Pathway 2050: An Energy Plan for Jersey

APPENDICES

States of Jersey

Energy Plan Nov 2012 v5 Appendices

Appendix 1 – Carbon accounting

1.1 The Kyoto Protocol

It is recognised that there are limitations to the methods employed to account for carbon under Kyoto; some would argue that they are not stringent enough. Nevertheless, it is the internationally adopted methodology by which Jersey must demonstrate its progress and should be the first level against which we measure progress.

In April 2007, the UK's ratification of the Kyoto Protocol was extended to Jersey at the request of the Chief Minister. Jersey was not awarded binding carbon reduction targets in the 2008 to 2012 period (carbon reduction is measured against the 'baseline year' of 1990). Despite not having an 'allocated allowance' under the Kyoto Protocol, at the time of the extension of the ratification, Jersey was asked by the Department of Constitutional Affairs:-

'to introduce, where possible, and having taken into account local circumstances, policies in line with the objectives of the UK Climate Change Programme. In relation to any subsequent commitment periods, Her Majesty's Government agrees that any obligation upon the Government of Jersey for the reduction of emissions shall be as determined by the Government of Jersey, in conjunction with Her Majesty's Government, to be what Jersey can reasonably deliver'

Extending the ratification of the Kyoto Protocol signalled Jersey's intent to set challenging carbon dioxide reduction targets. These will be implemented alongside energy reduction targets.

Current EU and UK carbon emission reduction targets are an 80% reduction on the 1990 baseline year by 2050.

1.2 Jersey's carbon emissions

The Island has reported its emissions information to the agency that collates the UK's information where the historical and current data was aggregated into the total UK carbon emissions[1]. Because until 2009, the data Jersey provided was not available separately, the States of Jersey Statistics Unit made provisional carbon estimates based on the carbon emitted from imported energy and published these annually in the Jersey Energy Trends Report.

However, in late 2009 Jersey's emissions data was disaggregated and made available to the Island. The data is very similar to the provisional estimates made by the Statistics Unit but is more comprehensive and categorised in source and sink categories according to the International Panel on Climate Changes Guidelines for National Greenhouse Gas Inventories. Table A1 below shows the source data used to construct Graph 1, Section 2.1 of the Plan.

[1] http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html (Source AEA Technology on behalf of the Department for Energy and Climate Change)

Table A1 Green house gas inventory for Jersey expressed in tonne of carbon dioxide equivalents 1990-2009

CATEGORY	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Power Stations	209,918	210,486	328,213	269,397	283,997	294,120	281,825	218,299	243,811	237,180	130,083
Industrial Combustion	36,549	36,549	36,549	33,921	39,144	39,792	45,353	63,652	60,414	44,071	51,632
Aviation	44,941	43,254	41,701	41,163	40,115	39,732	39,348	38,857	41,447	42,890	49,075
Road transport	122,565	122,567	124,655	128,414	133,773	133,866	130,836	126,570	130,734	118,976	129,202
Commercial	62,234	62,254	54,598	59,641	63,683	62,241	69,507	76,638	95,560	61,811	62,948
Domestic	113,144	113,144	98,314	104,498	100,828	101,003	106,584	115,204	135,918	104,459	104,744
Land use, land use change & forestry	272	-322	-773	-771	-1,839	-3,909	-2,840	-814	-553	-1,095	-2,833
Agriculture	21,355	21,345	21,468	21,466	21,428	21,437	21,473	21,500	21,435	21,421	21,881
Waste water treatment	1,027	961	1,069	1,060	1,107	1,057	1,087	1,121	1,153	1,121	1,151
HFCs & PFCs & SF6* (see footnote for info on data from 1990 to 1995	51	51	52	946	2,030	3,473	5,098	6,887	9,049	10,282	12,125
Total	**612,056**	**610,288**	**705,846**	**675,765**	**684,266**	**692,813**	**698,270**	**667,913**	**738,968**	**696,334**	**560,009**

CATEGORY	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Power Stations	99,486	84,973	34,558	50,782	32,612	38,249	81,233	39,584	38,662	
Industrial Combustion	49,291	49,770	49,581	51,201	48,454	49,236	46,072	46,937	46,937	
Aviation	49,827	49,123	49,775	48,871	49,065	46,943	49,642	51,091	42,798	
Road transport	129,998	128,351	126,911	123,712	121,878	123,487	119,956	122,645	122,164	
Commercial	132,172	144,598	64,135	79,529	57,861	60,578	98,206	53,619	53,637	
Domestic	107,829	103,755	99,467	100,422	99,015	99,038	102,401	99,210	99,210	
Land use, land use change & forestry	-4,571	-574	-2,274	-565	-302	192	192	192	192	
Agriculture	21,396	18,799	16,912	16,217	15,638	16,933	17,530	15,205	15,061	
Waste water treatment	1,153	1,158	1,161	1,164	1,172	1,182	1,199	1,208	1,212	
HFCs & PFCs & SF6	13,807	15,798	17,036	17,981	18,865	18,918	19,158	19,250	18,880	
Total	**600,388**	**565,751**	**457,261**	**489,315**	**444,258**	**454,757**	**535,588**	**448,940**	**438,751**	

The categories are defined as follows and key information in the Jersey context has been added. The numbers in brackets refer to the IPCC category that is used:

Power Stations (1A1a) - Carbon dioxide, nitrous oxide and methane emissions arising from the generation of on-island electricity by the Jersey Electricity at La Collette Power Station using Heavy fuel oil and the Combined Gas Turbines at Queens Road using Gas Oil. This category also includes combustion for the generation of energy and heat, in the Jersey context this includes emissions from the Energy from Waste plant.

Carbon emissions arising from Energy from Waste plants are dealt with very specifically under the Kyoto Protocol. Only the proportion of carbon emitted from non-biogenic material is accounted for since that which arises from 'recently photosynthesised' or 'non-fossil carbon' is not counted as a greenhouse gas for the purposes of the protocol. AEA have advised that there have been recent changes in the way emissions are calculated from Jersey (and the other Crown Dependencies and Overseas Territories) to make it more integrated with the UK system. This led to a change in the emission factor for carbon from MSW combustion and the emissions factor used is 75kt carbon/Mt waste.

It must be noted that the updated figure provided by AEA is much lower than that advised in 2006 by the National Inventory for Greenhouse Gas Emissions and was used in Energy Policy Green Paper. That is why EfW emissions appear as a lesser proportion of GHGs emissions than have been previously described.

Whilst in policy terms we must adapt to the external advice given to us in respect of international reporting mechanisms, it is recognised that Energy from Waste contributes to carbon emissions even if Kyoto does not recognise it all for the purposes of the convention. Thus, there is significant overall benefit in fully investigating alternatives to EfW technology at the end of the replacement plant's life. In addition, ongoing work with AEA and an on-island project to more fully categorise the local waste stream is expected to lead to Jersey-specific MSW emissions factors being available in the future.

Industrial Combustion (1A2f) - Carbon dioxide, nitrous oxide and methane emissions arising from the combustion of kerosene (burning oil) fuels in the commercial sector. Jersey’s kerosene emissions are partly attributed to this category since the overall accounting methodology finds it difficult to account for in the way our small jurisdiction burns heating oil in the commercial sector. We are advised that he emissions from this category are essentially from kerosene in the commercial sector and it is acceptable to combine emissions from the ‘Commercial (1A4a) category and this category.

Aviation (1A3a) - Carbon dioxide, nitrous oxide and methane emissions arising from national but not international flights (which are reported separately).

Road transport (1A3b) - Carbon dioxide, nitrous oxide and methane emissions arising from all road vehicles.

Commercial (1A4a) - Carbon dioxide, nitrous oxide and methane emissions from fuel combustion in commercial and institutional buildings. It includes kerosene for space heating as well as gas oil and fuel oil which power larger scale heating plant in sectors such as retail, agricultural and

Domestic (1A4a) - Carbon dioxide, nitrous oxide and methane emissions from fuel combustion in residential buildings (i.e. space heating from kerosene & LPG gas)

Land use change and forestry (5G) - Carbon dioxide, nitrous oxide and methane emissions and removals from forest and land use change activities. This sector shows a net sink between 1991 and 2004 although the size of the sink is variable over time, depending on the land use change to grassland and there is no clear trend. Activity data on land use is available since 1990: only land use change between cropland and grassland and liming contribute to the inventory.

Agriculture (4b14)- Carbon dioxide, nitrous oxide and methane emissions from agriculture including the carbon dioxide and methane emissions from the enteric fermentation from cattle (4A1), sheep (4A3), goats (4A4), horses (4A6) and pigs (4A5). Also includes carbon dioxide, and methane arising from the wastes from cattle (4B1), sheep (4B3), goats (4B4), horses (4B6), pigs (4B8) and poultry (4B9)

Waste water treatment (6B2)- The methane and nitrous oxide emissions arising from the handling of liquid wastes and sludge from housing and commercial sources (including human waste).

HFCs, PFCs & SF_6 - Emissions from the potent greenhouse gases, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) (these two being used mainly as refrigerants and air conditioning units) and sulphur hexafluoride (SF_6 - particularly from high voltage electric switch gear where SF_6 is used as a thermal insulator). *SF6 was not used in the early part of the reporting periods but becomes a more significant portion of this category as its use increased replacing CFCs in aerosols. For this reason 1995 is taken as the baseline year for this category not 1990.

Appendix 2 Predicting energy growth to 2050 & projecting carbon emissions

A simple energy growth model has been used to show how the Island's energy demand (expressed in tonnes of oil equivalents - toe) is likely to change into the future if we continue in a ‘business as usual’[2].

This model is helpful to understand how energy use is likely to rise under a 'do-nothing' or 'business as usual' scenario and makes a number of key assumptions as follows:

1. Immigration – using a scenario of net nil immigration per annum. The population projections are calculated by the Statistics Unit[3] in 2009 and have been adjusted to take into account the 2011 census figure which demonstrated a higher population than predicted in the between census periods.

2. Motor Fuel - Continuing trend of improved energy efficiency and small growth in the use of diesel for cars. Growth assumes a current near-saturation of car use on Island. Lead replacement fuel declines to residual figures by 2010.

3. Gas oil - Continuing trend of decline with an assumed switch to gas and electricity

4. Heavy Fuel Oil - Assumed use for electricity generation at 32% efficiency and comprising 3% of total electricity supply until 2015 falling to 2% of supply post 2015

5. Kerosene - Continued use as heating oil with a slight decline in use post 2011 as new builds continue to be smaller apartments and more likely to be powered by electric heating (the trend to date)

6. Electricity - Continued increasing use in all sectors because of the ability to fix long term price contracts with more certainly and ease compared to hydrocarbon fuels which are expected to become significantly more expensive as a result of developments in global fossil fuel prices

7. Gas - Bottled and mains gas remains an important part of fuel mix for existing customers, whilst small growth potential is expected for industry as a result of Combined Heat and Power

8. Aviation - Small long-term increase in aviation traffic to and from the Island

Energy demand under a 'business as usual' scenario

A 'business as usual' scenario predicts the following trends in each energy sector as measured by tonnes of oil equivalents (Table A1 below). NB The sectors comprise demand as a result of all the different energy products. For example 'road fuel' comprises toe of petrol (leaded and unleaded) and diesel and 'domestic' comprises coal, and LPG, kerosene and electricity for the domestic market. All the details are available in Supporting Document A

YEAR	Population	Road Fuel	Aviation	Commercial & Industrial	Domestic	On-Island Electricity Generation	Total Energy Demand
2000	87,100	46,161	14,806	36,078	47,052	34,395	178,493
2005	88,400	43,116	17,225	57,016	68,387	3,779	189,523
2010	97,852	45,303	18,004	63,560	72,961	5,620	205,448
2015	97,852	45,270	18,274	63,744	74,394	5,620	207,424
2020	97,852	45,259	18,549	63,939	75,879	5,620	209,489
2025	97,852	45,249	18,827	64,143	76,723	5,620	210,961
2030	96,975	44,839	18,938	63,780	76,923	5,620	210,602
2035	95,549	44,177	18,939	63,061	76,719	5,620	209,091
2040	93,574	43,266	18,826	61,982	76,094	5,620	206,398
2045	91,161	42,156	18,616	60,611	75,122	5,620	202,737
2050	88,199	40,795	18,281	58,871	73,693	5,620	197,833

Table A1 Historic and projected energy demand by sector based on an energy model that assumes net nil immigration. Data is shown in tonnes of oil equivalents (toe)

The data shown above in tabular form is also represented in the Figure A1 (below). Overall between 2000 and 2050 there is a projected c.11% rise in energy demand (of 19,340 toe from 178,493 toe to 197,833 toe). This is due to a projected population trend over the whole period of a rise to nearly 100,000 and then an overall small reduction in the size of the population as a result of an ageing society.

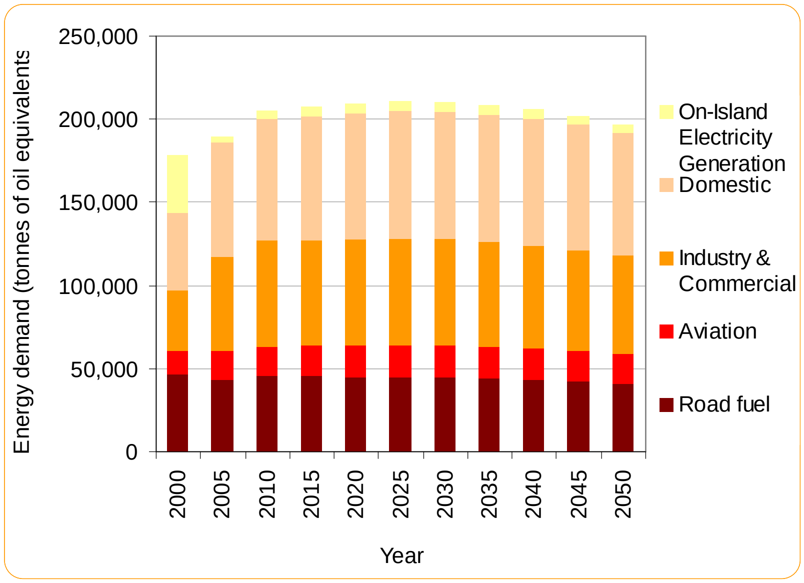


Figure A1 Illustration of patterns of future energy demand using a simple 'business as usual' model.

Carbon emissions under a 'business as usual' scenario

The 'business as usual' energy growth model allows an estimation to be made of the overall trend in energy use to 2050. Using this information, the impact on emissions each decade to 2050 can be forecast. There are differences in the carbon intensities of the different products comprising the categories so this must be accounted for during this calculation (see Spread sheet for full details).

Table A2 shows a summary of the forecast emissions under a business as usual model and Figure A2 below it shows the same information graphically.

CATEGORIES	1990	2009	2020	2030	2040	2050	Target 20% of 1990 levels
Power stations	209,918	38,662	41,192	44,052	17,542	17,542	**41,984**
Industrial combustion	36,549	46,937	47,406	47,406	45,984	43,685	**7,310**
Aviation	44,941	42,798	43,654	44,963	45,413	44,051	**8,988**
Road transport	122,565	122,164	122,164	120,942	117,277	113,685	**24,513**
Commercial	62,234	53,637	54,174	54,174	52,549	49,921	**12,447**
Domestic	113,144	99,210	103,178	104,210	103,168	100,073	**22,629**
Land use, change & forestry	272	192	192	192	192	192	**54**
Agriculture	21,355	15,061	15,061	15,061	15,061	15,061	**4,271**
Waste water treatment	1,027	1,212	1,212	1,103	1,064	1,004	**205**
HFCs, PFCs & SF6	3,473[4]	18,880	18,880	17,181	16,579	15,634	**695**
TOTAL	**615,478**	**438,751**	**447,111**	**449,283**	**414,828**	**400, 847**	**123,096**

Table A2 Pattern of carbon emissions per decade as predicted by a simple 'business as usual' scenario of energy demand with the target amount of emissions illustrated in the far column. This information is shown graphically in Graph 2 Section 2.3 of the main Plan.

What is clear is that without comprehensive action across all sectors, a 'business as usual' scenario means that emissions in all sectors are far above the target. Graph 3, Section 2.3 of the main Plan shows graphically what emissions across all sectors must do if the Island is to achieve its reduction target.

[4] Note 3,473 t/CO_{2eq} are the 1995 emissions as this is the baseline year used for this category

A number of assumptions were made in order to predict the carbon growth figures as well as those made in respect of population growth in Table A3:

CATEGORIES	Assumptions underpinning each sector's carbon
Power stations	Assumed growth in emissions from EfW according to predicted levels of municipal solid waste to 2030. Retained on-island power generation at 2009 levels into future (standby levels only)
Industrial combustion	Applied sector growth per decade as predicted from the energy demand model
Aviation	Applied sector growth per decade as predicted from the energy demand model
Road transport	Applied sector growth per decade as predicted from the energy demand model
Commercial	Applied sector growth per decade as predicted from the energy demand model
Domestic	Applied sector growth per decade as predicted from the energy demand model
Land use, change & forestry	Remains static at 2009 level since little scope for significant scale landscape / agricultural changes
Agriculture	Remains static at 2009 level since assumed present levels of agriculture and livestock levels
Waste water treatment	Calculated as a function of population change per decade
HFCs, PFCs & SF6	Calculated as a function of population change per decade on 1995 baseline

Table A3 Assumptions underpinning forecasts of carbon emissions to 2050. For further detail see supporting worksheet.

Appendix 3 The Energy Partnership

Government, industry and the third sector to monitor, review and work towards a low carbon Jersey in line with the actions outlined in Pathway 2050.

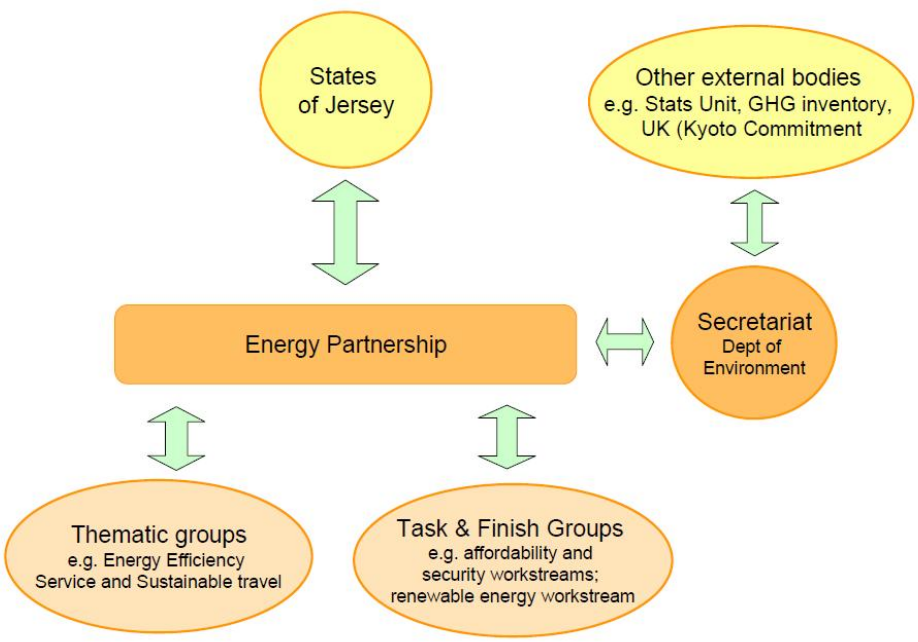
The Partnership will include representation from the Department of the Environment, Economic Development, Transport and Technical Services and Social Security Departments; representatives from the business community and energy industry plus representatives from the third sector. The secretariat services will be provided by the Department of the Environment.

The Partnership will establish a series of thematic groups and 'task and finish groups'. Each group will be chaired by a representative of the Partnership. Groups will be formed to develop specific work streams as required within fixed time periods, in line with the agreed actions.

The Partnership will receive reports from the groups and also relevant research studies commissioned to support the energy Plan. The Partnership will also receive, for consideration, reports from the Statistics Unit including the annual GHG inventory data.

The Partnership will be responsible for the monitoring and review of the Plan and advise on new interventions as appropriate according to review findings.

The Terms of Reference will be developed in consultation with relevant stakeholders to ensure the partnership is well constituted and fit for purpose, following the adoption of the Energy Plan. The following illustration shows a possible structure.



Appendix 4: Impact Assessments

All of the Proposed Action Statements have been assessed against the following criteria for their contribution to the goals of the Energy Plan (i.e. to provide secure, affordable and sustainable energy):

Sustainability

Sustainability means that activities associated with energy and energy use meet the needs of the present without compromising the ability of future generations to meet their needs. Specifically this means not causing environmental harm and moving away from diminishing sources of energy and towards renewable sources.

Likely to be achieved by:

- Reducing emissions of GHGs in line with our international commitments to reduce emissions to 20% of 1990 levels by 2050, an 80% reduction.
- Moving towards renewable sources of energy where it can be justified on grounds of economics, security and sustainability
- Bringing forward other environmental benefits (e.g. improved biodiversity)

Affordability

Affordability means:

- Ensuring that the most vulnerable groups in society do not struggle to pay for an acceptable level of energy i.e. adequate heating, electricity and hot water and;
- Efficient mix and use of energy to keep the cost of energy to a minimum given sustainability and security objectives.

Could be achieved by:

- Redistribution to these vulnerable groups from some other source (be it other energy customers, taxpayers, or other)
- A reduction in energy demand so reducing consumer's future exposure to increased global energy costs than might be the case without action;
- The delivery of energy at best value to the consumer.

Security

Security of energy supply means the uninterrupted physical availability at a price which is affordable.

Could be achieved by:

- Prevention:
    - A reduction in energy demand and thus reducing imported energy and lengthened lifespan of existing energy infrastructure and need for infrastructure upgrades to cope with increased demand;
    - More diverse sources of energy;
    - Increased potential for locally generated energy, where appropriate

- Planning: More effective resilience planning.

However energy security is about balancing the risks and costs of threats to the energy supply with the cost of reducing them. At present the risks to energy security in Jersey are not well understood. It is proposed that work is undertaken to gain a better of the potential threats to the availability of energy to Jersey, the costs that these threats could impose on the Island should they materialise, and the specific actions that could be taken to mitigate them.

	ACTION STATEMENT	SECURITY			AFFORDABILITY		SUSTAINABILITY	
		Reduction in energy demand & so reduction in imported energy	**More diverse sources of energy**	**More effective resilience planning**	**Reduction in energy demand**	**Increased competition in the marketplace**	**Reducing emissions of GHGs**	**Other benefits**
1	The formation of an Energy Partnership	√	√	√	√	√	√	√
2	Introducing a 'carbon-neutral' standard for new homes through Building ByeLaws	√	√		√	√	√	√
3	Energy efficiency measures applied to pre-1997 stock of properties	√			√	√	√	√
4	Implement micro-renewables in the domestic sector	√	√				√	
5	Assisting the uptake of microgeneration	√	√				√	
6	Improved energy efficiency through behaviour change programme	√			√		√	
7	Energy Efficiency improvements in the public sector	√			√		√	
8	Energy Efficiency improvements in the private sector	√			√		√	
9	Reducing emissions from ruminants						√	√
10	The implementation		√				√	

	of Anaerobic Digestion systems for waste management of livestock slurry by 2020							
11	The effect of improved EU emissions standards for cars	√			√		√	
12	The effect of improved EU emissions standards for vans	√			√		√	
13	The effect of an increase in the number of ultra low emission vehicles (ULEVs)	√	√				√	
14	Achieving Sustainable Transport Policy 2010 congestion management targets						√	√
15	Achieve a 5% shift to sustainable modes transport by 2020	√			√		√	
16	The effect of improved international operating standards for aircraft	√			√		√	√
17	Liquid Waste Treatment Options	√	√		√		√	
18	Working to negate unavoidable residual carbon emissions after CO_2 targets have been achieved	√						√
19	Understanding energy security in the local			√				

	context							
20	Contingency planning and stock holding for liquid hydrocarbons			√				
21	Working with Jersey Electricity to set supply standards			√			√	√
22	Preparing the way for utility scale renewable energy		√	√			√	
23	Minimising residual waste		√	√			√	√
24	Investigating district heating from the energy from waste plant		√	√			√	√
25	Investigating and supporting the use of biofuels	√	√				√	√
26	Understanding affordable energy in the Jersey context				√			√
27	Understanding how competition in the local energy market affects prices paid by consumers				√			

Appendix 5 Resource assessments to deliver energy efficiency in the domestic sector

Action Statements 3 to 8 apply to the domestic and business sector and are based on the delivery of a series of energy efficiency interventions.

The delivery mechanism will be the extended activity of the Eco-Active Energy Efficiency Service which receives revenue funding of approx £900,000 per annum.

The direct costs for implementation of the action statements, where known, are included within the main Energy Plan document. This appendix provides an overview of the budget for the provision of the Energy Efficiency Service in recognition of the interdependent nature of the work to deliver the actions to both the domestic and commercial sector. The table below provides an illustrative re-profiled budget for the Energy Efficiency Service for the next 5 years. If additional resources were made available, the implementation of the programmes outlined could be accelerated and the reach extended to a wider section of the community.

The costs outlined represent the direct delivery costs, for the first 5 years only, based on the actions as outlined in the Energy Plan, they do not include external costs such as skills based training for the construction sector.

	Year 1	Year 2	Year 3	Year 4	Year 5
Energy efficiency measures applied to pre-1997 stock of properties	605,000	627,000	637,000	598,000	620,000
Implement micro-renewables in the domestic sector	0	0	0	20,000	20,000
Assisting the uptake of microgeneration	0	0	10,000	50,000	50,000
Improved energy efficiency through behaviour change programme	75,000	75,000	75,000	75,000	75,000
Energy efficiency improvements in the Private Sector	80,000	80,000	80,000	80,000	80,000
Running the Energy Efficiency Service	131,000	131,000	131,000	131,000	131,000
SUBTOTAL (excluding Energy partnership)	£886,000	£908,000	£928,000	£949,000	£971,000
TOTAL (including Energy partnership)	£891,000	£913,000	£933,000	£954,000	£976,000

Note Revenue figures based on medium term financial plan limits for years 1 -3 and forecasts for years 4-5 based on 2.5% growth and 1% increase in staffing costs.

Appendix 6: Interpretation of Emissions savings by Sector to support Chapter 3.

This illustrates how to read the information on the tables on the following pages – the example is based on the data from the domestic sector.

Domestic BAU	1990	2009	2020	2030	2040	2050	2050 Target 20% of 1990 levels
Emissions under a business as usual scenario (t/CO_{2eq})	113,144	99,210	103,178	104,210	103,168	100,073	22,629

Step 1 – Table 3 shows the projected emissions under Business as Usual scenario (Supporting Document A). This example follows the projected emissions for 2020 of 103,178 t/CO_{2eq}

Step 2 – Table 4 shows the emissions as a result of applying all the policies. Policy 1 reduces emissions from 103,178 t/CO_{2eq} by 21,820 t/CO_{2eq} to give reduced emissions of 81,358 t/CO_{2eq} in 2020. Supporting document B shows how the reduction in emissions was calculated.

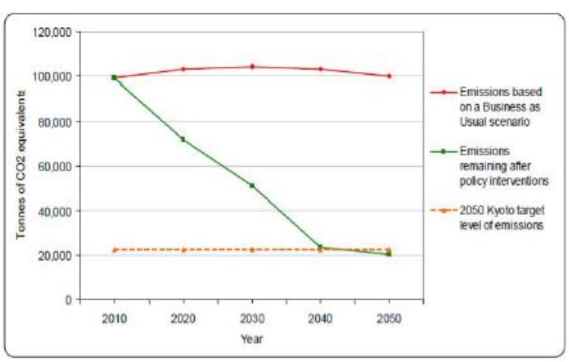
Domestic Sector Interventions	GHG emissions pathway (cumulative) from interventions by decade (t/CO_{2eq})			
	2020	2030	2040	2050
Energy efficiency measures applied to pre-2000 stock of properties	81,358	60,570	37,717	34,612
Introducing a 'carbon-neutral' standard for new homes through Building Bye-Laws (by 2014 60% more efficient homes and 2018 carbon neutral for space heating)	76,696	55,908	33,045	29,950
Implement micro-renewables in the domestic sector (solar thermal)	76,696	55,856	25,848	22,753
Improved energy efficiency through behaviour change programme	71,932	51,093	23,466	20,371
Final emissions pathway after all interventions and % reduction	71,932	51,093	23,466	20,371 82%

Step 3 – By reading down the column, the effect in emission's reductions from the next policy can be seen. The impact of Policy 2 is to further reduce the 81,358 t/CO_{2eq} by 4,662 t/CO_{2eq} to give reduced emissions of 76,696t/CO_{2eq} in 2020.

Step 4 – As above, the impact of the next policy (3) is calculated. However, because this policy is not enacted until 2030, no emissions reduction is recorded in 2020 - hence the emissions remain at 76,696 t/CO2eq

Step 5 – As above, the impact of the next policy is shown. The impact of Policy 4 is to further reduce the 76,696 t/CO_{2eq} by 4,764 t/CO_{2eq} to give reduced emissions of 71,932 t/CO_{2eq} in 2020. Because all the impacts of the policies have been accounted for, this gives the final 2020 residual emissions total

Step 6 – Reading across the rows shows the cumulative effect of all the policies over the decades to 2050 as shown by the green line in Graph 5. The red line represents the Business as Usual projections as shown in Table 3.



Emissions Pathway for each sector

The following pages present the cumulative emissions savings for the interventions for each sector.

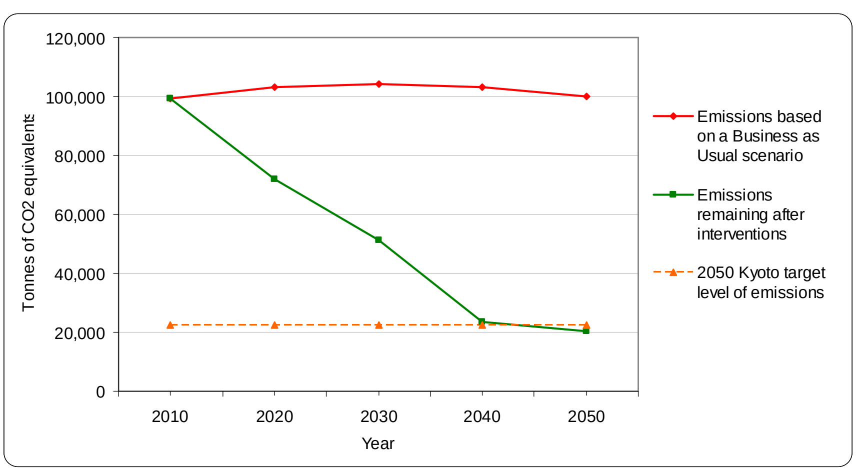
Domestic Sector

Domestic BAU	1990	2009	2020	2030	2040	2050	2050 Target 80% reduction on 1990 levels
Emissions under a business as usual scenario (t/CO_{2eq})	113,144	99,210	103,178	104,210	103,168	100,073	**22,629**

Table above: Forecast of GHG emissions under a 'business as usual' scenario compared to the target emissions in 2050 of an 80% reduction on 1990 levels. With no interventions there is an estimated shortfall of 77,444 t/CO_2eq.

Domestic Sector Interventions	GHG emissions pathway (cumulative) from interventions by decade (t/CO_{2eq})				Impact on total CO_{2eq} savings
	2020	**2030**	**2040**	**2050**	**%**
Energy efficiency measures applied to pre-1997 stock of properties	81,358	60,570	37,717	34,612	29%
Introducing a 'carbon-neutral' standard for new homes through Building Bye-Laws (by 2014 60% more efficient homes and 2018 carbon neutral for space heating)	76,696	55,908	33,045	29,950	3%
Implement micro-renewables in the domestic sector (solar thermal)	76,696	55,856	25,848	22,753	2%
Improved energy efficiency through behaviour change programme	71,932	51,093	23,466	20,371	2%
Final emissions pathway after all interventions and % reduction	**71,932**	**51,093**	**23,466**	**20,371 82%**	

Table above: The emissions pathways as a result of the each intervention in the domestic sector. Note that after the interventions emissions can be reduced by 82% as illustrated in the graph below



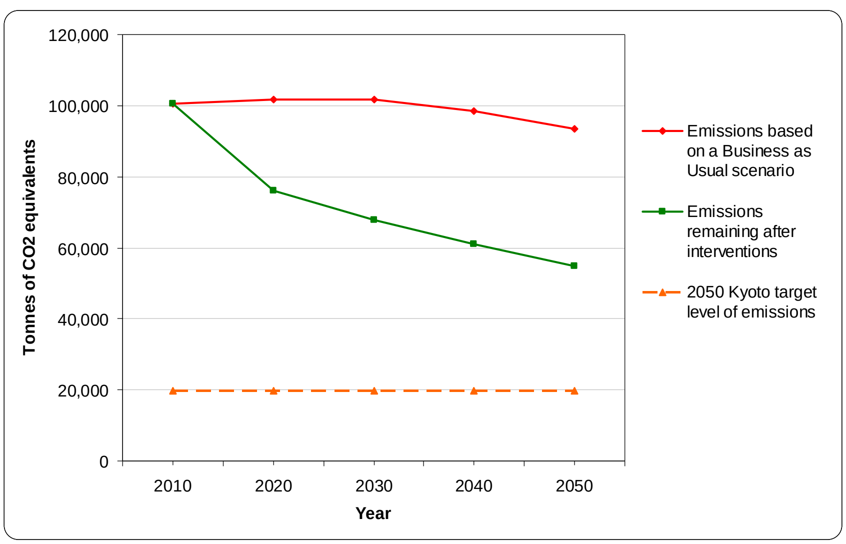
Industrial and Commercial

Industrial and Commercial BAU	1990	2009	2020	2030	2040	2050	Target 20% of 1990 levels
Emissions under a business as usual scenario (t/CO_{2eq})	98,783	100,574	101,580	101,580	98,533	93,606	**19,757**

Table above: Forecast of GHG emissions from the industrial and commercial sector under a 'business as usual' scenario compared to the target emissions in 2050 of an 80% reduction on 1990 levels. With no interventions there is an estimated shortfall of 73,849 t/CO2eq.

Industrial and Commercial Interventions	GHG emissions pathway (cumulative) from interventions by decade (t/CO_{2eq})				Impact on total CO_{2eq} savings
	2020	**2030**	**2040**	**2050**	**%**
Energy efficiency improvements in the Public Sector (States of Jersey). 10% reduction to 2010-2015 and then a 15% reduction to 2020 and a further 10% per decade thereafter)	100,993	100,40 6	97,358	92,432	1%
Energy efficiency improvements in the Private Sector (15% by 2020 and a further 10% per decade thereafter)	76,153	67,892	60,985	54,769	19%
Final emissions pathway after all interventions and % reduction	**76,153**	**67,892**	**60,985**	**54,769 45%**	

Table above: The emissions pathways as a result of the each intervention in the industrial and commercial sector. Note that after the interventions emissions can be reduced by 45% as illustrated in the graph below.



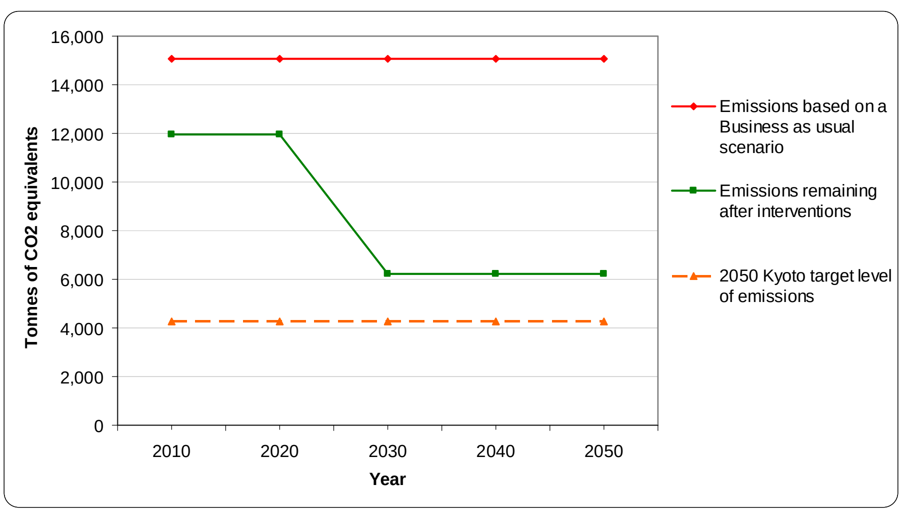
Agriculture

Agriculture BAU	1990	2009	2020	2030	2040	2050	Target 20% of 1990 levels
Emissions under a business as usual scenario (t/CO_{2eq})	21,355	15,061	15,061	15,061	15,061	15,061	**4,271**

Table above: Forecast of GHG emissions from the agricultural sector under a 'business as usual' scenario compared to the target emissions in 2050 of an 80% reduction on 1990 levels. With no interventions there is an estimated shortfall of 10,790 t/CO_{2eq}

Agriculture Interventions	GHG emissions pathway (cumulative) from interventions by decade (t/CO_{2eq})				Impact on total CO_{2eq} savings
	2020	**2030**	**2040**	**2050**	**%**
Reduction in emissions from ruminants (30% by 2030)	15,061	12,395	12,395	12,395	1%
Implementation of Anaerobic Digestion systems for waste management of livestock slurry by 2020	11,973	6,220	6,220	6,220	3%
Final emissions pathway after all interventions and % reduction	**11,973**	**6,220**	**6,220**	**6,220 71%**	

Table above: The emissions pathways as a result of the each intervention in the Agriculture sector. Note that after the interventions emissions can be reduced by 71% as illustrated in the graph below.



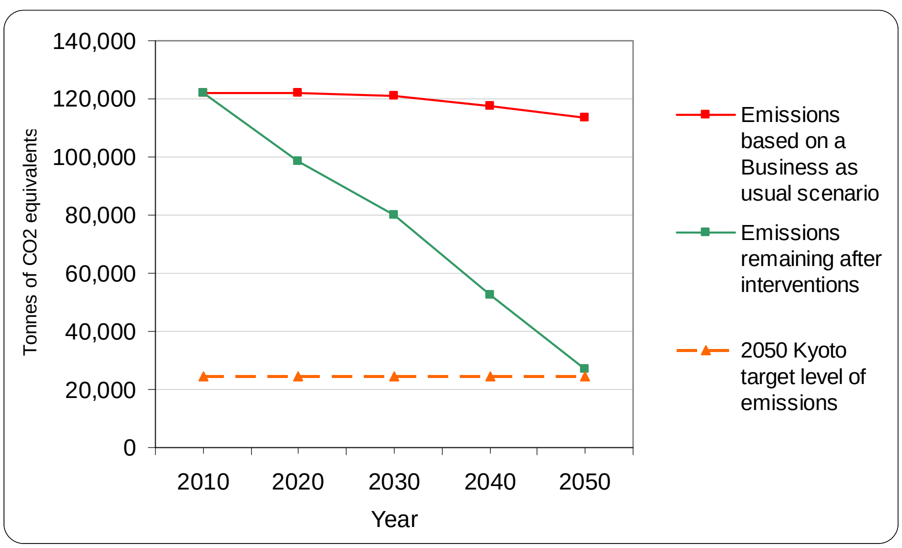
Road Transport

Road Transport BAU	1990	2009	2020	2030	2040	2050	Target 20% of 1990 levels
Emissions under a business as usual scenario (t/CO_{2eq})	122,565	122,164	122,164	120,942	117,277	113,685	**24,513**

Table above: Forecast of GHG emissions from the Road Transport sector under a 'business as usual' scenario compared to the target emissions in 2050 of an 80% reduction on 1990 levels. With no interventions there is an estimated shortfall of 89,172 t/CO2eq

Road Transport Interventions	GHG emissions pathway (cumulative) from interventions by decade (t/CO_{2eq})				Impact on total CO_{2eq} savings
	2020	2030	2040	2050	%
Improved EU emissions standards for vans	119,720	118,523	114,932	111,412	4%
Improved EU emissions standards for cars	112,319	111,196	107,826	104,524	1%
Achieve a modal shift away from dependence on single occupancy private car use by 2020 i.e. reduction of car mileage of 5%	107,741	106,664	103,432	100,264	23%
Introduction of Ultra Low Emission Vehicles (ULEVs) (10% by 2020, 30% by 2030, 60% by 2040 and 90% by 2050)	99,044	80,833	53,335	27,420	<1%
5. Achieving STP congestion management targets (15% reduction in peak time travel by 2015)	98,428	80,217	52,719	26,804	3%
Final emissions pathway after all interventions and % reduction	**98,428**	**80,217**	**52,719**	**26,804 78%**	

Table above: The emissions pathways as a result of the each intervention in the Road Transport sector. Note that after the interventions emissions can be reduced by 78% as illustrated in the graph below.



Aviation

Aviation BAU	1990	2009	2020	2030	2040	2050	Target 20% of 1990 levels
Emissions under a business as usual scenario (t/CO_{2eq})	44,941	42,798	43,654	44,963	45,413	44,051	**8,988**

Table above: Forecast of GHG emissions from the aviation sector under a 'business as usual' scenario compared to the target emissions in 2050 of an 80% reduction on 1990 levels. With no interventions there is an estimated shortfall of 35,063 t/CO_{2eq}

Aviation Interventions	GHG emissions pathway (cumulative) from interventions by decade (t/CO_{2eq})				Impact on total CO_{2eq} savings
	2020	**2030**	**2040**	**2050**	**%**
Improved international operating standards for aircraft (By 2050 reduce emissions by 50% on 2005 levels)	35,438	32,816	30,043	24,533	8%
Final emissions pathway after all interventions and % reduction	**35,438**	**32,816**	**30,043**	**24,533 45%**	

Table above: The emissions pathways as a result of the each intervention in the aviation sector. Note that even after interventions emissions can only be reduced by 45% as illustrated in the graph below.