587.5	2780.4	2973.4	3166.3	26385.75
3191.9	3602.6	4013.3	4424.0	4834.7	40288.78
1664.6	1753.3	1842.0	1930.6	2019.3	16827.27

Price diff 2020

24.4698799	24.0898667	23.7098535	23.3298403	22.9
22.199345	21.4409094	20.6824737	19.924038	19.2
18.8415727	17.5235084	16.205444	14.8873796	13.6
17.0758957	15.4635519	13.851208	12.2388641	10.6
37.5722522	37.6716159	37.7709795	37.8703432	38.0
34.9465837	34.6083359	34.2700881	33.9318404	33.6
30.520674	29.4447746	28.3688753	27.2929759	26.2
30.4390069	29.3494963	28.2599857	27.1704752	26.1

0.6 0.7 0.8 0.9 1

2016	2017	2018	2019	2020	2020 Eur	2010-2020 £	Eur
1403	1530	1656	1780	1902	2283	13935	16721.81
1293	1390	1481	1567	1648	1978	12832	15398.74
1118	1166	1203	1229	1244	1493	11073	13287.59
1080	1116	1139	1151	1150	1380	10681	12816.62
1406	1528	1647	1763	1876	2252	13936	16723.78
1290	1379	1461	1537	1605	1926	12765	15317.62
1109	1148	1173	1186	1185	1423	10945	13133.4
1052	1072	1076	1066	1040	1248	10348	12417.95

Sheet 9 EU time series

		2010	2011	2012	2013	2014	2015
New time-track of Cost	Basics						
Total ktoe road fuel		303242	304470.6	305699.2	306927.8	308156.4	309385
Petrol ktoe		113433.8	113091.4	112742.5	112387.1	112025.3	111657.0
Diesel ktoe		189808.2	191379.2	192956.7	194540.7	196131.1	197728.0
Petrol TJ		4749245.4	4734909.6	4720302.9	4705425.2	4690276.4	4674856.8
Diesel TJ		7946890.7	8012665.5	8078711.2	8145028.0	8211615.7	8278474.4
Petrol Mlitres		144618	144181	143736	143283	142822	142353
Diesel Mlitres		217306	219105	220911	222724	224545	226373
Petrol 10% TJ		47492	89963	132168	174101	215753	257117
Diesel 10% TJ		317876	368583	420093	472412	525543	579493
Petrol B7 TJ		47492	89963	132168	174101	215753	257117
Diesel B7 TJ		317876	368583	420093	472412	525543	579493
Assumed phase-in to 2020	Petrol	0.10	0.19	0.28	0.37	0.46	0.55
	Diesel	0.40	0.46	0.52	0.58	0.64	0.70
Total consumption (Mlitres)		2010	2011	2012	2013	2014	2015
Bioethanol: to meet 10% of petrol-based demand in 2020		2232	4228	6211	8181	10139	12082
Biodiesel: to meet 10% of diesel-based demand in 2020		9605	11137	12693	14274	15879	17510
Bioethanol: with biodiesel limited to B7 in 2020		2232	4228	6211	8181	10139	12082
Biodiesel: limited to B7 in 2020		9605	11137	12693	14274	15879	17510
Scenario	Fuel	Price diff 2010					
Low	P->E	27	26.3699459	25.9899327	25.6099195	25.2299063	24.8498931
Central	P->E	27	25.9915234	25.2330877	24.4746521	23.7162164	22.9577807
High	P->E	27	25.4318947	24.1138303	22.7957659	21.4777015	20.1596371
HighHigh	P->E	27	25.1376152	23.5252713	21.9129274	20.3005835	18.6882396
Low	D->B	37	37.0754339	37.1747976	37.2741612	37.3735249	37.4728885
Central	D->B	37	36.6378225	36.2995747	35.9613269	35.6230792	35.2848314
High	D->B	37	35.9001709	34.8242715	33.7483721	32.6724728	31.5965734
HighHigh	D->B	37	35.8865597	34.7970491	33.7075386	32.618028	31.5285174

2016	2017	2018	2019	2020	
310613.6	311842.2	313070.8	314299.4	315528	
111282.3	110901.0	110513.3	110119.1	109718.5	
199331.3	200941.2	202557.5	204180.3	205809.5	
4659166.1	4643204.4	4626971.8	4610468.1	4593693.5	
8345604.1	8413004.8	8480676.5	8548619.1	8616832.8	
141875	141389	140894	140392	139881	
228209	230052	231903	233760	235626	
298187	338954	379412	419553	459369	10.00%
634266	689866	746300	803570	861683	10.00%
348260	439910	532064	624719	717874	15.63%
584192	588910	593647	598403	603178	7.00%

0.64	0.73	0.82	0.91	1.00
0.76	0.82	0.88	0.94	1.00

2016	2017	2018	2019	2020	
14012	15928	17829	19716	21587	15.43%
19165	20844	22550	24280	26036	11.05%
16365	20672	25003	29357	33734	24.12%
17652	17794	17937	18081	18225	7.73%

Price diff 2020

24.4698799	24.0898667	23.7098535	23.3298403	22.9
22.199345	21.4409094	20.6824737	19.924038	19.2
18.8415727	17.5235084	16.205444	14.8873796	13.6
17.0758957	15.4635519	13.851208	12.2388641	10.6
37.5722522	37.6716159	37.7709795	37.8703432	38.0
34.9465837	34.6083359	34.2700881	33.9318404	33.6
30.520674	29.4447746	28.3688753	27.2929759	26.2
30.4390069	29.3494963	28.2599857	27.1704752	26.1

0.1 0.2 0.3 0.4 0.5

Scenario	Split	2010	2011	2012	2013	2014	2015
Low	10% each	4148	5244	6333	7416	8493	9564
Central	10% each	4148	5179	6175	7135	8061	8952
High	10% each	4148	5073	5918	6682	7366	7968
HighHigh	10% each	4148	5059	5878	6604	7238	7778
Low	B7 limit	4148	5244	6333	7416	8493	9564
Central	B7 limit	4148	5179	6175	7135	8061	8952
High	B7 limit	4148	5073	5918	6682	7366	7968
HighHigh	B7 limit	4148	5059	5878	6604	7238	7778

0.6 0.7 0.8 0.9 1

2016	2017	2018	2019	2020	2020 Eur	2010-2020 £	2010-2020 Eur
10629	11690	12745	13795	14840	17808	104895	125874.1
9808	10629	11415	12167	12884	15460	96554	115864.6
8489	8929	9286	9562	9755	11706	83177	99812.67
8226	8581	8842	9010	9084	10901	80450	96539.5
10637	11683	12703	13696	14662	17594	104579	125494.2
9802	10591	11318	11984	12588	15105	95934	115120.3
8471	8862	9140	9305	9356	11227	82290	98747.87
8167	8419	8532	8506	8338	10006	78669	94402.4

