



STATES OF GUERNSEY

# Guernsey Energy Resource Plan

Date: 14<sup>th</sup> November 2011



## Contents

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### **GUERNSEY ENERGY RESOURCE PLAN**

1. Executive Summary
2. The States Strategic Plan & relationship with the Energy Resource Plan
3. Introduction
4. Environmental Issues – Kyoto Protocol and International Developments  
Guernsey's current Emissions
5. Demand Side Issues  
Total Energy Consumption  
Gas Consumption  
Oil Demand  
Heat and Light Demand
6. Supply Side Issues  
Electricity  
Gas Supplies  
Oil Imports
7. Renewables and Carbon Intensity
8. Environmental Issues
9. Guernsey's Energy Challenge
10. Guernsey's Energy Plan Objectives and Actions
11. Implementation

ANNEX - Useful Relevant Energy-Related Documentation from Other Jurisdictions

APPENDIX 2 – Consultation Responses



# Guernsey Energy Resource Plan

## 1. Executive Summary

1.1. This Energy Resource Plan describes Guernsey's sources and use of energy and sets out key objectives which will affect future energy decisions. This Plan is supported by key principles and strategic actions which are both pragmatic and achievable. This Energy Resource Plan in turn is based on an energy vision for 2020 whereby:

- There will be a gradual decarbonisation of Guernsey's energy generation;
- There will be a diversification of energy generation between low carbon and renewables;
- We will continue to provide a sustainable and secure energy supply for Guernsey; and
- There will be greater transparency in energy decision making to all stakeholders.

1.2. The States recognizes that a clear, stable and sustainable strategy committed to and agreed by all stakeholders is critical if it is to be successful and it will provide certainty for investment for all the Island's energy suppliers.

1.3. This Energy Resource Plan contains a set of high level principles and aims covering all forms of energy use. These principles and aims are believed to be realistic and achievable in current circumstances but adaptable to meet changing circumstances, particularly in global energy markets, and local public attitudes to environmental issues. The Energy Resource Plan will thus provide a framework which is transparent to the community and within which strategic decisions can be made by the States and the energy providers in relation to market structures and investment.

- 1.4. It is inevitable that a long term plan such as this cannot contain all the necessary detail to enable policy aspirations to be delivered. This plan should be seen as an enabling document, with the expectation that a number of detailed pieces of legislation and workstreams which are coherent with this plan will follow when the time is right for each of them. Where appropriate the plan does provide objectives, specific targets and actions on how our energy vision will be realized.
- 1.5. At the core of the Energy Resource Plan is the need to maintain and build on the high quality of life enjoyed by the Island's community. This can be achieved by providing the energy needed to allow economic growth at a financial price that is affordable for all consumers and at an environmental cost that does not compromise the ability of future generations to meet their own needs and preserve the environment for the future.
- 1.6. The Energy Resource Plan recognizes that:
- Energy has become an essential commodity for the economic and social wellbeing of the Island and we need to **provide** affordable security and resilience of our energy supplies.
  - As with any commodity we should **promote** the efficient use of energy, thus using it wisely and not wasting it.
  - We should recognise that energy generation and energy use have environmental impacts and we should **plan** to adopt carbon reduction measures proportionate to Island circumstances to reduce those impacts locally and as part of our contribution to international initiatives.
- 1.7. Guided by these three fundamental principles of *providing, promoting and*

*planning*, the Energy Resource Plan sets out three Strategic Objectives and a set of actions and directions to achieve for each:

- **‘Maintaining the safety, security, affordability and sustainability of the Island’s energy supplies’** is designed to ensure that the Island has the safety, security and reliability in energy supplies and associated infrastructure as required to maintain our economy and improve our quality of life whilst ensuring that we respond appropriately to the consequences of the world’s declining supplies of hydrocarbon fuels.
- **‘Using energy wisely, efficiently and not wasting it’** is designed to ensure that we use energy wisely, not only to protect the natural resources but also to reduce the cost to the consumer.
- **‘Reducing environmental impacts locally as part of our contribution to international initiatives as part of the global community’** is designed to ensure that we adopt measures proportionate to our Island’s circumstances so that we can act now to limit environmental impacts and protect our environment for the benefit of future generations.

1.8. Taken as a whole these principles represent a commitment by the States to actively seek to change energy supplies and user behaviours and patterns to achieve secure, safe and affordable supplies and greater efficiency of usage.

1.9. In summary, Guernsey is facing significant choices about how we act today and how we value the future. Energy as a commodity is essential for the well-being of our society and for sustainable economic growth. We have no choice other than to respond to the energy challenge. The issues which need to be addressed are coming from global pressures and energy

markets are going to change in the next 20 to 30 years. Guernsey simply cannot ignore them. We are not alone in facing these challenges, but in many ways, as a small Island jurisdiction, the challenges we face are more daunting than our closest neighbours in Europe. It will require a change in mindset and behaviour across our society and economy if we are to be fully successful in meeting our objectives and providing a sustainable future for our children. However, the energy challenge also brings with it significant opportunities for the Island. With potentially vast quantities of wind, tide and wave derived energy sources off our shores; Guernsey might be able to become self sufficient in power and potentially a provider of electricity beyond the Island.

## **2. The States Strategic Plan**

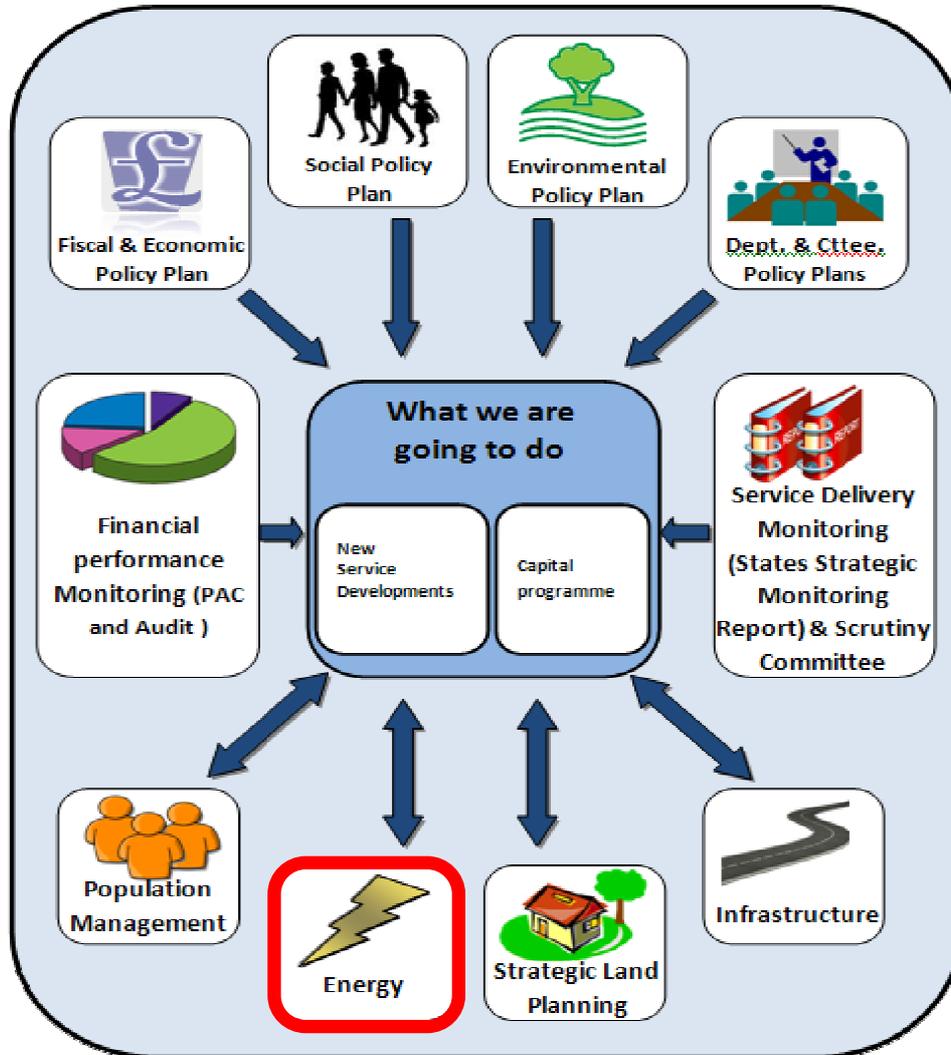
- 2.1 The Energy Resource Plan describes Guernsey's sources and use of energy and sets out key objectives which will affect future energy decisions. Its relationship with the States Strategic Plan is explained below and illustrated by the diagram on page 9.

### **The Energy Resource Plan's relationship with the States Strategic Plan**

- 2.2 The Energy Resource Plan is one of the four Island Resource Plans (see diagram below) that form part of the States Strategic Plan. The other Island Resource Plans cover Population Management, Strategic Land Planning and Island Infrastructure. The Energy Resource Plan provides a high level strategic framework endorsed by the States to guide future decisions involving the use of energy.

# The States Strategic Plan

A family of related plans



2.3 To support the delivery of policies aimed at achieving the economic, social and environmental objectives contained within the States Strategic Plan, the Energy Resource Plan takes a broad and long term view of energy use. More specific policies and guidance material will be directed by this Plan and published separately following the endorsement of this Plan by the States.

### **3. Introduction**

3.1. Energy is vital to a modern economy. Reliable and secure sources of energy are needed to heat and light homes, for transport and for many business activities. Unfortunately, because the use of energy is taken for granted, insufficient thought is given as to where this energy has come from or what the consequences of using it might be. Energy can no longer be thought of in these terms.

3.2. For a number of years, the States of Guernsey have had a plan for energy provision. This plan needs to be updated to include environmental and sustainability concerns. The States of Guernsey previously joined the United Kingdom in committing to the principles of the Kyoto Protocol<sup>1</sup>. However, the protocol is due to expire in 2012 and a new international framework is yet to be negotiated and ratified. Supplementary to the Kyoto Protocol, the UK has also passed legislation to tackle their carbon emissions. The Climate Change Act became a UK law in November 2008 and it set long term targets to be achieved by 2020 and 2050 respectively. As Guernsey is also committed to reducing its own levels of greenhouse gas emissions, we will look to review the current targets that are included in the 2008 Energy Policy Report and adopt similar targets to those set out in the UK's Climate Change Act. In this way Guernsey will be able to demonstrate that it is playing its part in taking urgent action to tackle

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<sup>1</sup> The Kyoto Protocol is a binding agreement to reduce greenhouse gas omissions.

global climate change. The majority of our energy supplies are presently derived from burning finite fossil fuels. Our electricity supplies come from burning fossil fuel on-Island and importing lower carbon sources in Europe.

3.3. Consumers have already seen how energy prices react to world influences, which are beyond our control or our ability to mitigate. Energy prices are forecast to remain high and increase in the long term. This can have a very real and swift effect on our quality of life. By following the policies set out in this plan we can seek not only to improve the sustainability of our energy supplies but also to mitigate the rise in prices which is potentially harmful to our economy.

3.4. The Energy Resource Plan identifies current energy uses and summarises the Island's environmental, supply and demand side issues with respect to energy. The key challenge facing us is how to reconcile the demands of a modern growing economy with concerns for the future of our environment. We are using increasing amounts of energy at a time when energy prices are being driven upwards by the uncertainties of global politics and the realities of a declining energy resource. These issues are discussed in the following sections.

3.5. We will review our progress against the actions on an annual basis and review the Energy Resource Plan objectives every four years (or earlier if external changes affect the underlying assumptions upon which the Energy Resource Plan is premised).

#### **4. Environmental Issues**

##### **Kyoto Protocol and International Developments**

4.1. The Kyoto Protocol to the United Nations Framework Convention on

Climate Change (UNFCCC) was adopted by the conference in December 1997. Under the terms of the Protocol, developed countries agreed to binding targets with a view to reducing their emissions of six specified greenhouse gases by 5.2% overall from 1990 levels over the period 2008-2012. The Protocol permits countries to undertake their commitments jointly and the Member States of the European Community have agreed to meet the 8% overall reduction target assigned to them by the Protocol. Under the agreement, the 8% reduction target will be shared out between Member States to take account of different circumstances. The UK has agreed a reduction of 12.5%. Guernsey's greenhouse gas emissions are included as part of the overall figures for the UK.

- 4.2. However, the Kyoto Protocol is now coming to a close and as there is no indication of an international framework to supersede it, there is an opportunity for Guernsey to review its current energy targets. The United Kingdom established the Climate Change Act in 2008. This UK based law states its intent to achieve a 34% reduction of carbon emissions by 2020 and an 80% cut by 2050 (both targets are set against the 1990 baseline). Whilst it is not mandatory for Guernsey to conform to the Climate Change Act, similar targets can be used to continue its reduction in carbon emissions.

#### **Guernsey's Current (2009) Emissions**

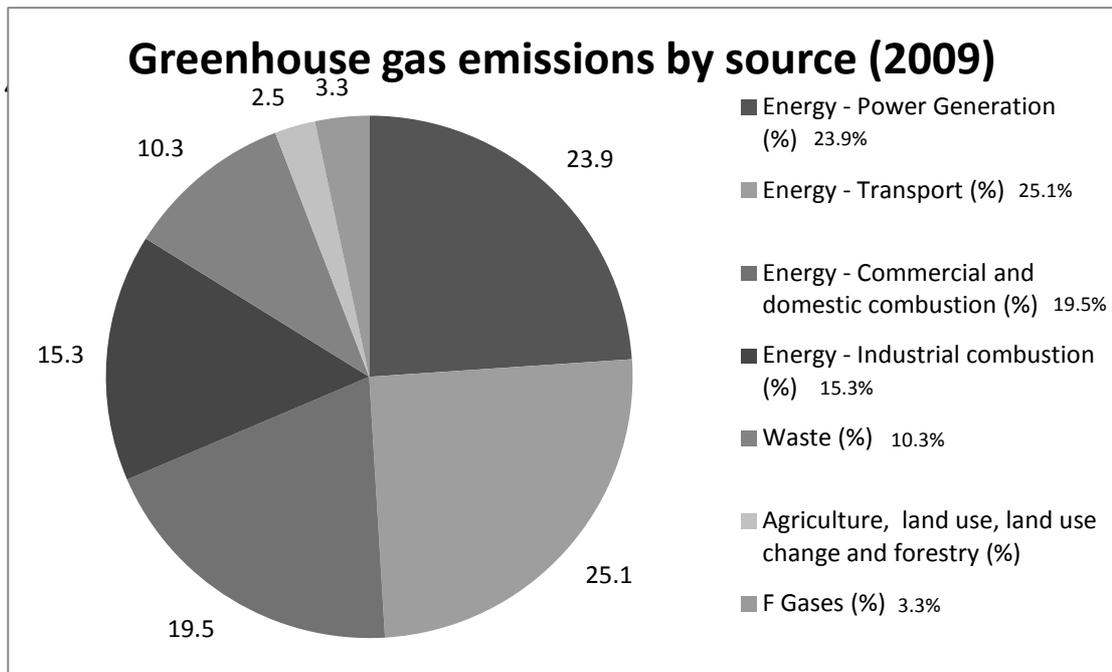
- 4.3. Energy use accounts for 83.8% of Guernsey's emissions by source – with Transport (25.1%) and Power Generation (23.9%) the largest areas. Since 2001 a significant proportion of the Island's electricity has been imported from France via a cable link. As the greenhouse gas inventory is "source based", which means it reflects only the emissions released from Guernsey, this cable link has led to a significant decrease in the amount of

emissions relating to power generation included in the Kyoto inventory.

- 4.4. Guernsey's Greenhouse Gas emissions are monitored in accordance with international standards. This means that emissions are recorded at point of source not point of use. This is relevant in relation to importing electricity from France. In relation to the carbon intensity of various fuels (including that used for generation of imported electricity), Guernsey uses the conventions adopted by the Carbon Trust. A large proportion of electricity imported into Guernsey from France in 2010/11 was from nuclear (i.e. low carbon) generation (64%), with some renewable electricity in the form of hydro-electricity.
- 4.5. There has been an argument that although the electricity imported into Guernsey has a low carbon intensity, drawing this power out of the European Power Grid may result in any gap being made up from carbon intense power generation (e.g. coal). However, even if this was the case in the short term, the whole of the European Power Grid is affected by carbon emission targets and energy policy decisions in every country contributing to the Grid will be influenced by the demands for low carbon power and the legally enforced carbon emission targets of the EU.
- 4.6. In June 2011 Guernsey Electricity and Jersey Electricity announced the signing of a new 10-year supply contract with Électricité de France (EDF) that guarantees Jersey and Guernsey low carbon supplies of electricity to 2023. The agreement is a positive step in further reducing the carbon footprint of the Island and specifies that around 30% of the supply will come from hydro-electric sources and the remaining 70% from nuclear sources.
- 4.7. Emissions from transport formed nearly 30% of energy emissions (and

25% of total emissions) in 2009, with 80% of this portion of emissions resulting from on Island road transport. Figure 1 shows the percentage breakdown of 2009 emissions by source.

**Figure 1 2009 Emissions by Source<sup>2</sup>**



4.8. Figures 2 and 3 show the detailed breakdown of emissions in selected years since 1990. Under the Kyoto Protocol emissions are only counted at the point of generation not at the point of use. It is clear that the availability and use of electricity from the Channel Island Electricity Grid (CIEG) cable link from 2001 has had a major influence on emission trends. Differentials between the cost of electricity from local generation and that from the cable resulted in significant use of imported electricity in the early years after 2001, but an increased use of local generation in the later years. This has contributed to the recent trend of increasing total emissions.

<sup>2</sup> Greenhouse Gas Bulletin 2009, [www.gov.gg/ghg](http://www.gov.gg/ghg)

Figure 2 Emissions by Source 1990 to 2009<sup>3</sup>

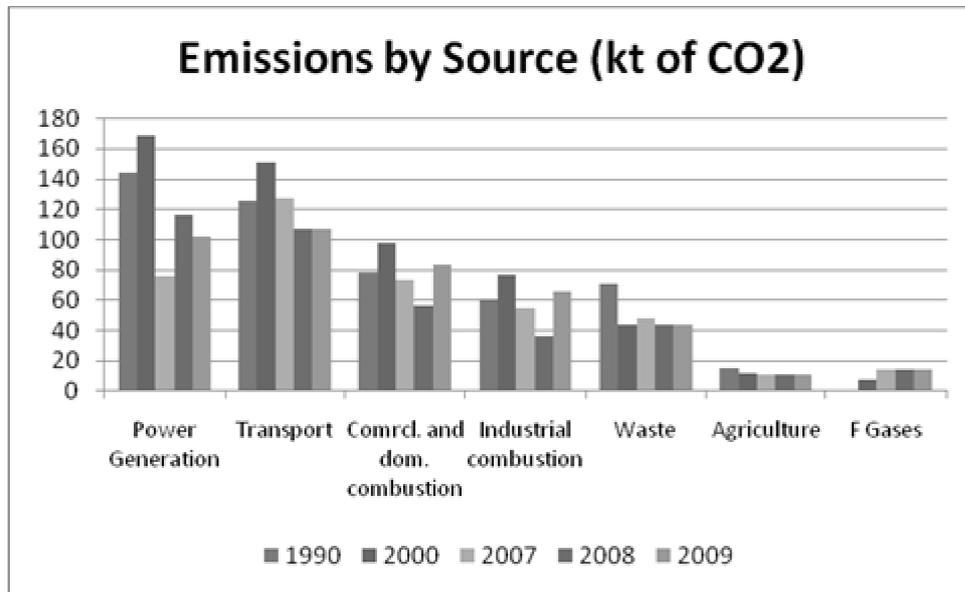
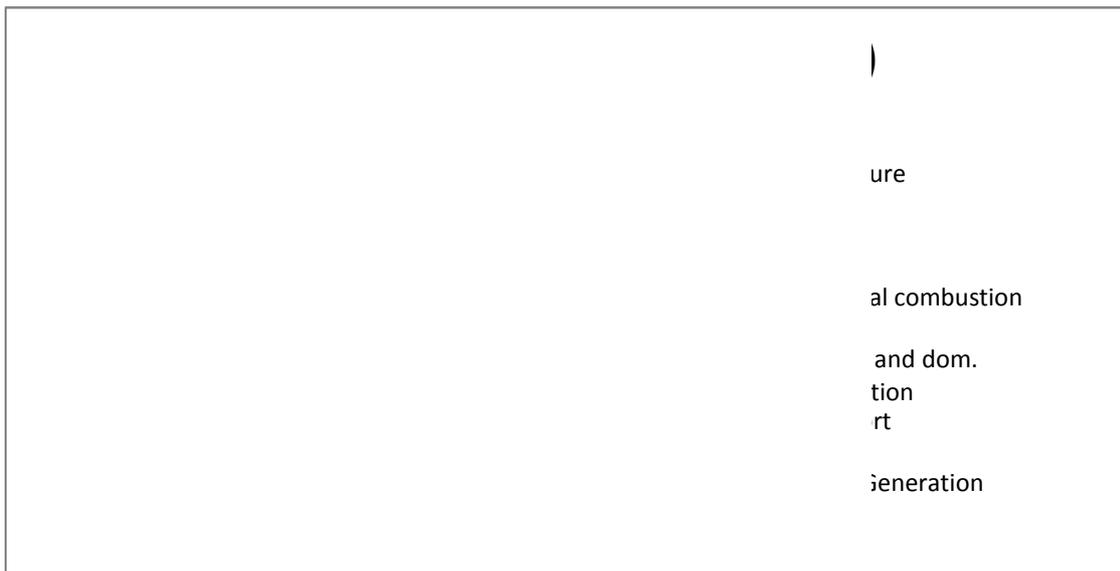


Figure 3 Emissions by Source 1990 to 2009<sup>4</sup>



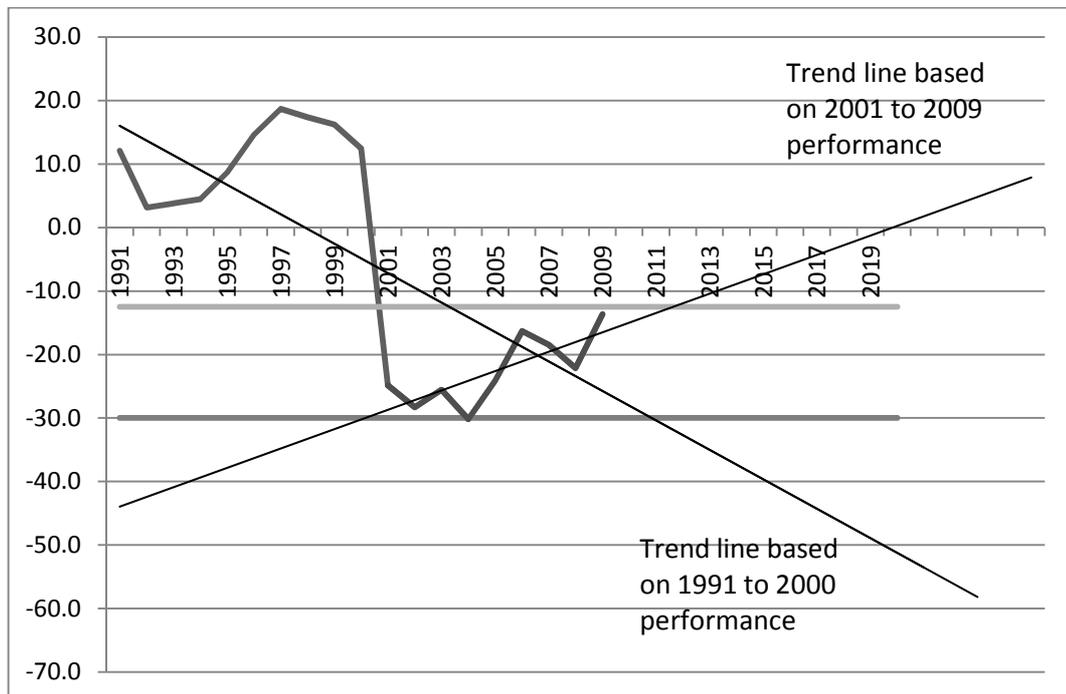
4.9. Guernsey's reduction in carbon emissions since 1990 is represented in Figure 4 and shows Guernsey performance against the 2020 target of 30% reduction from 1990 levels. The graph clearly highlights the impact of the CIEG cable in 2001. The trend line shows an overall reduction in emissions

<sup>3</sup> Greenhouse Gas Bulletin 2009, [www.gov.gg/ghg](http://www.gov.gg/ghg)

<sup>4</sup> Greenhouse Gas Bulletin 2009, [www.gov.gg/ghg](http://www.gov.gg/ghg)

and a simple trend forecast could suggest that Guernsey is likely to meet the 30% carbon emission reduction by 2020 - such a conclusion however may be misleading. The annual change in the level of carbon emissions appears highly volatile and the overall downward trend has been driven primarily by the 2001 step change in electricity generation.

**Figure 4 Performance against Carbon Emission Reduction Targets<sup>5</sup>**



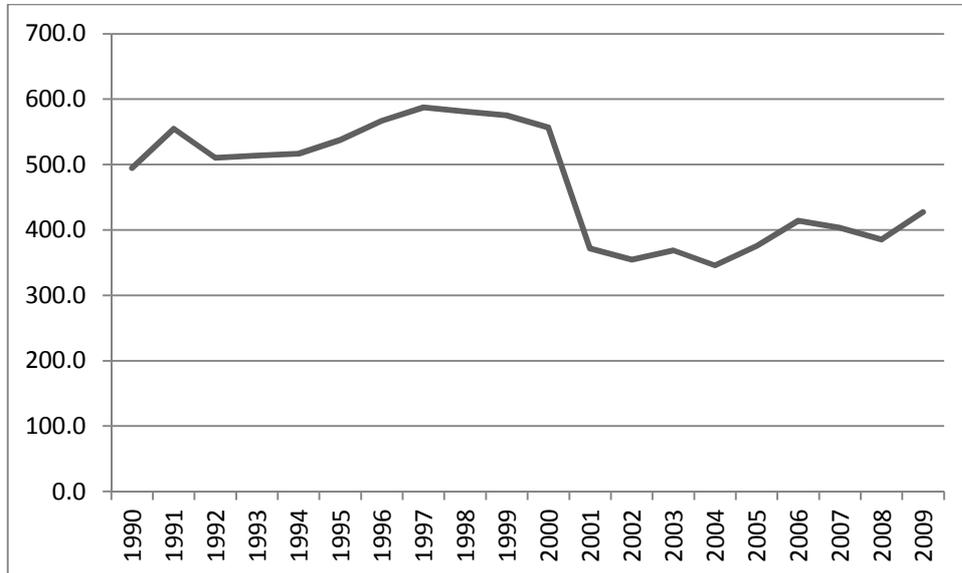
4.10. Unfortunately this change was essentially a “one off” step change and whilst its significance should not be understated, nor should it be allowed to mask the overall rising trend of energy consumption from fossil fuel in other areas of the economy. This is illustrated in Figure 5 which shows Total Green House Gas Emissions from 1990-2009.

4.11. A sounder and more realistic conclusion from the evidence is that, in the absence of further technological changes and direct action by the States,

<sup>5</sup> Greenhouse Gas Bulletin 2009, [www.gov.gg/ghg](http://www.gov.gg/ghg)

Guernsey is unlikely to achieve a 30% reduction in carbon emissions from 1990 levels by 2020.

**Figure 5 Total Green House Gas Emissions 1990-2009<sup>6</sup>**



## 5. Demand Side Issues

5.1. The demand side of energy consumption requires full analysis and understanding and is increasingly important as the demand and supply of energy will become increasingly intertwined in the future. In the future energy users will demand power in a different way and at different times of the day (e.g. electric cars being charged over night); renewable generation is cyclical and intermittent which produces a specific supply profile which needs to be taken into account in terms of the generation mix; and as energy storage and smart grids develop the demand and supply of energy can be more closely matched. These factors will require

<sup>6</sup> Greenhouse Gas Bulletin 2009, [www.gov.gg/ghg](http://www.gov.gg/ghg)

The Guernsey greenhouse gas emissions inventory is compiled by AEA Technology, the company which calculates emissions for the whole of the UK and British Isles on behalf of the Department of Energy and Climate Change (DECC). The figures published here should not be compared with those previously published.

future energy planning to be much more holistic with potential intervention in the demand side to ensure that it matches increasingly intermittent supply.

### **Total Energy Consumption**

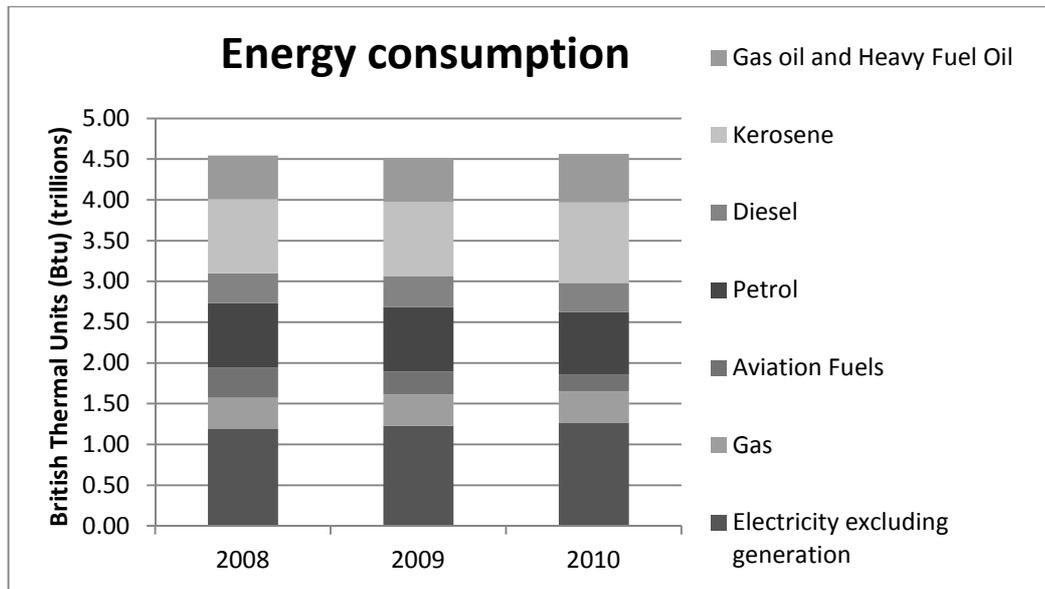
5.2. Figure 6 represents the total amount of energy supplied to Guernsey consumers, in the form of electricity, kerosene, gas and fuel oils. The data does not include energy consumed by the burning of other fuels such as wood and coal or home generation of electricity. This form of reporting was introduced in the 2010 Facts and Figures Booklet.

5.3. The figure demonstrates the total energy consumption over the three years to be fairly static. However there is considerable volatility over the years between the fuel sources in particular:

- Electricity increased by 6.5%
- Gas Oil and Heavy Fuel Oils increased by 12.2%
- Kerosene increased by 7.6%
- Aviation fuels fell dramatically by 45.3%

5.4. It is worth stating that aviation fuel consumption has fallen dramatically not due to increased efficiency, but instead due to increased quantities of aviation fuel provided to consumers from outside the Bailiwick, mainly from the UK mainland. Without this switching of suppliers total energy consumption would have increased.

**Figure 6 Guernsey's Energy Consumption (kt CO2)<sup>7</sup>**



**Notes:**

Gas oil and Heavy Fuel Oil: Energy in the form of Gas Oil and Heavy Fuel Oil, as consumed by Guernsey Electricity in the generation of electricity on island (i.e. which is not supplied to customers), is not included in this category.

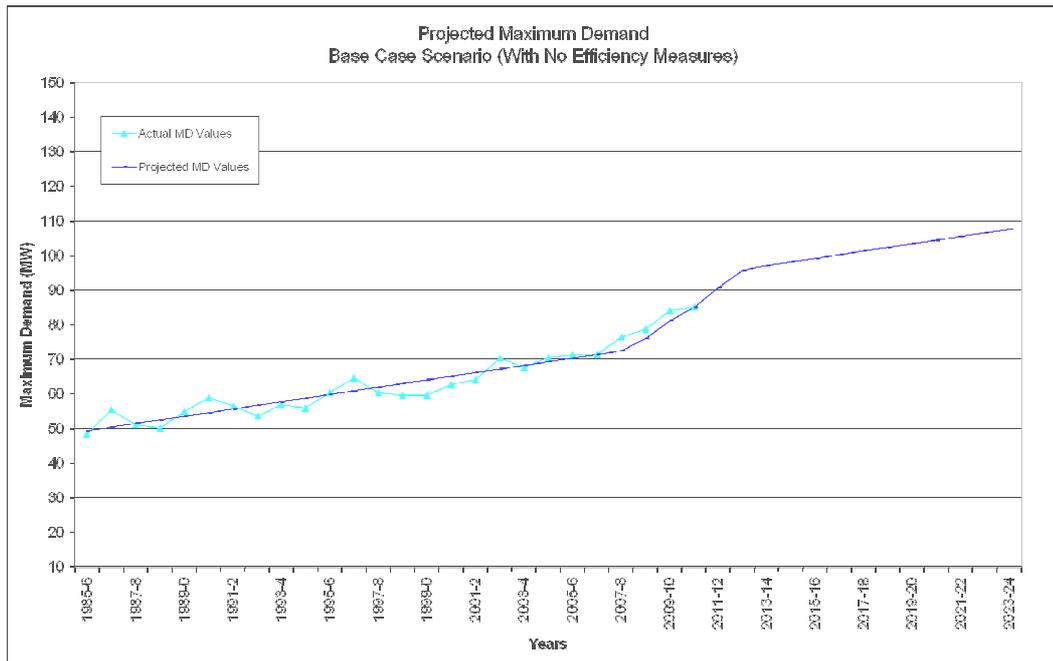
Gas figures presented are calculated from the Guernsey Gas accounts and as such annual figures represent usage between 1<sup>st</sup> July and 31<sup>st</sup> June. All other figures are based on calendar year.

**Electricity Demand**

5.5. The trends in maximum demand have shown general growth over the last twenty years, markedly since 2006. The maximum demand in 2000 was 63MW and in 2010 85MW, an increase of 35%. The upward trend in electricity demand since 1985/86 is shown in Figure 7. The growth for electricity has similarly increased, from 310 GWh to 400 GWh per annum, an increase of 30%, over the last ten years.

<sup>7</sup> Source: Policy Council, States of Guernsey

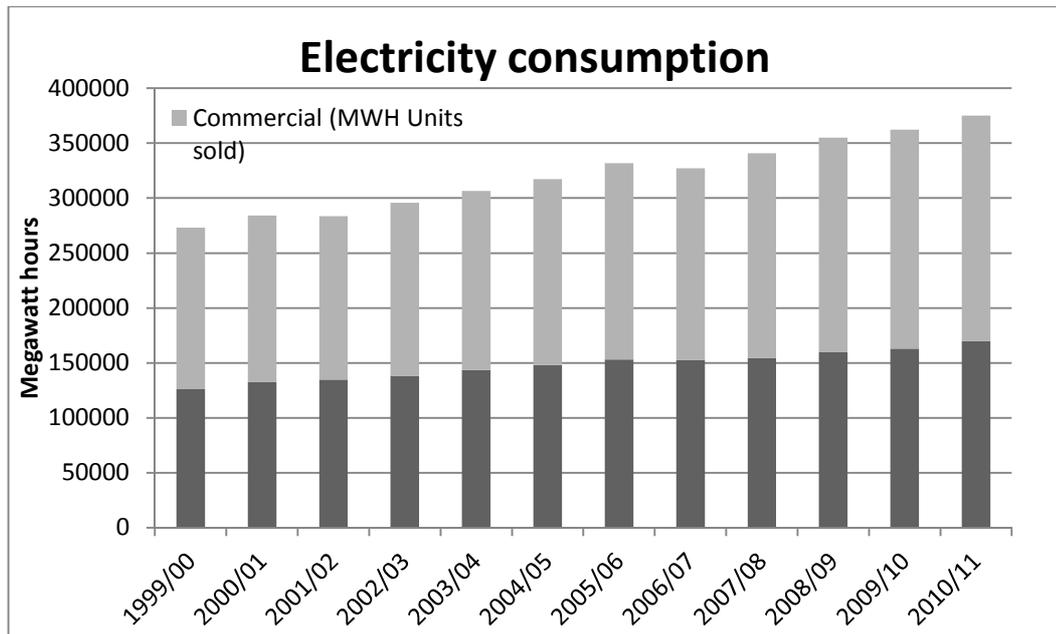
**Figure 7 Maximum Demand and Predictions<sup>8</sup>**



5.6. Figure 8 disaggregates electricity consumption between domestic and commercial users. Commercial consumption has increased at a slightly higher rate than domestic consumption. The commercial proportion of electricity demand has increased gradually from 54% of the total in 1999/2000 to 55% in 2009/10.

<sup>8</sup> Source: Guernsey Electricity

**Figure 8 Guernsey's Electricity Consumption 1999/2000 to 2009/10<sup>9</sup>**



5.7. The total electricity consumption per customer and per capita from 2006/07 through to 2009/10 is show in Table 1 below. This represents the average amount of electricity consumed each day per capita and shows how per capita consumption has increased year on year since the data has been collected.

**Table 1 Daily Electricity Consumption per capita by customer (kWh per day)<sup>10</sup>**

	Domestic	Commercial	Total
2006/07	6.8	7.8	14.7
2007/08	6.8	8.2	15.1
2008/09	7.1	8.6	15.8
2009/10	7.2	8.8	15.9
2010/11	7.5	9.0	16.5

<sup>9</sup> Source: Guernsey Electricity and Guernsey Population Bulletin

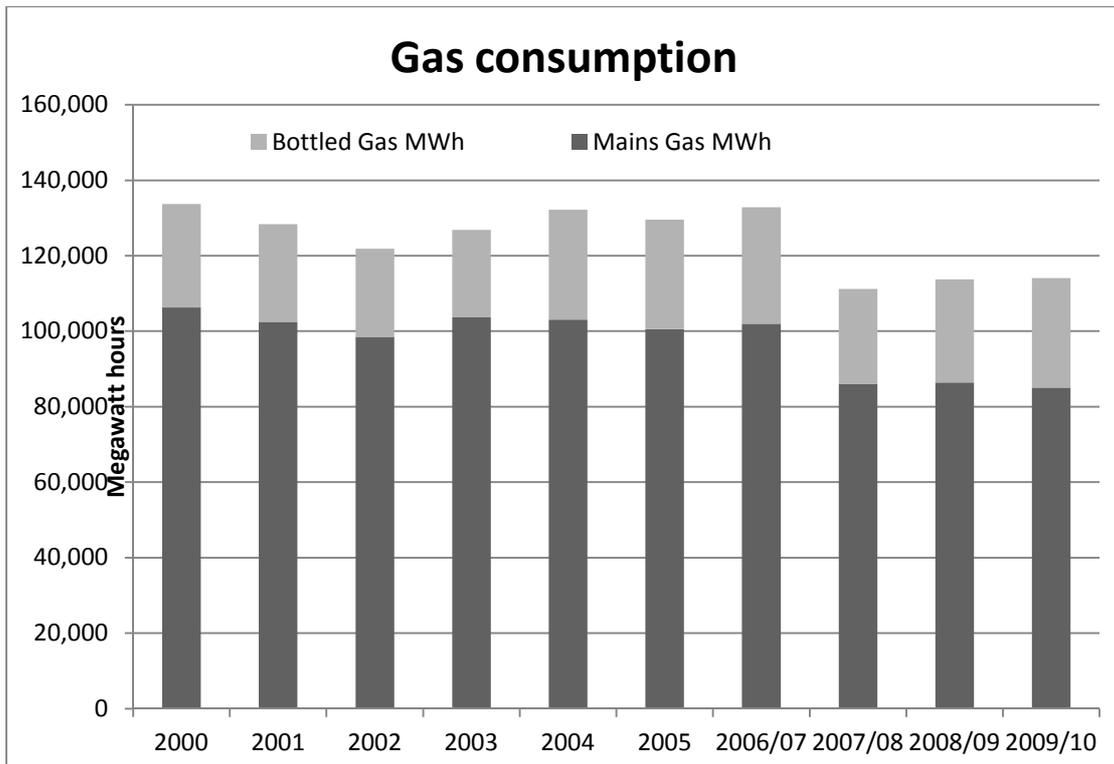
<sup>10</sup> Source: Guernsey Electricity and Guernsey Population Bulletin

- 5.8. The data shows small increases year on year in per capita consumption for both domestic and commercial use. It is important to remember that growth in consumption is not necessarily a “bad” outcome provided that two conditions are met – it represents productive and not inefficient use of electricity and that the electricity used is low carbon where it is replacing higher carbon alternatives. It appears likely, however, that there is scope for both domestic and commercial users to use electricity more efficiently.
- 5.9. The increase in demand for electric heating and the development of data centres are two of the underlying reasons for this additional load. Whilst population has also grown slightly in recent years household consumption has increased on average as electricity becomes a greater part of lifestyle activities.
- 5.10. Over the past few years Guernsey Electricity has introduced smart metering which, whilst not necessarily directly linked to demand, enables greater information to be available, and allows remote interaction with the meter, without needing to read or enter the premises. It additionally removes the need for estimated bills. 95% of all Guernsey Electricity customers currently have a smart meter installed. These meters will allow customers to receive more detailed energy consumption information, and take any actions to change their consumption behaviour, and minimise their costs if they wish to do so.

### **Gas Consumption**

- 5.11. Total gas consumption including bottled gas and mains gas (and mini bulk sales) from 2000 to 2009/10 is shown in Figure 9.

Figure 9 Guernsey's Annual Gas Consumption (MWh pa)<sup>11</sup>



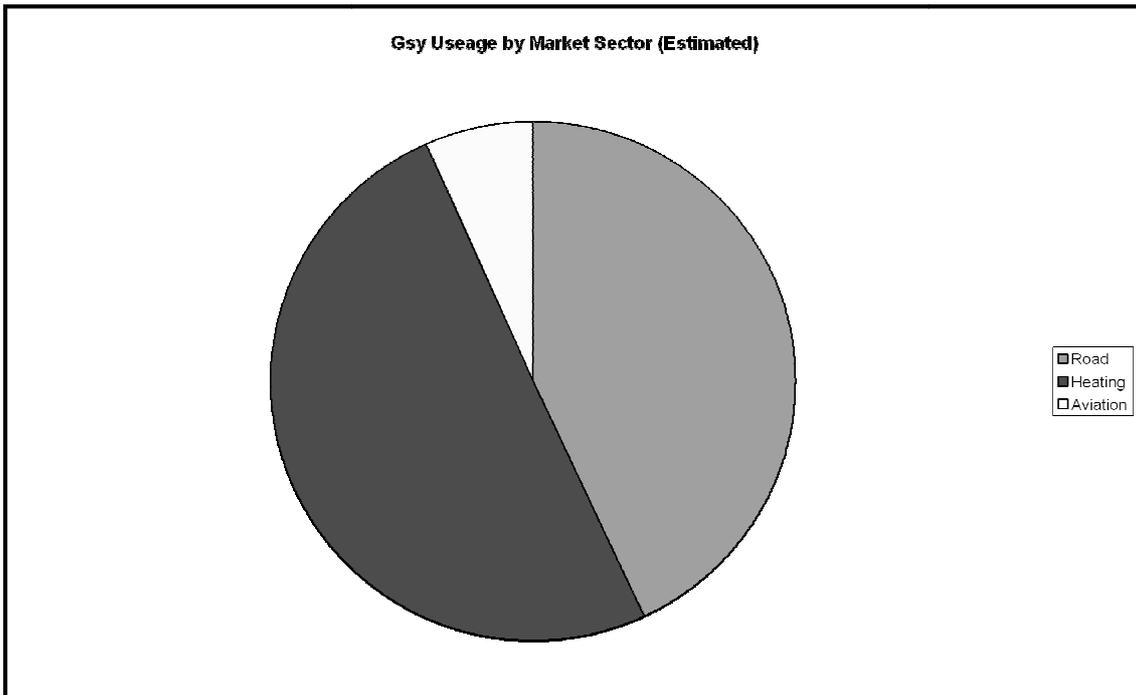
5.12. The figure highlights a downward trend in total gas demand with a 20% reduction in gas demand, but as with previous figures the overall trend masks significant differences within the market. Since 2000 bottled gas demand has increased by 6% whilst mains gas demand has fallen by 20%. These changes have been driven by more efficient appliances plus migration to other forms of energy.

### Oil Demand

5.13. The Guernsey oil demand is approximately 100,000 cubic metres per annum, which represents approximately 0.1% of the overall UK consumption. The split into market areas is as shown in Figure 10.

<sup>11</sup> Source: Facts and Figures 2010 Policy Council

**Figure 10 Guernsey Oil Demand 2010<sup>12</sup>**



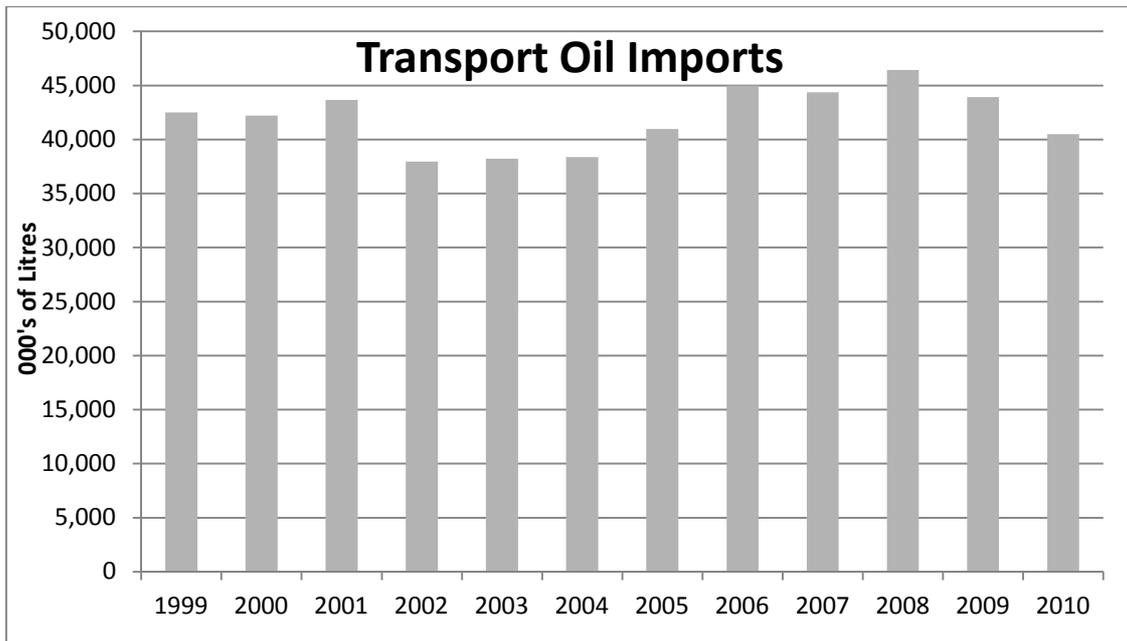
5.14. The UK sales by grade, after allowing for the UK's much larger volumes for aviation, show a similar trend.

5.15. The use of diesel and petrol accounts for around 31% of oil supplied to the Island and fuels for transport contribute up to 25% of our greenhouse gas emissions, the second largest contributor. This makes it an important area for the reduction of our energy consumption. Many Guernsey residents have become heavily dependent on the private car and the flexibility and freedom it provides. The Environment Department is in the process of reviewing the States' Integrated Road Transport Strategy. The aim of that strategy is to provide a sustainable transport system which accords with the economic, social and environmental objectives of the States of Guernsey.

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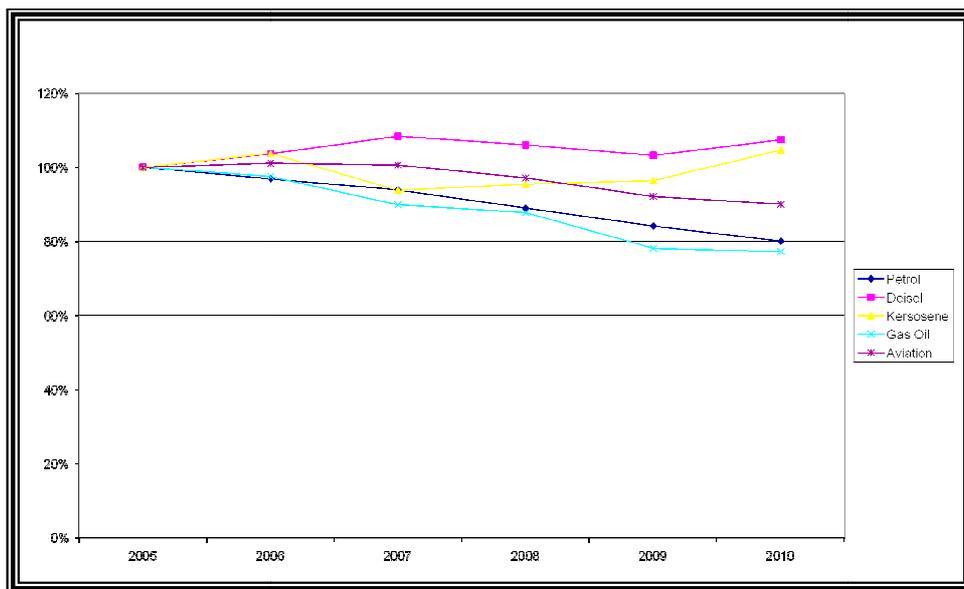
<sup>12</sup> Source: Rubis & Total Estimates. Excludes oil for electricity generation.

Figure 11 Guernsey's Transport Oil Imports 1999 - 2010 (000s litres)<sup>13</sup>



5.16. The consumption in Guernsey is following a similar pattern to the UK (except aviation), whose trends in petroleum products are shown below.

Figure 12 UK Demand for Oil



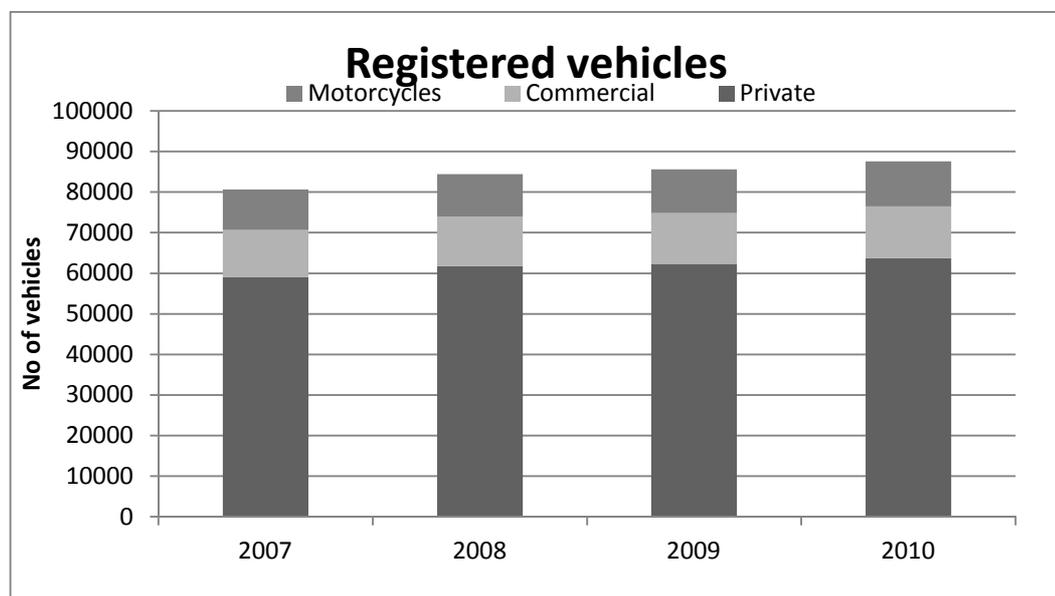
<sup>13</sup> Source: Facts and Figures 2011 Policy Council

5.17. The changes in consumption are primarily based on more fuel efficient equipment (cars, boilers, insulation, engines etc), as well as a directional change from petrol to diesel for private transportation.

5.18. Transport is also virtually exclusively powered by oil Products

5.19. The Island has high private car ownership levels, and with increased economic success there has been a trend to the purchase of larger vehicles. As at 31 December 2010, Guernsey had 62,349 cars and light vans, 12,796 commercials and 11,047 motorcycles registered. Guernsey has 45,000 active provisional and full driving licences. The annual figures from 2007 to 2010 are shown in Figure 13.

**Figure 13 Guernsey's Vehicle Registrations 2000 - 2010<sup>14</sup>**



5.20. Improvements in vehicle technology and the increasing use of diesel fuel have helped to offset the impact of the increase in registered vehicles on fuel consumption. Fiscal measures are already in place to encourage the

<sup>14</sup> Source: Facts and Figures 2010 Policy Council

driver to adopt a more energy-efficient approach: a significant percentage of the cost of a litre of road fuel is duty. To date policies have been aimed at promoting consideration of the need for each individual journey. However, as many car owners will feel that once a vehicle has been purchased it should be used, a key challenge remains in persuading against vehicle purchase in the first place. We may need to consider fiscal approaches at initial purchase and with on-going running costs, as adopted in some other countries and from whom Guernsey may learn valuable lessons if we are to meet carbon reduction targets.

### **Heat and Light Demand**

- 5.21. Improvements in energy consumption in the domestic and commercial sectors have for some time concentrated on space heating. The desire for better working conditions in offices has created additional cooling demand and further energy consumption. Regulatory approaches have been used across all sectors of the industry to improve thermal efficiency of all new buildings and extensions to existing stock, thereby improving energy efficiency.
- 5.22. Locally the building regulations were last updated in 2006 when the thermal requirements were raised from the UK's 1995 position to the 2002 standards. This was a considerable improvement for the industry to adopt and at that time it was always envisaged that further improvements would be necessary.
- 5.23. The Environment Department has recently begun work on revising the legal framework of the Regulations to enable the Department to accept emerging technologies and to consider alternative approaches to compliance with the functional requirements. With respect to energy efficiency, this will mean that the Department will be able to review the

approaches taken by other jurisdictions and enable it to develop policy tailored for Guernsey. Consideration must be given to the Island's geographical location, its reliance on the importation of building materials balanced with any potential negative effects on the construction industry and its contribution to the economy of the Island.

5.24. Setting higher standards for energy efficiency in the design, build and operation of homes will have a number of consequences and need to be fully understood before determining the appropriate policy for Guernsey. This includes accepting that energy-efficient homes may look different to more traditional forms of building, that this may have cost implications and may impact on the rights of the property owner in terms of how buildings are designed and laid out.

5.25. Work on the actual revision of the functional requirements and the 'deemed to satisfy' guidance relating to the conservation of fuel and power will commence this year and will require a comprehensive consultation process. However it can be assumed that any ultimate improvement measures proposed will be similar to the recent UK version, focusing on energy conservation and sustainability measures.

5.26. It is possible to construct properties with very low heat energy requirements, but the cost of achieving this have to be considered. Looking to the example of other countries, particularly those in Scandinavia, it is clear that this area of work will continue to provide scope for energy savings in the future. Similarly, there are emerging technologies, such as heat pumps and small scale combined heat and power, that will provide energy for the home or business premises which use energy in a very efficient manner. It is clear, however, that the capital cost of such technically advanced systems will act as a constraint upon

their wide scale deployment, and that it may be necessary to provide subsidy in one form or another to push the market. Such subsidies are common in other developed countries.

5.27. The emerging review of the Strategic Land Use Plan (SLUP) for Guernsey will provide the overarching strategic framework for the consequent revision of the Development Plans, currently known as the Urban and Rural Area Plans; these were adopted in 2002 and 2005 respectively. Whilst neither of these plans currently contains policies relating to energy efficiency, there is an expectation that relevant policies will be developed in an Island-wide context rather than focusing on sub-areas. These policies will be guided by the Strategic Land Use Plan and will be based upon the principles of promoting sustainable development, of which energy use forms an integral part. Moreover, the Land Planning and Development (Guernsey) Law, 2005 and the subsequent Land Planning and Development (Environmental Impact Assessment) Ordinance, 2007 have introduced the need for the main significant effects of certain scheduled developments to be assessed; these include inter alia, the need to address any impacts on the use of natural resources, including energy use.

5.28. The conservation of energy by reducing consumption has a major role to play in our attempts to limit the impact on the environment. By reducing our consumption of fossil fuel derived power we are reducing the amount of carbon dioxide released. While this will reduce in any event if we are able to switch to carbon neutral energy supplies, it is clearly better to save energy than to generate it. This approach benefits consumers financially, especially as energy prices continue to soar. It will form an important part of our approach.

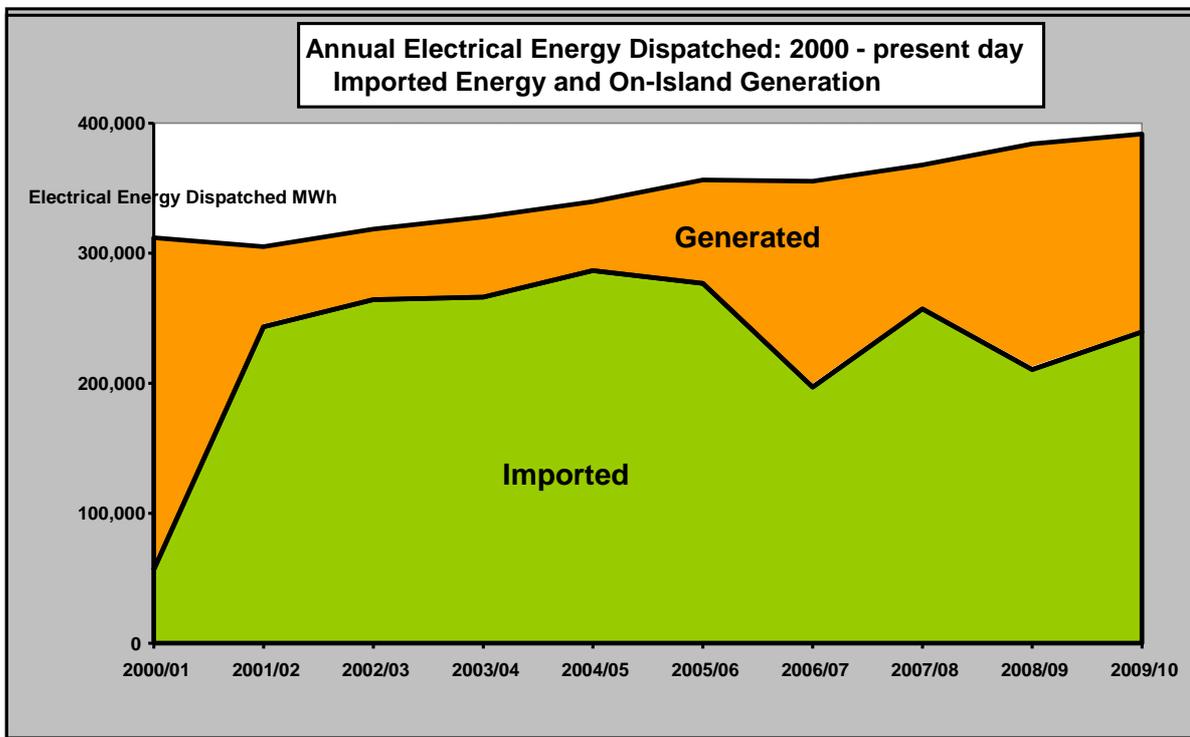
## **6. Supply Side Issues**

6.1. We recognize that it is essential for energy suppliers on the Island, due to the capital intensity of their industries, that the Energy Resource Plan provides clarity and certainty to allow business planning, and so that any private sector investment can be made with reasonable levels of confidence. The intention is that the States, through this Energy Resource Plan sets out a clear vision of Guernsey’s future energy markets which will provide the energy suppliers with certainty to assist their future capital investment.

### Electricity

6.2. Figure 14 below shows how the demand increases described in Section 4 have been met, using the least cost economic dispatch principle (commonly referred to as the “merit order”), from either generated or imported energy.

**Figure 14 Annual Electrical Energy Dispatched 2000/01 to 2009/10<sup>15</sup>**



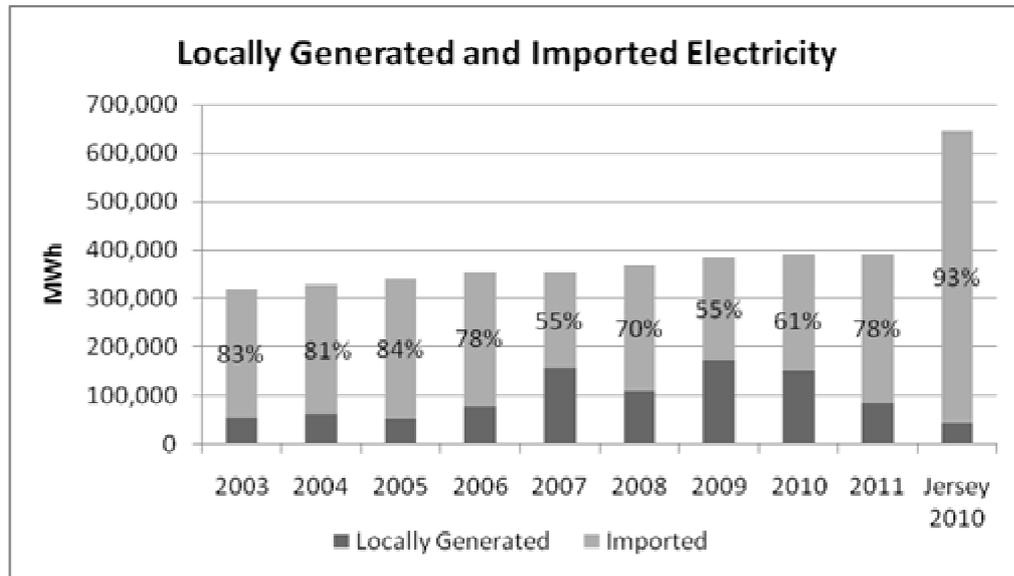
<sup>15</sup> Source: Guernsey Electricity

- 6.3. The Jersey - France electricity links currently have a total capacity of 145MW compared with Jersey's peak demand of 158 MW. Guernsey contributed to the costs of the second Jersey – France cable when it was installed in 2000 and has the right to draw at least 16MW (guaranteed capacity or firm capacity) from France and pass it through Jersey and the 55 MW cable to Guernsey. Additionally Guernsey Electricity can use capacity greater than the 16 MW if Jersey does not need it, which is very often the case.
- 6.4. Discussions are taking place on the possibility of Guernsey joining a Jersey Electricity project to install an additional 100 MW cable Jersey – France. In return it is anticipated that Guernsey would increase its guaranteed capacity over the network by 24 MW making 40 MW in total.
- 6.5. However despite this increase in firm capacity, the single Guernsey – Jersey cable remains a “single point of failure” meaning that there is no alternative route (resilience) for imported electricity, should supply through this link be interrupted. A fault with the submarine cable could take at least six months to rectify.
- 6.6. In 2001 this issue of strategic independence of electricity supplies was raised amid concerns of what would happen if supply through the cable link to France via Jersey was interrupted. The “n-2” principle was adopted, subsequently confirmed in a 2005 report to the States and not changed in the 2008 Energy Policy Report.
- 6.7. The 2005 States resolution was “To confirm their commitment to the existing policy of retaining sufficient sources of electricity to meet requirements, in any circumstances where two such sources (on-Island generators or the Channel Islands Electricity Grid (CIEG) cable link to

France) were unavailable at the same time (the n-2 policy)".

- 6.8. When the n-2 policy was first introduced, Guernsey Electricity Limited) GEL had a particular mix of diesel generators and guaranteed cable capacity to meet predicted demands and gas turbines to cover for unexpected peaks or supply failures. The increase in the guaranteed cable capacity changes that mix, so that more on-Island generation capacity is required as standby generation plant, which in turn imposes additional costs on consumers.
- 6.9. The consequence of the present arrangements and the proposed new Jersey/France cable is that Guernsey may be able to import 95% of its electricity from France, but will still be dependent on the use of local fossil fuelled plant to meet high demands during the winter. The fossil fuelled plant will also be required to provide supply security given the single cable to Jersey and to provide economic generation in the event that prices in Europe rise above local generation prices.
- 6.10. Figure 15 below shows the proportions of locally generated and imported electricity supplied in Guernsey over the last 7 years (to 31st March) and a comparison with Jersey (for 2010).

**Figure 15 Locally Generated and Imported Electricity**

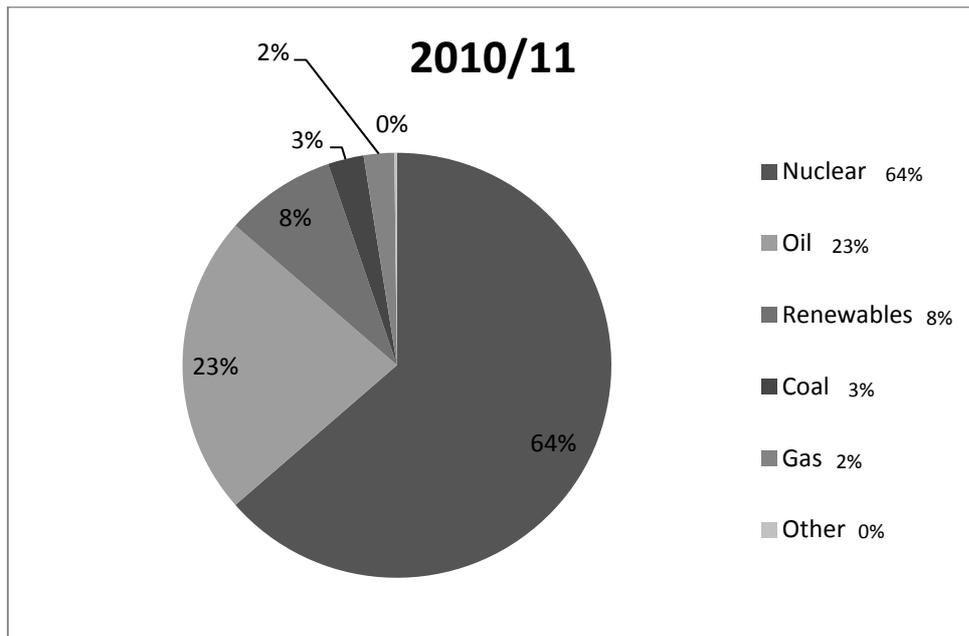


6.11. The November 2010 Office of Utility Regulation’s (OUR) Consultation on the Guernsey Electricity Price Control (OUR 10/13) raised issues about the interpretation of the n-2 policy and whether or not the cost of maintaining strategic independence should be borne equally by all customers. With the advent of time and changed circumstance, it is appropriate for us to revisit the ‘n-2’ policy as part of the implementation of this Energy Resource Plan.

6.12. A disaggregation of electricity sources in 2009/10 is show in Figure 16. In Guernsey Electricity’s 2010/11 accounting year 64% of Guernsey’s electricity originated from nuclear power imported by the cable link with France. This represents a significant increase of 14 percentage points from the previous accounting year. Oil generation, which includes electricity generated on-Island, accounted for 23% of the electricity consumed in 2010/11. This represents a continuing downward trend; figures in the two previous years were 46% and 40%. These changes, however, are being driven only by changes in the international prices of oil and electricity since Guernsey Electricity at present is mandated to follow a “least cost”

approach. Since 2008/09 renewables (wind and hydro) as a proportion of electricity generated (i.e. imported over the CIEG cable has increased from 5%, to 6% and 8% in 2010/11.

**Figure 16 The Origin of Guernsey's Electricity 2010/11<sup>16</sup>**



6.13. Purely from the perspective of meeting local electricity demand, a long term strategy on the mix of local generation and supply through a cable network needs to be developed, possibly involving a new direct cable link to France or an additional cable to Jersey.

6.14. The Islands interconnector cable strategy should also take into account the possibility of electricity export to Jersey, France or the UK by "statistical transfer<sup>17</sup>" through the CIEG network of any surplus renewable energy generated by Guernsey or Sark. Further cables to the continent, whatever the route, may give rise to opportunities to work collaboratively

<sup>16</sup> Source: Guernsey Facts and Figures 2010, 2011 Policy Council States of Guernsey

<sup>17</sup> Statistical transfer of electricity is where one jurisdiction with excess renewable energy can sell the value of its surplus power to another member state. The power / physical flow of electricity is not actually transferred between jurisdictions, only the renewable value of the electricity is transferred

with other private sector companies, in telecoms for example, to lay dark fibre at the same as the electricity cable and so allow both parties to benefit from economies of scope and reduce the costs compared to investing separately.

6.15. At first glance the application of a bias in the merit order for using locally generated or cable electricity has some immediate attraction in reducing local carbon emissions. With guaranteed capacity in the cable increased to 40 MW it is estimated that up to 95% of Guernsey current requirements could be met from imported electricity, but this proportion will reduce as Guernsey and Jersey's consumption increases.

6.16. There may however be a perverse energy market consequence in that if any additional costs of such a bias are passed on solely to the electricity customer, as opposed to being spread across the whole energy market or covered by some form of subsidy, this could make other forms of heating based on fossil fuel a more competitive option and therefore lead to increased carbon emissions.

6.17. Therefore the introduction of any bias in favour of "more expensive" imported low carbon energy (or indeed renewable energy) should not be considered in isolation, but as part of this comprehensive Energy Resource Plan.

6.18. It is likely that electric vehicles will become more prevalent on Guernsey's roads and this will have an impact on the electricity infrastructure around the island. An increase in such vehicles, or similar, should be matched by alternative renewable energy generation to maximize the overall benefit available. Driving electric cars which are basically powered by electricity generated in traditional ways (e.g. through fossil fuels) is missing out on

the overall available benefits. However, driving such vehicles when they are powered by genuine macro renewable electricity should be a very attractive option for jurisdictions such as Guernsey.

6.19. Guernsey Electricity is planning a large capital investment programme in the next five years as part of its asset management replacement programme. The States has traditionally adopted a “Save to Spend” policy with regards to its trading companies i.e. current customers contribute towards the capital investment up front from which customers in the future will benefit. Whilst this may have been appropriate for simple organic growth, such a funding model might not be sustainable when faced with large capital costs and underlying wholesale cost increases (e.g. prices did not have to increase to fund the original CIEG cable investment as they were already artificially high and the cost of sales were not rising to the same extent as now). Relying on the Save to Spend policy is likely to require an unacceptably large increase in electricity prices and the company’s profits in the short term – or if staggered over a longer period may take so long that we will fail to decarbonise our economy and meet our targets. It may be necessary for the States to consider alternative sources of funding for significant, specific, planned Guernsey Electricity’s capital projects (whilst maintaining States ownership of the company). This may include reviewing the appropriate capital structure for the company (i.e. allowing debt finance) and or considering working in partnership with the private sector.

6.20. This commentary on supply side issues has been written during a time of significant changes in the global market for energy. The long term effect of some of the changes listed below is not fully known, however they will affect the availability and price of power (nuclear and other) from Europe to Guernsey.

6.21. The UK government's plans for the greater role of nuclear energy were developed prior to the March 2011 Fukushima nuclear disaster in Japan. This is currently believed to lead to a two year delay into EDF Energy's plans to build Britain's first new reactor by 2018, which may pose significant problems for the UK Government. More than 20 coal, oil and nuclear plants will shut in the next decade and if the new generation of nuclear plants is delayed, then the shortfall in supply will have to be met by gas-fired stations, which will hinder the UK Government's ability to achieve its carbon emission target. The UK has further revisited its targets from renewables with offshore wind generation falling from its original target of 33GW by 2020 to only 12GW.

6.22. The Fukushima nuclear disaster has had far reaching consequences for the energy sector across Europe. For example Germany announced in May 2011 that it intended to cease any supply from nuclear power stations in Germany in the next decade. This will put pressure on other non-nuclear supplies and the overall supply and price of energy within Europe.

6.23. The Middle East has been experiencing political unrest in 2011 and as a region accounts for 21.5% of total world oil production.<sup>18</sup> The world demand and supply for oil is finely balanced and influenced by complex geo-political issues.

6.24. Both the above issues will affect the timing of "Peak Oil", which is the moment when the supply of oil is, for technical reasons, no longer able to keep up with demand. In effect, it has to be accepted that the era of "cheap oil" is over and, increasingly, with output from many of the world's oilfields now depleting, future demand will only be able to be met through

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<sup>18</sup> BP Statistical Review of World Energy 2010

bringing new resources into production using increasingly expensive techniques, for example deep-sea drilling, or through converting “unconventional” resources such as Canadian tar sands.

6.25. The exact timing of “Peak Oil” is open to interpretation, as this depends on a number of different factors:

- Future increases in demand which as a result of energy conservation measures and the development of alternative energy sources is likely to be flat in developed countries but to increase sharply in emerging economies.
- Investment by major oil companies in increasing the productivity of current resources and in bringing new resources into production.
- The development and use of alternative fuels such as nuclear, natural gas, and renewables, as well as measures to conserve energy.
- The consequences of external factors, such as the Fukushima incident referred to above, and the “Deepwater Horizon” oil spill in the Gulf of Mexico in 2010 as well as geopolitical events such as political unrest in oil-producing countries.

6.26. Whatever the date, the likely consequences of reaching “Peak Oil” include increasing oil prices, increasing volatility in oil prices and possible disruptions to supply. All these would have potentially very significant consequences for the Island’s economy.

6.27. There are many different projections as to when “Peak Oil” is likely to occur, from the most pessimistic, that it has in fact already occurred, to the most optimistic that, at least in the foreseeable future until about 2035, production can be expected to keep up with demand. In general it is expected that it will occur at some time between now and 2030, with 2020 often mentioned as a likely date. Firm action to conserve energy and

develop alternative energy resources would defer the “Peak Oil” event

## **Gas Supplies**

6.28. As is the situation with the Island’s two oil importers, Guernsey Gas relies on specialists to load, transport and offload Liquid Petroleum Gas (LPG) to the Island. It is believed that there are very few carriers available who can deliver the small volumes of LPG (propane and butane) associated with Guernsey. When this is combined with the requirements and restrictions of St Sampson’s Harbour it can be seen that the availability of suitable vessels is further limited. Security of supply in terms of the supply chain is therefore a risk for all importers of fuel through St Sampson’s Harbour.

6.29. The gas supply infrastructure in Guernsey can be divided into two elements;

- The LPG bulk and cylinder supply operations which rely on distribution via the road transport network and;
- The town’s gas (LPG/Air) supply which is distributed by underground gas mains.

6.30. The LPG bulk and cylinder business mirrors the UK model and effectively allows off grid customers to use gas for heating, hot water and cooking. Also associated with the cylinder business are leisure activities, such as barbeques. LPG is a standard product and the availability of CE marked appliances should continue provided the UK/European LPG market remains.

6.31. The Guernsey Gas underground distribution system consists of cast iron and polyethylene constructed gas mains. As with other utilities that use underground infrastructure, there is a requirement to upgrade and replace these networks over time. Guernsey Gas is likely to have to

continue replacing its aging cast iron infrastructure in the future as part of its Mains Replacement capital expenditure programme.

6.32. Gas appliance manufacturers do not produce standard appliances to operate on Guernsey's LPG / air mains gas. Hence appliances are modified, adjusted and or converted to operate on the Islands LPG / air mixture. Such modifications are allowed in Guernsey due to local legislation. One of the benefits of adopting a standard type of gas (natural gas or neat LPG) is the access to a wider range of appliances without the need to modify or convert them. There are various alternatives available for the Island to migrate to a standard gas type, convert to neat LPG or natural gas via a pipeline, Liquidised Natural Gas or Compressed Natural Gas.

6.33. The introduction of natural gas to the Island via a pipeline has been assessed in the past, not only to supply network customers with a standard gas, but also to be used for the generation of electricity. The commercial viability of these options will need to be reassessed. To take full account of utilising natural gas in the future for power generation, carbon capture would also need to be considered.

6.34. The option for integrated pipelines to the Island should be assessed when considering the offloading infrastructure improvements required at St Sampson's Harbour.

## **Oil Imports**

6.35. Rubis and Total<sup>19</sup>, the Island's two oil importers rely on the two, States owned, "Sarnia" tankers, which from a safety perspective may only be able to operate in Guernsey waters for another 10 years due to changes in international standards<sup>20</sup>. A deep water berth or similar solution might be the long term objective to ensure a selection of vessels, from different operators, are always available to supply into Guernsey. The current situation increases the risk of supply difficulties due to safety related issues. This is not believed to be viable without a suitable deep water berth able to take larger capacity vessels.

6.36. Currently both oil importers rely on one shipping company and there a limited number of vessels capable of discharging in St Sampson's harbour and this latter point exposes Guernsey to a high risk. For example should refineries reject the vessels and/or the operator for any safety related reason, the Island would be left in a critical supply situation almost overnight. This "supply critical" situation has already been experienced in recent years and for prolonged periods of time although these critical situations occurred prior to the States of Guernsey acquiring the Sarnia Cherie and Sarnia Liberty.

6.37. Tidal conditions in St Sampson's Harbour mean that there are significant periods of time, when vessels cannot dock and if a tidal window is missed, due to operational problems and weather conditions, delays, typically over a week in duration, can be all too common. This puts the basic security of supply at risk, and should this ever occur to both oil importers simultaneously, then supplies could be expected to be exhausted relatively quickly. Neither location has sufficient land or cost justification

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<sup>19</sup> At the time of writing Total UK (including its CI operations) is subject to Sale and Purchase Agreement with DCC now seeking to acquire the Channel Islands and Isle of Man operations from Rontec.

<sup>20</sup> JamesCo's (the owner of the Cherie and Liberty) assume 20 year asset lives for depreciation accounting purposes and believe that any changes in standards would have a long lead in period and that instead of a deep water berth the cheapest solution might be to simply replace the vessels when necessary.

(in the current market) for significant additional storage to reduce this risk.

6.38. There are also risks that are encountered when discharging fuel vessels in a built up environment with no ability to move a vessel somewhere safer due to the Not Always Afloat But Safely Aground (NABSA) nature of the harbour. Land is a finite and extremely valuable resource in an Island such as Guernsey and we need to ensure that we take into account competing demands for this resource so that we maximise the benefit to the island. In addition, the existing fossil fuel storage sites have development exclusion areas known as Development Proximity Zones (DTZs). The removal of the fuel storage and therefore the DTZs could potentially free up existing land for development for other uses.

6.39. Maintaining or improving the security of supply also means regular investments from the energy players. Such investments can only be implemented if a level playing field for all energy suppliers is in place and the overall market place is equitable and balanced. The desire to move to different fuels for vehicles (e.g. compressed gas or hydrogen) would require major investments in the fuel delivery infrastructure. The absence of a natural gas direct supply line aggravates this situation. Other alternative fuels for vehicles (e.g. electric) may have a lesser effect on the delivery infrastructure. The promotion/ distribution of bio-fuels should require less investment if the existing liquid fuel distributors are involved in the supply chain. Production of bio fuels on Island has not been identified as a preferred option, given the absence of suitable quantities of raw materials or land.

6.40. The emerging use of Bio Fuel presents several key issues for Guernsey. Most European refineries are currently phasing out non bio fuel

production (as all of Europe must have bio fuel components added), so sourcing supplies will become increasingly more difficult, and probably attract premium prices from refineries. Any potential introduction of bio fuels would introduce several changes and risks for the oil importers to manage. In the first instance petrol blended with ethanol (the bio component for petrol) cannot be transported by sea. This would result in the import of ethanol into Guernsey, and its associated storage prior to blending on the Island. This external development in the supply chain could potentially require additional pipelines to both terminal locations and additional storage tankage. Secondly the bio component of Diesel (FAME) is suitable for road diesel but can impact heating/ marine applications. Bio fuels have a considerable cost implication to the refinery, and throughout Europe, where the Bio Fuel duty is reduced to ensure the economic viability of bio fuels. This would be required on Guernsey to eliminate the cost differences and significant investment required in both terminals.

## **Renewables and Carbon Intensity**

### **7.**

- 7.1. The two core issues for consideration with respect to energy generation are “carbon intensity” and “renewable sources”. Energy produced from fossil fuels has a high carbon intensity. The current convention is that electricity generated from nuclear energy has a low carbon intensity but is not from a renewable source.
  
- 7.2. The States are aware of the EU targets on Member States and that for reporting purposes Guernsey’s emissions are grouped with those of the UK. Within the overall EU target of 20% of energy from renewable sources by 2020 each member state has its own target reflecting its specific circumstances (e.g. the UK’s is 15%, Malta’s is 10%). This approach reflects

the differing starting points of the Member States and their differing potentials. Malta, for instance, presently has no renewable energy production and even to achieve 10% will require an extremely aggressive programme of wind energy development, attracting significant costs.

- 7.3. In considering the future role of renewable energy in Guernsey it is essential to recognize that renewable energy generally has higher costs than its fossil fuelled equivalent. Countries across the globe have recognized this by the provision of regimes which, in a variety of ways, subsidise the production of renewables. As an extreme example of such a practice, a number of European countries have adopted arrangements where electricity generated by solar arrays attracts a value of circa 40 pence per kilowatt hour, whereas the commercial market value is more like 6 pence. Guernsey's small market size requires that we proceed carefully since over ambitious renewable targets could result in major additional costs to the Island economy.
- 7.4. This Energy Resource Plan sets out achievable and proportionate measures for Guernsey which are based on the transparent disclosure of the relative costs of energy options. The States recognizes that the public will need to be convinced to accept the additional costs of achieving them.
- 7.5. In addition, if meeting targets is to be achieved through intervention in the commercial competitive market for energy, then care will have to be taken that any distortion of that market does not have perverse consequences, e.g a requirement to import electricity whatever the cost may make electricity less competitive in the domestic heating market and encourage greater use of fossil fuel based energy.
- 7.6. The introduction of the CIEG cable and the commercial energy market have

resulted in the importation of a proportion of low carbon intensity nuclear generated electricity at no additional cost over locally generated electricity which has significantly reduced overall emissions. Further use of the cable may present an opportunity to decrease the Island's carbon emissions still further at low cost, providing a useful breathing space, whilst international developments reduce the costs of deploying local renewable systems.

7.7. Since the original Energy Policy noted by the States in June 2008, significant progress has been made by the Commerce & Employment Department, the Shadow Renewable Energy Commission and its successor the Renewable Energy Team with help from a number of States Departments in researching the potential for Guernsey to benefit from the development of local macro renewable power generation. This has included consideration of tidal power opportunities and the potential for onshore and offshore wind generation.

7.8. The States have paved the way for the development of such industries through approval of the Renewable Energy (Guernsey) Law 2010, which is currently awaiting Royal Assent. A Regional Environmental Impact Assessment has also been undertaken to identify the areas of the Island's Territorial Waters which have the greatest potential for the generation of macro renewable energy, and to identify areas of existing interests which will need to be taken into account in any licensing regime for the renewable energy industry in Guernsey. This work includes close consultation with the authorities in Sark and Alderney in relation to the opportunities for joint working. Such opportunities also exist in relation to Jersey.

7.9. While progress has been made in preparing the way for a macro renewable energy industry to develop in Guernsey, the reality is that there

are widely differing views as to when the commercial development of tidal power will become a reality. Whilst some believe that this may be between five and ten years away there are some signs that this timetable may be accelerated.

7.10. In June 2011, Ministers from the British Isles, Ireland, The Channel Islands and the Isle of Man signed up to a historic deal to cooperate on exploiting the major wind and marine resource in and around the Islands. Members of the British Irish Council agreed to co-operate in the All Islands Approach to energy. The intention is that the All Islands Approach to energy resources across the British Islands and Ireland will encourage and enable developers to exploit commercial opportunities for generation and transmission, facilitate the cost-effective exploitation of the renewable energy resources available, and increase integration of our markets and improves security of supply. The agreement follows recognition that there is potentially a source of clean, green, secure energy that remains untapped in the Irish Sea and onshore in Ireland, as well as around the Channel Islands however to date there has been little incentive to exploit the resource. BIC Members recognise that optimising the natural renewable resource available around the Islands would benefit all parties and that it makes much more sense to develop and share clean, green, secure energy rather than import vast amounts of fossil fuels from far flung parts of the world. In practice, more interconnection between the Islands would mean that on, for instance, a very windy day in mainland Britain, surplus power could be sold to Ireland and mainland Europe, as well as enabling imports of electricity from Ireland and mainland Europe when required.

7.11. Guernsey is not planning to enter this industry at the R&D phase, nor is it planning to be in the vanguard of experimental commercial developments.

It is however preparing all necessary legal, procedural and administrative matters so that it is ready to move as soon as the industry becomes commercially viable. In the meantime further research is being undertaken in regard to the Island's potential for wind farms (onshore or offshore).

7.12. While there are limitations on what may be deliverable in terms of tidal energy (through constraints on existing areas of the sea – for example conservation, fisheries, shipping lanes/routes, cable and pipe routes, areas of scientific interest and aesthetic considerations), current studies have highlighted significant potential for meeting a large part of Guernsey's own electricity demand, with some possibility at times of a surplus for export. Further work will be needed to more accurately define the potential in our waters from the developing renewable technologies.

7.13. However the States believes that if an incentive mechanism, in the form of a feed in tariffs for example, does not exist then it is certain that there will be no development of renewable generation in the Island for local consumption of renewable unless and until the costs of renewables approach those of more conventional systems.

7.14. Guernsey will also need to consider the ultimate destination for any renewable power it generates, to ensure that the renewable power can qualify for any subsidies or incentives which may be available if that power is exported. Although this may not directly assist the consumption of renewable energy on Guernsey it does meet some of the Energy Resource Plan's objectives. In addition, the installation of a second cable link to the Island (referred to in Section 6) could provide the infrastructure needed to export electricity efficiently and as a result contribute positively to the local economy.

7.15. While there is currently some interest in other jurisdictions regarding micro-renewable energy opportunities, Guernsey has questioned the viability of States intervention through direct support for micro-renewables. Micro-renewables may be able to make a small contribution to the objectives in this Energy Resource Plan. In the absence of any incentive or subsidy, micro-generation is unlikely to make a greater contribution.

7.16. Despite rising public expectations marine renewable technologies are not yet commercially proven. We would anticipate that Guernsey should be planning for a substantial development of macro renewable electricity generation in the 2020s, possibly in excess of many tens of MWs of installed capacity by 2025. An alternative may be to establish an objective which is cost related in the following terms “we will establish a target that 10% of Guernsey’s local electricity generation should be derived from renewable resources provided that the cost does not imply an increase of more than 15% of the cost of electricity.”

7.17. However to put forward firm commitments in this regard will require a series of studies to investigate the feasibility and implications of achieving such a target and this is covered in the actions set out in section 9, but we are committed to reviewing this as a matter of urgency.

7.18. Accordingly, we do not intend to set a target for the generation of local renewable energy for the time being. Rather the cost of generating electricity from renewable sources will continue to be monitored closely and a target will be put forward when the cost can be reasonably quantified and is deemed reasonable compared with the then market prices for energy. In the meantime the Commerce and Employment

Department will work closely with Guernsey Electricity and the Office of Utility Regulation to establish whether greater use can be made of the CIEG cable network with a view to further reduce the Island's carbon emissions. The Commerce and Employment Department will report back to the States on this matter when appropriate. The States of Guernsey remains receptive to the development of this important area and will put in place policies that enable it to be developed as and when viable.

## **8. Environmental Issues**

8.1. As part of the States Strategic Plan, the States have approved an Environmental Plan which recognises "Managing energy demand and the Island's carbon footprint" and "Climate Change Impacts – in particular coastal defence" as significant challenges to be addressed by the Island. The Plan states that:-

*"Consideration of our environment will be core to all policy decisions and actions. Environmental Policy will be equal, not subservient, to economic and social policy. The quality of our environment will be protected and enhanced. The Island will respond in an environmentally sustainable way to local issues and existing and emerging global challenges."*

8.2. The Plan sets out States priorities for environmental action which include: reducing our carbon footprint and adapting to climate change, conserving energy use and switching to cleaner fuels. Several of the Plan's Outcomes are focused on energy policy issues, including:-

- "There will be enhanced readiness in the Island to respond positively to (climate change) impacts, consequently reducing adverse effects of impacts";
- "The Island's contribution to greenhouse gases will be reduced

through leadership and engaging active community participation”;

- “Guernsey’s use of energy will be more sustainable”; and
- “Guernsey will be more self-sufficient.”

8.3. Guernsey’s Energy Resource Plan has been developed to reflect these desired outcomes on appropriate time scales

8.4. On a small Island, where the majority of the 62,000 population lives at, or only a few metres above sea-level, a major challenge is managing the impact of climate change. Guernsey will feel the effects of climate change in this century. The temperature is likely to rise at a faster rate than at any time in the last 10,000 years. The risks of flooding and droughts are likely to increase, and sea level may rise sufficiently to cause regular flooding to much of the low-lying densely populated parts of the Island. More extreme weather events are predicted and agriculture and fisheries will also be affected, as will the Island’s biodiversity.

8.5. “*Sarnia Storm*,” a recent Strategic Coordinating Group Exercise, identified that a risk currently exists to the supply of electricity in the lower lying areas of the Island as the switching stations are located in areas that might be flooded if the sea defences are topped or breached. We will need to identify control measures to ensure that the supply of electricity is not threatened in such a way.

8.6. Whilst actions in Guernsey will have a negligible impact on global greenhouse gas emissions and climate change, they are part of a wider concerted effort by the international community and Guernsey wishes to play its part in these efforts. In seeking to reduce our dependence on imported fossil fuel energy supplies we will not only be securing progress towards a sustainable future as set out in the Island’s Environmental Plan,

but we will also be making our contribution to global climate change reduction.

8.7. The 2009 Guernsey Annual Greenhouse Gas Bulletin published by the Policy Council comments that the cumulative decrease in greenhouse gas emissions since 1990 was 17.9%. It also comments that this exceeds the 2012 target of 12.5%.

8.8. Carbon dioxide emissions are of particular concern because they form the vast majority of emissions by volume (83.4% in 2009). The approximate total greenhouse gas emissions on Guernsey in 2009 were 427.4 kilo tonnes (equivalent to 6.9 tonnes per person), compared to 385.3 kt in 2008 – an increase of 10.9%. However, the cumulative percentage change between 1990 and the 2008 to 2009 average was a decrease of 17.9% (or 88.6 kt of CO<sub>2</sub> equivalent). This exceeds the Kyoto Protocol target for the UK (including Guernsey) of a decrease of 12.5%.

## **9. Guernsey's Energy Challenge**

9.1. It is abundantly clear that Guernsey faces unprecedented energy challenges over the next decade. There are global political threats, the ever approaching moment of "peak oil", technological changes and supply chain disruptions. Guernsey has to face these issues at a time when the States finances are under pressure and household disposable income coming under ever increasing pressure limiting the States' ability to increase new taxation.

9.2. It is essential therefore for the States to adopt an integrated and coherent Energy Policy which supports the objectives of the States Strategic Plan in a coordinated manner.

- 9.3. The complex supply and demand side issues highlighted earlier combined with the often conflicting objectives will require both strategic management and strong leadership by the States with Directions to Guernsey Electricity and the OUR in particular. It is apparent, as is the case in the UK, that the market alone cannot deliver a sustainable energy infrastructure for the future and the States will have to adopt a more interventionist role than it has in the past.
- 9.4. Many jurisdictions have introduced targets for both carbon emission reductions and the contribution of renewable energy towards total electricity generation. We have seen the danger of setting inappropriate and aspirational targets without providing a road map setting out how these targets will be achieved. From our own perspective Guernsey's original Energy Policy proposed targets were only noted by the States. We have an opportunity in this Energy Resource Plan to learn both from our own experiences and the lessons from the rest of the world.
- 9.5. In June 2008 (Billet VIII) the States considered the Energy Policy Report from the Energy Policy Group submitted by the Policy Council and the States agreed to note the Report which contained the statement that:  
*"... in principle, and subject to further investigation, the following targets: to reduce Guernsey's carbon dioxide emissions by 30% on 1990 levels by 2020; and to reduce Guernsey's carbon dioxide emissions by 80% on 1990 levels by 2050; and to generate 20% of electricity from local renewable sources by 2020.*
- 9.6. The Kyoto and States targets on emissions could be met thorough making maximum use of the CIEG cable capacities irrespective of cost. Otherwise, meeting the 30% target for 2020 is going to be challenging. At this stage

due to the state of commercial development it is not clear to what extent local renewable generation will be able to assist in meeting this emission reduction target, but it is now unlikely that a major impact can be achieved by 2020.

- 9.7. There is a risk that if achieving local renewable energy (which is currently more expensive than traditional energy sources) targets distorts the energy market and increases the cost of electricity compared to other sources of energy, it could have the perverse consequence of encouraging the use of fossil based or other high carbon sources. In these circumstances the current renewable and emission targets should specify that emission targets must be met through measures across all uses, not simply electricity measures.
- 9.8. If the States are to intervene in the market to facilitate the achievement of these targets then a form of carbon tax is likely to be necessary. However for the States to achieve its objectives, care will have to be taken to ensure that any distortion of the energy market does not have perverse consequences.
- 9.9. It may be inevitable that the States will have to intervene in the market at some point since the goals of reducing carbon and creating local supplies are essentially long term whilst markets operate in the short term. A carbon tax is not complex in principle since the carbon content of all fuels can be established and the taxation should impact each fuel according to its carbon intensity. It is clear that any such intervention must be carefully judged and for it to be successful would require satisfying two preconditions. Firstly a carbon tax should not simply contribute to general revenue, but may need to be hypothecated to fund other elements of the Energy Resource Plan. It will also be necessary to determine the form of a

carbon tax and whether any categories of users should be exempted. It is recommended that a carbon tax is seriously considered and noted that such an approach seems a very pragmatic and sensible way forward.

9.10. The introduction of achievable and realistic targets is paramount, as is the need to ensure that the direct and immediate additional costs of achieving targets needs to be balanced against the long term and less tangible benefits of achieving more diverse and sustainable sources of energy and reducing our impact on the global environment.

9.11. **However in terms of emission targets the States remain committed to the following targets: to reduce Guernsey's carbon dioxide emissions by 30% on 1990 levels by 2020; and to reduce Guernsey's carbon dioxide emissions by 80% on 1990 levels by 2050.**

9.12. Whilst setting the general direction of travel through to 2050 it would be presumptuous and premature at this moment in time to set out a detailed road map showing how Guernsey will achieve its targets. It would also be contrary to the principles of good corporate governance adopted by the States to set out recommendations not based on evidence and the best available information. As acknowledged by the UK's Committee on Climate Change there are many current uncertainties on the future decarbonisation of economies (e.g. the appropriate mix of low carbon generation technologies for the 2020s and 2030s is unknown, marine technologies are currently expensive with cost reductions not yet realised)<sup>21</sup>. That is why we have set out a list of actions that need to be taken urgently to improve our understanding of the options we face. Working with the private and voluntary sectors to share our resources and knowledge will be essential as we develop recommendations to help us

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<sup>21</sup> The Renewable Energy Review May 2011, Committee on Climate Change

move into the delivery stage and our detailed route map for the future. We envisage that many of the actions will help to inform the implementation of this Energy Resource Plan and will in themselves require States Reports for the States to endorse specific recommendations.

9.13. Turning to renewables, Guernsey's efforts to date have focused on developing the framework for licensing marine renewable technologies, primarily using the natural resources from our tidal flows. However the development of the technology and the costs of producing energy from tidal remain high and it is unlikely that tidal will be commercially viable for at least another five years. There must be recognition that Guernsey's ability to generate local renewable electricity is dependent on the commercial development of the technologies globally. It is therefore unlikely that meeting 20% of our local electricity demand from local renewable sources will be achievable by 2020. As a result we must look at all other renewable options and not simply limit our options to tidal technologies. This will mean ensuring that technologies such as off shore wind and wave power are also added to the potential portfolio of renewable power within Guernsey.

**9.14. The States therefore believe that the development of local renewable electricity generation, in whatever form, should be determined by the maturity and cost of available technology, with the full scale exploitation of our local resources delayed until demonstrably viable technology is available at an affordable cost. However the States is committed to 20% of its electricity supplies to be met by renewable sources by 2020.**

9.15. It will be essential therefore that the development of new technologies are monitored closely so that appropriate renewable generation targets

are set as quickly as possible, once the market is able to deliver commercial renewable arrays.

## **10. Guernsey's Energy Resource Plan Objectives and Actions**

10.1. We have no choice but to respond to the challenges facing us. We have to follow the principles of sustainable development and respect our Kyoto obligations by including environmental concerns in our approach to energy use, but we cannot ignore the fact that our society has been built on energy consumption and energy consumption will remain a key part of our quality of life for the foreseeable future. These facts are reflected in Guernsey's core energy policy:-

*"to maintain and build on the high quality of life enjoyed by the Island's community by providing the energy needed to allow economic growth at a financial price that is affordable for all consumers and at an environmental cost that does not compromise the ability of future generations to meet their own needs."*

10.2 This Energy Resource Plan in turn is based on an energy vision for 2020 whereby:

- There will be a gradual decarbonisation of Guernsey's electricity generation;
- There will be a diversification of electricity generation between low carbon and renewables;
- We will continue to provide a sustainable and secure energy supply for Guernsey; and
- There will be greater transparency in energy decision making to all stakeholders.

10.3 Consumer engagement and affordability will be two fundamental

requirements in the successful implementation of the above vision. In addition in order to demonstrate compliance with good corporate governance the availability and provision of good quality data and information to enable evidence based decision making will be a pre-requisite.

10.4 Guernsey's Energy Resource Plan has been prepared to provide a simple and focused management of the transition towards our vision of the Island's energy supplies and usage for the future.

10.5 To achieve this, the States of Guernsey will progress three main objectives:-

- **Energy Resource Plan objective 1: to maintain the safety and security of affordable and sustainable energy supplies**
- **Energy Resource Plan objective 2: to use energy wisely, efficiently and not waste it**
- **Energy Resource Plan objective 3: to reduce environmental impacts of our energy consumption as part of our contribution to international initiatives as part of the global community**

10.6 The States will apply this Energy Resource Plan to all government decisions involving the use of energy ensuring that all future policy and capital development proposals state how they reflect this Energy Resource Plan. We will also review our performance against these aims and actions on an annual basis.

10.7 All actions are subject to funding and being included in the States Strategic Plan.

**Energy Resource Plan Objective 1: maintaining the safety and security of affordable and sustainable energy supplies**

10.8 This objective is designed to ensure that the Island has the reliable energy supplies that it needs to maintain our economy and improve our quality of life whilst ensuring that we respond to the consequences of the world's declining supplies of hydrocarbon fuels.

**Actions:**

- i. We will ensure that the Island's Infrastructure Plan and the States Capital Expenditure Programme takes into account the infrastructure requirements from the States of the Island's energy suppliers. Projects such as a deep sea port at St Sampsons and a gas interconnector will need to be investigated.
- ii. We will invest, through Guernsey Electricity, to improve the resilience of our imports of electricity from the Continent by ensuring a second cable of greater capacity than the existing cable from Guernsey to either Jersey or France is completed by the end of the decade.
- iii. We will amend the current States n-2 security of supply policy to enable further infrastructure investment, such as cables from Guernsey, to be made economically.
- iv. We will take appropriate steps to ensure the safety of our energy supplies and the resilience to short term disruptions to our supply chains.
- v. We will actively manage the States ownership of the Sarnia Cherie and Sarnia Liberty to protect the interests of our citizens.
- vi. We will through the States Social Policy and Fiscal & Economic Policies ensure that the cost to the Island of energy security and the volatility in the world wholesale markets, is managed in terms of fuel poverty and

affordability to the Island with an emphasis on fuel reduction and efficiency rather than direct grants.

- vii. We will develop opportunities for the use of low carbon or carbon neutral energy sources and to encourage the diversification of low carbon and renewable energy supplies at the macro level.
- viii. We will support efficient small scale renewable/ low carbon generation schemes.
- ix. We will work collaboratively with our sister Islands in the Channel Islands in developing our natural resource.
- x. We will participate fully in the British Irish Council's All Islands Approach to open up renewables opportunities.
- xi. We will review the strategic stock-holding levels for all fuels on the Island.
- xii. We will review the appropriateness of Guernsey Electricity's capital structure and at the same time welcome and consider innovative funding arrangements with the private sector to share benefits and risks for future interconnectors from the Island.

**Energy Resource Plan Objective 2: using energy wisely, efficiently and not wasting it**

10.9 We need to use energy wisely, not only to protect the resource but to reduce the cost to the consumer. The benefits of pursuing efficiency policies are immediate and common to whatever other policies may be adopted in the future.

10.10 Using energy wisely has connotations both for the individual and the community. For the individual it may be control of how long for and

when devices are switched on and the temperature settings which could bring immediate benefits or an appreciation of energy market trends which could bring long term benefits. For the community it may be benefitting from shifts in peak usage and a migration to more sustainable sources.

**Actions:**

- i. We will reduce the unit energy consumption of the Government estate over the next five years and publish our targets and achievements annually to demonstrate our commitment to these aims.
- ii. We will reduce the unit energy consumption and carbon emissions of the public sector housing estate over the next five years and publish our targets and achievements annually to demonstrate our commitment to these aims.
- iii. We will reduce the energy consumption and carbon emissions of the government fleet over the next five years and publish our targets and achievements annually to demonstrate our commitment to these aims.
- iv. We will reduce the energy demand of space heating and cooling in the domestic and commercial sectors by the application of planning policies and revised building regulation controls where this is compatible with other land planning objectives, as set out within the Strategic Land Use Plan.
- v. We will as part of the Island's Integrated Transport Strategy seek to reduce the unit energy consumption of the transportation sector through measures designed to increase transportation efficiency, to reduce vehicle emissions and to promote public transport.
- vi. We will consider mechanisms to alleviate fuel poverty, possibly by providing financial support for energy efficiency measures.

- vii. We will encourage energy conservation and the use of high efficiency and low carbon energy technologies.
- viii. We will consider how Guernsey consumers can have access to an advisory service to promote energy conservation.
- ix. We will encourage the improvement of thermal efficiency in pre-2001 construction private, domestic and commercial properties through education, advice and possibly financial support schemes.
- x. We will ensure transparency of energy prices and the carbon intensity of differing energy sources and communicate the implications of strategic energy decisions to all stakeholders.

**Energy Resource Plan Objective 3: reducing the environmental impacts of our energy consumption as part of our contribution to international initiatives as a member of the global community**

10.11 This aim is designed to ensure that we adopt measures proportionate to our Island's circumstances so that we can act now to limit environmental impacts and protect our environment for the benefit of future generations. Several of the actions relating to Objectives 1 and 2 will also help to deliver this third objective.

**Actions:**

- i. We will, through appropriate Directions to the OUR, ensure that Guernsey Electricity is able to deviate from the merit order to facilitate the supply of low carbon and renewable energy and to ensure the targets set in this plan are achieved.
- ii. We will monitor the development of renewable technologies so that when they reach acceptable cost levels we can introduce appropriate targets for local renewable electricity generation.

- iii. We will reduce the carbon dioxide emissions of each unit of grid supplied electricity and publish our achievements on annual basis.
- iv. We will work with other jurisdictions where appropriate to assist with the development of Guernsey's renewable energy resources.
- v. We will seek to encourage the decarbonisation of our energy supplies and if necessary put in appropriate policies to ensure this happens.
- vi. We will assess the scope for introducing a carbon tax to prevent market distortions and to incentivise consumption patterns which would align with and assist in providing the appropriate economic environment for local macro renewable generation and our vision of a decarbonised economy.
- vii. We will upskill our construction sector labour force so that we are able to adopt new practices and technologies.

## **11 Implementation**

11.1 In order to move towards our energy vision for 2020 and beyond and to inform the actions for the three energy objectives we will need to progress a number of important initiatives.

11.2 In the first instance of critical importance is the need for a comprehensive review and assessment of the current hydrocarbon import supply chain with a cost benefit analysis to determine the viability of new importation infrastructure. This would comprise a complete energy provider study. The result should indicate whether maintaining current energy diversity is affordable into the future and whether we need to assess these markets and explore alternatives. This should be combined with the concerns about the use of carbon based fuels and will affect all suppliers.

- 11.3 We should assess the current Island electricity interconnection strategy associated with the importation of electricity to develop a proposed approach which will ensure future security of supply and allow the opportunities associated with local renewable energy to be facilitated. This will help to inform the discussion on any future n-2 policy and the risk of having substantial redundant capacity on-Island.
- 11.4 There is an urgency to commence the actions we have identified and the Energy Policy Group has a key role to play not only simply in co-ordinating and monitoring progress but also engaging with all members of society who will be affected by the implementation of the energy strategy. The Energy Policy Group intends to enter a constructive dialogue with consumers more generally and also with those individuals with relevant expertise and knowledge to help realize our objectives.
- 11.5 We will therefore adopt a two pronged strategy to realize this aim.
- 11.6 Firstly the Energy Policy Group intends to actively educate the public and raise awareness of energy efficiency opportunities in partnership with the private sector and voluntary sector organizations through campaigns, seminars, exhibitions and workshops with the public. The response to the consultation on the draft Energy Resource Plan generated a number of ideas and opportunities that can be discussed and implemented and we intend to build on this momentum in the coming months.
- 11.7 Secondly to help progress the actions listed in section 9 of this Plan the Energy Policy Group will work in partnership with the private sector to prioritise these actions and undertake the necessary research and analysis to develop the road map for realizing Guernsey's Energy Vision for 2020 and beyond.



## **ANNEX**

### **Useful Relevant Energy-Related Documentation from Other Jurisdictions**

#### **Global**

*Shell Global Energy Scenarios to 2050*, 2008

[http://www.shell.com/home/content/aboutshell/our\\_strategy/shell\\_global\\_scenarios/shell\\_energy\\_scenarios\\_2050](http://www.shell.com/home/content/aboutshell/our_strategy/shell_global_scenarios/shell_energy_scenarios_2050)

[http://www.shell.com/home/content/aboutshell/our\\_strategy/shell\\_global\\_scenarios/](http://www.shell.com/home/content/aboutshell/our_strategy/shell_global_scenarios/)

*Potential for Biomass and Carbon Dioxide Capture and Storage*

Ecofys study for the IEA Greenhouse Gas R&D Programme, IEAGHG , 2011/06, July, 2011.

<http://www.ecofys.com/com/news/pressreleases2010/IEAGreenhouseGasRDProgramme.htm>

*Corporate Sustainability: A progress report*, KPMG International in cooperation with Economist Intelligence Unit, 2011

<http://www.sustainableguernsey.info/blog/2011/05/corporate-sustainability-strategy-increases-profitability-improves-employee-morale-and-attracts-new-customers-according-to-kpmg-report/>

#### **Europe**

*Draft EU Energy Efficiency Directive*

[http://ec.europa.eu/energy/efficiency/eed/eed\\_en.htm](http://ec.europa.eu/energy/efficiency/eed/eed_en.htm)

#### **Island Jurisdictions**

*Renewable energy sustainability study – impacts and opportunities for the Isle of Man*

AEA Technology plc, November 2010. See: Isle of Man Energy Projects

<http://www.gov.im/daff/enviro/energy>

*Energy Efficiency Study G06-1643 Rev 1.2* by Kema Limited for States of Jersey, January 2007

<http://www.gov.je/Government/Pages/StatesReports.aspx?ReportID=145>

#### **United Kingdom**

*Planning our electric future:*

*a White Paper for secure, a White Paper for secure, affordable and low-carbon electricity*

Presented to Parliament by the Secretary of State for Energy and Climate Change by Command of Her Majesty , July 2011 , CM 8099

[http://www.decc.gov.uk/en/content/cms/legislation/white\\_papers/emr\\_wp\\_2011/emr\\_wp\\_2011.aspx](http://www.decc.gov.uk/en/content/cms/legislation/white_papers/emr_wp_2011/emr_wp_2011.aspx)

*UK Renewable Energy Roadmap, DECC*

*Analysis of Renewables Growth to 2020, AEA*

[http://www.decc.gov.uk/en/content/cms/meeting\\_energy/renewable\\_ener/re\\_roadmap/re\\_roadmap.aspx](http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/re_roadmap/re_roadmap.aspx)

*Renewable Energy Action Plan, 2009*

[http://www.decc.gov.uk/en/content/cms/meeting\\_energy/renewable\\_ener/uk\\_action\\_plan/uk\\_action\\_plan.aspx](http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/uk_action_plan/uk_action_plan.aspx)

*Anaerobic Digestion Strategy and Action Plan, DEFRA, June 2011*

<http://www.defra.gov.uk/publications/2011/06/14/pb13541-anaerobic-digestion-strategy/>

*Climate change policy in the United Kingdom Alex Bowen and James Rydge*

Policy paper , August 2011

Centre for Climate Change Economics and Policy

*Developing a sustainable framework for UK aviation: Scoping document, March 2011*

<http://www.dft.gov.uk/consultations/dft-2011-09>

*Government Response to CCC Aviation Report, August 2011*

<http://www.theccc.org.uk/news/latest-news/1070-government-response-to-ccc-aviation-report-published-25-august-2011>

*CCC Report on International Aviation and Shipping, to be published in March 2012*

<http://www.theccc.org.uk/news/latest-news/1070-government-response-to-ccc-aviation-report-published-25-august-2011>

Grantham Research Institute on Climate Change and the Environment

[http://www2.lse.ac.uk/GranthamInstitute/Media/Releases/2011/MR180811\\_climate-change-uk-policy.aspx](http://www2.lse.ac.uk/GranthamInstitute/Media/Releases/2011/MR180811_climate-change-uk-policy.aspx)

*Energy Efficiency and Support for Renewables Key to Market Reform, WWF, July 2011*

[http://www.wwf.org.uk/what\\_we\\_do/press\\_centre/?uNewsID=5086](http://www.wwf.org.uk/what_we_do/press_centre/?uNewsID=5086)

*Renewable Energy Review, Committee on Climate Change, May 2011*

<http://www.theccc.org.uk/reports/renewable-energy-review>

*Planning our electric future: a White Paper for secure, affordable and low-carbon electricity,*

DECC July 2011

[http://www.decc.gov.uk/en/content/cms/legislation/white\\_papers/emr\\_wp\\_2011/emr\\_wp\\_2011.aspx](http://www.decc.gov.uk/en/content/cms/legislation/white_papers/emr_wp_2011/emr_wp_2011.aspx)

*Carbon Budget, DECC*

[http://www.decc.gov.uk/en/content/cms/emissions/carbon\\_budgets/carbon\\_budgets.aspx](http://www.decc.gov.uk/en/content/cms/emissions/carbon_budgets/carbon_budgets.aspx)

*Climate Change Agreements, DECC*

<http://www.decc.gov.uk/en/content/cms/emissions/ccas/ccas.aspx>

*CRC Energy Efficiency Scheme, DECC*

[http://www.decc.gov.uk/en/content/cms/emissions/crc\\_efficiency/crc\\_efficiency.aspx](http://www.decc.gov.uk/en/content/cms/emissions/crc_efficiency/crc_efficiency.aspx)

*Renewable Energy Review, Committee on Climate Change, May 2011*

<http://www.theccc.org.uk/reports/renewable-energy-review>

*Carbon Capture and Utilisation in the green economy*

<http://www.lowcarbonfutures.org/>

*Working Papers, Centre for Climate Change Economics and Policy*

<http://www.cccep.ac.uk/Publications/home.aspx>

*TEQs (Tradable Energy Quotas): A Policy Framework for Peak Oil and Climate Change,*

David Fleming and Shaun Chamberlin, January 2011, for All-Party Parliamentary Group

on Peak Oil, and The Lean Economy Connection.

[www.teqs.net/APPGOPO\\_TEQs.pdf](http://www.teqs.net/APPGOPO_TEQs.pdf)

*The Lean Economy: A Vision of Civility for a World in Trouble, David Fleming, 2001*

<http://www.feasta.org/documents/review2/fleming.htm>

### **The United Kingdom Parliamentary Office of Science and Technology**

<http://www.parliament.uk/business/publications/research/post/>

Four page POSTnote subject summaries relevant to energy policy (in descending date order)

384 - Biofuels from Algae, July 2011

383 - Carbon Footprint of Electricity Generation, June 2011

365 - Electric Vehicles, October 2010

358 – Biochar, June 2010

354 - Global Carbon Trading, March 2010

353 - Renewable Heating, March 2010

351 - Lighting Technology, January 2010

347 - Climate Change: Engagement and Behaviour, January 2010

335 - CO 2 Capture, Transport and Storage, June 2009

324 - Marine Renewables, January 2009

319 - ICT and Carbon Dioxide Emissions, December 2008

318 - The Transition to a Low Carbon Economy, December 2008

317 - Future nuclear technologies, November 2008

315 - Renewable energy in a changing climate, October 2008

306 - Electricity storage, April 2008

301 - Smart metering of electricity and gas, February 2008

295 - Climate change science, November 2007

294 - Public Opinions on Electricity Options, October 2007 Appendix to 294 -  
Opinion Polls and Studies

293-Transport biofuels, August 2007

290-Voluntary carbon offsets, July 2007

282-Energy and sewage, April 2007

280-Electricity in the UK, February 2007

272 -Ambient air quality, December 2006

268 -Carbon footprint of electricity generation, October 2006

267 -Adapting to climate change in the UK, July 2006

255 - Low carbon private vehicles, January 2006

249 - Household Energy Efficiency, October 2005

245-Rapid Climate Change July 2005

238- Carbon capture and storage (CCS), March 2005

230-The future of UK gas supplies, October 2004

213-Climate change and business, January 2004

212-Environmental policy and innovation, January 2004

207 - The environmental costs of aviation November 2003

186 - Prospects for a Hydrogen Economy, October 2002;

164 - Renewable Energy, October 2001

163 - UK Electricity Networks, October 2001;

70 - Transport - Some Issues in Sustainability, November 1995

## **Appendix 2.**

A list of consultation responses (agreed for publication). For access to a full set of consultation responses agreed for publication, please visit [www.gov.gg](http://www.gov.gg)

Commerce & Employment

Environment Department

Home Department

Housing Department

Deputy Tony Spruce

Amalgamated Facilities Management Limited – Chris Leach

Fuel Supplies (C.I) Limited – Rubis Group

Guernsey Electricity

Guernsey Gas

Guernsey's Renewable Energy Team (RET)

Jamesco 750 Limited

Dr Douglas Haughey

Gavin Lanoe

Gavin St.Pier

Mikael Appelqvist

Paul Meader

Steve Morris