Mediterranean and National Strategies for Sustainable Development
Priority Field of Action 2: Energy and Climate Change

Energy Efficiency and Renewable Energy
Malta - National study

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Plan Bleu
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MEDITERRANEAN AND NATIONAL STRATEGIES FOR SUSTAINABLE DEVELOPMENT

Priority Field Action 2: Energy & Climate Change, Energy Efficiency and Renewable Energy

Malta – Country Report

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MALTA RESOURCES AUTHORITY
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Priority Field Action 2: Energy & Climate Change, Energy Efficiency and Renewable Energy

Malta – Country Report

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1. THE ENERGY SITUATION IN MALTA

1.1 SHARE OF THE ENERGY SECTOR AND INSTITUTIONS

The Maltese archipelago consists of Malta, Gozo and Comino and a number of uninhabited islets. The total area is 316 km^2 and the population is approximately 400,000. Between 1931 and 2005 the population density increased from 764 to 1,282 inhabitants/km^2. Malta has one of the highest population densities in the world and this is almost 11 times the EU25 average. The average population growth rate between 1995-2005 was 0.7% / annum.

The economy of Malta is highly dependant upon the tourism and manufacturing industries. The manufacturing industry is characterised by a significant proportion of micro enterprises consisting around 94 % of the total number of firms in these two sectors. There are also a number of relatively large foreign owned subsidiaries of multinational companies operating and these are mostly export driven. Tourism also contributes significantly to Malta's economic growth, employment creation and foreign exchange earnings.

1.1.1 Sector's Economic Weight

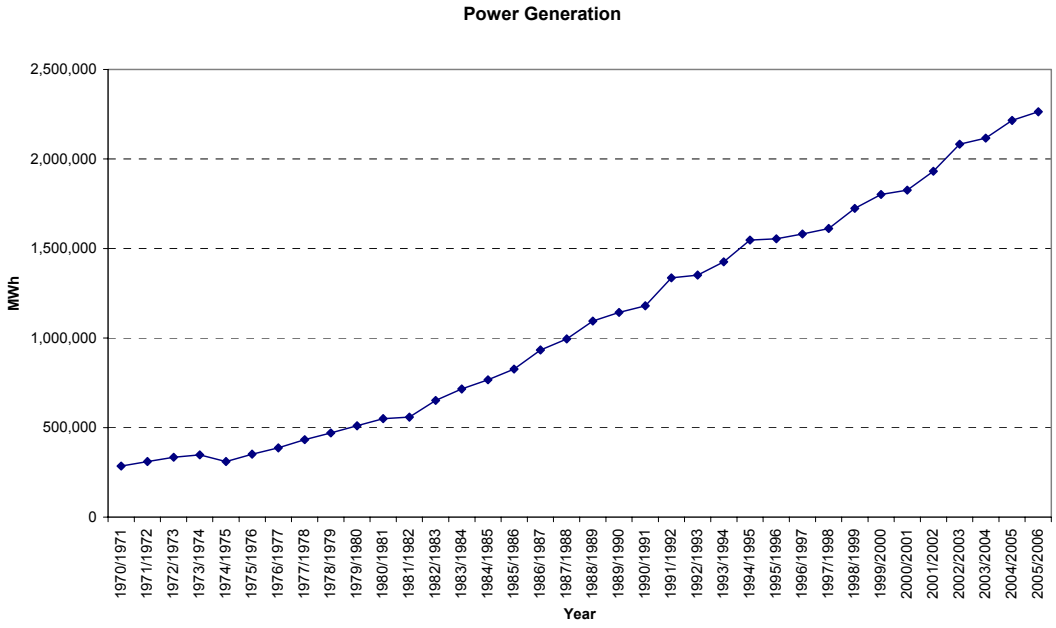
Malta is practically totally dependent upon imported fossil fuels for its energy needs. Malta has no refineries. Malta also has no natural gas, gas network or interconnections. Coal for electricity generation used to be imported until the 1990s but this was stopped for environmental reasons.

The State of the Environment report notes that in 2003 over 63% of the primary energy is used for power generation. The remaining oil consumption is mainly used for transportation (85%) and only a minor share is used for other purposes (15%). Heavy fuel oil and light distillate are used for power generation. Transport fuel consists of petroleum products and a small percentage of biodiesel (0.52%) (1.5 million litres of biodiesel).

Consumption of electrical energy has been increasing steadily over the years and this is due to various factors including economic growth and higher living standards. The electricity demand has increased from 284 GWh in 1970, 550 GWh in 1980, 1,186 GWh in 1990 to 1,603 GWh in 1995 to 2,263 GWh in 2005. Between 1970 – 1980 the average annual increase in electricity generation was 8.8 %. The average annual increase in electricity generation between 1981 – 1990 was 12 % and between 1991 – 2000 it was around 6.1%.

The active power maximum demand in summer has over the past few years surpassed the winter maximum demand in terms of magnitude.

Figure 1: Power Generation 1970- 2006



The State of the Environment Report for 2005 notes that Malta's total energy generated per unit GDP (at constant prices) has risen sharply, particularly since 2002, after declining during the 1990s. It is argued that the major contributing factors to this change in direction was related to the sharp rise in energy generation since the hot summer of 2002 as compared to the rate of GDP growth, which has been slower. The Report notes that there is an urgent need to decouple economic growth from energy consumption and to limit CO_2 emissions from power plants (Malta Environment and Planning Authority, 2006).

The Economic Survey October 2005 (Ministry of Finance, 2006) outlines the main developments of employment in direct production and an overview is given in Table 1. The private sector accounts for the vast majority of jobs in total direct production. However in the energy, gas and water sector practically all jobs in direct production are with the public sector. These sectors contribute to around 6-8% of the total jobs in direct production.

Table 1: Employment in Direct Production

	Electricity, Gas and Water			Total employment in direct production			% share of employment in direct production		
	Private	Public	Total	Private	Public	Total	% of Private	% of Public	% of Total
2002	2	3133	3135	35137	11249	46386	0.01%	27.85%	6.76%
2003	1	3059	3060	34257	10961	45218	0.00%	27.91%	6.77%
2004	1	3557	3558	33206	9828	43034	0.00%	36.19%	8.27%
2005	1	3405	3406	33063	9555	42618	0.00%	35.64%	7.99%
2006	5	3254	3259	32639	9666	42305	0.02%	33.66%	7.70%

* Excludes temporary employees

Source: Ministry of Finance, 2006

1.1.2 Main Institutions

The main institutions in the energy sector in Malta are:

(i) Enemalta Corporation which was established by virtue of the Enemalta Act (Cap. 272) of 1977, with responsibility for generation, transmission and distribution of electricity and for

the importation, storage and distribution of petroleum products. Enemalta Corporation falls under the responsibility of the Ministry for Investment Industry and Information Technology.

(ii) Malta Resources Authority (MRA) which was set up in accordance with the Malta Resources Authority Act, 2000 (Cap. 423, Act XXV of 2000) as the regulator for energy, water and minerals resources. The Malta Resources Authority falls under the responsibility of the Ministry for Resources and Infrastructure. The functions of the Authority are shown in Annex 1 – A1.1.

(iii) Malta Environment and Planning Authority which is the competent authority for the purposes of the Environment Protection Act 2001, to carry out the functions of the Competent Authority under this Act. The Malta Environment and Planning Authority falls under the responsibility of the Ministry for Rural Affairs and the Environment.

(iv) Malta Transport Authority as the competent authority responsible for road transport regulation, management, safety and control. The Malta Transport Authority falls under the responsibility of the Ministry for Urban Development and Roads.

(v) Malta Standards Authority as the entity entrusted with the coordination of standardization and related activities. The Malta Standards Authority falls under the responsibility of the Ministry for Competitiveness and Communications**.**

1.1.3 National Energy Resources and Potential Savings

1.1.3.1 Fossil Fuels

Malta has no indigenous supplies of fossil fuels. Petroleum exploration in Malta has been undertaken since 1954 and an onshore well was drilled in 1958. Various other exploratory wells have been drilled both onshore and offshore. The offshore area has been parcelled into blocks and this has been made available to the oil industry for exploration. The area is made up of different sedimentary domains some of which produce petroleum in neighbouring countries (Sicily and Libya). (Ministry for Resources and Infrastructure, 2007).

No commercial discoveries however have been made to date although some wells have tested good oil shows. Various offshore licences have also been awarded the possibility of making a commercial discovery in the future is realistically good.

1.1.3.2 Renewable Energy Sources in Malta – Potential and Savings

The Treaty of Accession of Malta to the EU set a target of 5% of the total electricity generated in 2010. Detailed studies on the potential of renewable energy sources in Malta have since been carried out and taking into account various aspects. This included resource characterisation, analysis of environmental and land use impacts from large, medium and micro-generation, feasible penetration rates and realistic support measures that may sustain such penetration rates as well as technical issues including impacts on system grid stability in a small isolated electricity system associated with large scale wind development.

These studies have highlighted both the overall country's potential as well as realistically achievable figures of penetration of renewable energy sources in the energy mix of the country. These studies indicate that for Malta, wind, solar photovoltaic (PV), biomass wastes, landfill gases and sewage treatment plant gas offer some potential for exploitation. On the other hand tidal flow, geothermal, hydropower, biomass energy crops and wave do not appear to offer significant opportunities for exploitation on a commercial scale.

In a report to the EU Commission on the implementation of EU Directive 2001/77/EC on the Promotion of Electricity from Renewable Energy Sources, Malta noted that given existing constraints a realistic figure for the national indicative target for electricity generated from renewable energy sources by 2010 should be around 1.37 % with the construction of a large scale wind farm while this would be reduced to 0.31% if the construction of a large scale wind farm is excluded (Ministry for Resources and Infrastructure, 2005).

Onshore Wind Power

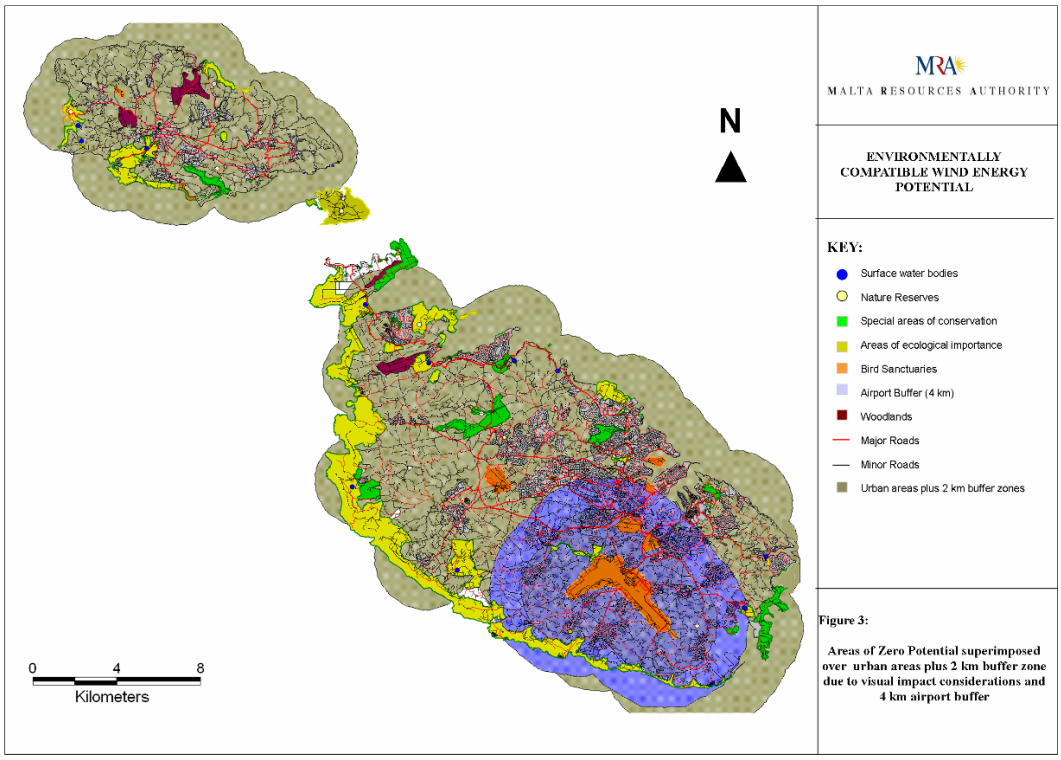
To assess the onshore wind power generation potential in Malta, a comprehensive site-specific analysis was undertaken by Mott Macdonald (2005) on behalf of Government. The unconstrained potential of wind energy in Malta was analysed and estimated at 230 MW. Subsequently the 'constrained' potential taking into account various barriers was evaluated. It has been noted that the constraints to the wind potential at these sites vary and include lack of access, airport interference analysis, ecology and landscape Impacts. Furthermore due to electricity system stability and until connection to European grid, wind capacity is estimated to be limited to 40 MW.

Malta has a very small and limited land area (316 km^2) and a high population density (1,282 inhabitants/km^2). Malta also has an open landscape with little tree cover affording long distance uninterrupted views and the high visibility and natural light intensity during practically the whole year. In view of these characteristics and scale of development – visual impacts can be significant and likely to limit number of windfarms.

In view of these factors, the Government of Malta has expressed concern on the impacts associated with large scale wind farms in a small country and particularly the intrusive visual impact in a landscape such as Malta's leading to deterioration in the overall quality of life of citizens and tourists. Government has therefore concluded that authorization of windfarms on land is inappropriate.

A complementary analysis was carried out by the Malta Resources Authority as part of the response to an assessment carried out by the European Environment Agency on 'Environmentally-compatible wind energy potential' the constraints to wind energy use in Malta were reviewed and mapped. Areas of zero potential were identified and include surface water bodies, infrastructures (roads), tourist sites, military areas, woodland/ forests, water bodies, Natura 2000 sites and important bird areas. In addition other areas posing high constraints were considered to include the airport plus a 4km buffer as well as urban areas plus a 2km buffer.

Figure 2: Environmentally compatible wind energy potential



Source: Malta Resources Authority

Offshore Wind Power

Similar site specific analysis were undertaken to assess the offshore wind power generation potential (Mott MacDonald, 2005; Malta Resources Authority, 2005). The bathymetry of Maltese waters imposes severe difficulties and limitations on wind farm development, since the 25 meter contour extends to just around 2 to 3 km off the coast. The main constraints to offshore wind farm development at these sites include the heavy and conflicting use of the waters where a significant proportion of the economy depends on marine activities and tourism.

Further assessments were also carried out on deepwater sites. Although yet commercially unproven, it is considered that such sites may have potential particularly in view of reduced environmental and visual impacts as well as reduced conflicts with other maritime activities.

Solar Energy

The **"unconstrained"** PV resource potential in Malta is enormous given the geographical location and relatively high incident solar radiation particularly when compared to other European countries. The annual mean of daily global irradiation on an inclined south facing solar panel has been estimated at 5.491 kWh/m^2/day. The PV potential of a 1kWp PV system for horizontal surface in built-up areas has been estimated at around 1360 kWh/annum (Suri *et al*., 2004).

The **"unconstrained"** PV electrical potential has also been estimated based upon maximum roof space available and this is extremely high at 1,724 GWh/annum by 2020. However exploitation of this resource requires significant financial support due to the high capital costs of PV systems. This is considred to be the main barrier to market uptake of solar photovoltaic installations in Malta.

The realistically realisable potential is however also constrained by other factors including visual impacts on the urban landscape and of reflective glare particularly in areas protected by cultural and historical designations, changing shadow patterns with increasing upward extensions of building stock and shared ownership of rooftop space (Mott MacDonald, 2005). Given these constraints, particularly the high financial support requirements and based upon feasible penetration rates set using other countries as a reference, the realistic target for PV potential to 2010 has been estimated at 1.45 GWh/annum by 2010. (Ministry for Resources and Infrastructure, 2005a).

Solid Waste Treatment

The potential of electricity from the treatment of municipal solid waste has been assessed by Government. Malta is in the process of constructing mechanical biological treatment plants to treat municipal solid waste. The total potential of electricity generated from treatment of municipal at the MBTs is estimated at around 25 GWh/annum. Further studies have also been carried out on the potential of treating refuse derived fuel (RDF) produced from the mechanical biological treatment plants. It has been estimated that the total electricity potential generated from treatment of RDF may be around 36 GWh/annum. This plant is not expected to be constructed before 2010.

Sewage and Animal Waste Treatment

In a report to Government on agricultural waste management, Sustech Consulting *et al*. 2005, recommend that digestion of cattle, poultry and rabbit manure may be carried out in 3-4 centralised anaerobic digestion (CAD) plants for the stablilisation of the manure and the production of electricity from biogas. It has been suggested that the plants would provide 24 GWh of electricity every year. No decision on the construction of these plants has been taken and therefore are not expected to be implemented before 2010.

Work is currently also underway in Malta to develop the sewage treatment infrastructure with the construction of 3 new sewage treatment plants (one in Gozo and two in Malta). The largest plant in the South will have an anticipated treatment capacity of 438,000 p.e. and will be equipped with anaerobic sludge digestion facilities. Preliminary estimates indicate that the energy recovery may be approximately 6.72 GWh/annum which is equivalent to 0.24% of the electricity consumption in 2010.

Biofuels

EU Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport requires Member States to set national indicative targets based upon reference vales of 2% for 2005 and 5.75 % for 2010.

Malta's potential for growing crops for producing biofuels is negligible due to the limited land availability, high population density, poor soil fertility and limited freshwater resources and where 50% of potable water is supplied from desalination. Given the lack of agricultural residues due to the reasons listed above, industrial and domestic waste is the only substantial source of biomass and, therefore, the only substantial source of producing biofuels.

With these constraints, Malta's production of biofuels from waste cooking oil has been very successful.

1.1.4 Rational Use of Energy

Rational energy use provides a feasible potential for greater saving. With effect from 2008 and in line with EU Directive 2006/32/EC, Malta is obliged to set an energy efficiency target by 1% per year and has to report to the European Commission by mid 2007 through an Energy Efficiency Action Plan.

Distribution losses and unaccounted for electricity in 2004/05 is estimated at around 365 MWh/annum. This is equivalent to around 16% of the electricity generated during the period.

1.1.5 Energy Policies

The Government of Malta has developed its draft energy policy for the Maltese Islands. A document on this Energy Policy was published for public consultation in June 2006.The policy is based upon three objectives all pursued in a balanced way to move towards a sustainable energy supply. These objectives are:

- security of supply,
- environmental protection,
- the social dimension, affordability and competitiveness.

This draft policy also includes a series of measures and actions designed to reach the various objectives, as well as the entity responsible to co-ordinate the various actions.

Following the publication of its draft Energy Policy, the Government of Malta also published a draft Renewable Energy Policy in August 2006 (Government of Malta, 2006a). This RES Policy identifies three key objectives namely:

1. Promotion of RES by setting ambitious goals and targets for penetration and putting in place appropriate support schemes and regulatory measures to encourage meaningful public investment and participation. Government will also lead by example.
2. Ensuring that the quality of life is not compromised or negatively affected by the choices made in considering and promoting RES development.
3. Seeking the holistic, most suitable and robust adoption of RES by ensuring that support services and development facilities are available and accessible including access to and dissemination of information, the promotion of public participation and acceptance of RES projects as well as human resource development to participate meaningfully and with excellence in the development and uptake of RES (Government of Malta, 2006a)

1.2 ENERGY SUPPLY, DEMAND AND PRODUCTION: EVOLUTION AND STRUCTURE

The energy sector in Malta has been for a significant period characterised by strong state involvement and is presently dominated by a state-owned monopoly – Enemalta Corporation. Enemalta Corporation is a horizontally and vertically integrated undertaking (utility), which has had exclusive rights and public service obligations to satisfy 'reasonable' energy demands. At the time of its formation it took over the operations and functions of the Malta Electricity Board, the Gas Board as well as the operations then carried out in the petroleum sector by various operators.

Enemalta Corporation continues to be the main producer of electricity in Malta, but this sector is now open to competition. In addition according to LN 511 of 2004 it is also the sole entity authorised to supply electricity to consumers. Enemalta Corporation is also designated as the distribution system operator in Malta and is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems and for ensuring the long term ability of the system to meet reasonable demands for the distribution of electricity. Enemalta Corporation is responsible for dispatching generation plant and for balancing the distribution system responsible and for maintaining a secure, reliable and efficient electricity distribution system within Malta.

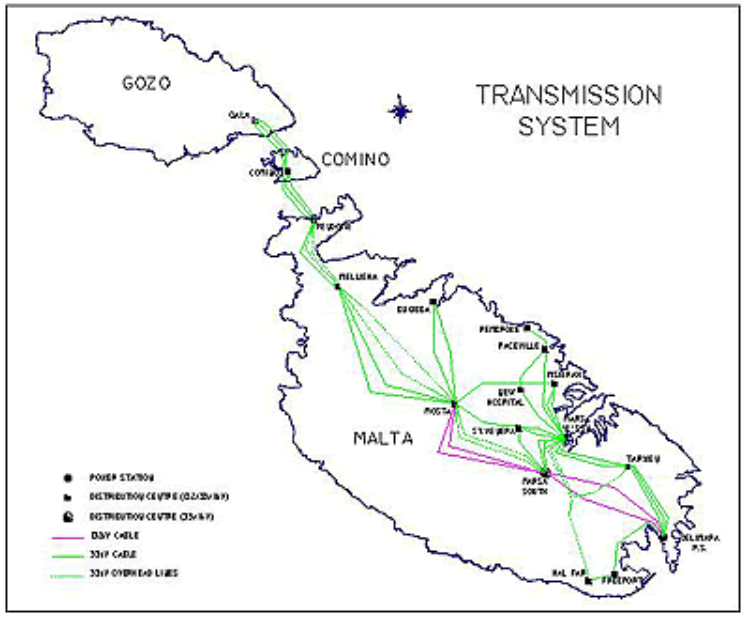
1.2.1 The Electricity System and Electricity Access

The electricity system in Malta is a small isolated system. Electricity generation is carried out by Enemalta Corporation (EMC), the national energy utility, which operates two conventional thermal power stations.

The 132 and 33kV system consists mainly of underground cables with a total length of approximately 214 km. Gozo is supplied with electricity from Malta via three submarine cable circuits which pass over the island of Comino where there is a 33/11kV distribution centre to supply electricity to Comino. The 11KV system consists in 1041km of 11kV underground cables and 159 km of 11kV overhead lines. Some major industrial and commercial customers are supplied directly with electricity at 11kV. The low voltage system in the Maltese Islands is a three phase, 4 wire, 400/230V system (Enemalta Corporation, 2006a).

In Malta, practically 100% of the population has access to electricity. Enemalta Corporation supplies electricity to some 200,000 consumers.

Figure 3: Distribution System



Source: Enemalta Corporation, 2006a

1.2.2 Evolution and structure of the energy demand

Electricity demand in Malta has constantly increased during the last 15 years at a high rate as shown in Table 2. Today total electricity consumption is around 2,243 GWh/year (year 2003/2004) an increase of 75 % over 1990/1991 when electricity consumption was 1,278 GWh. The increase in electricity demand may be attributed to various factors including:

(i) changing lifestyles including increased purchases of and demands for various energy-related products and services. For example there has been a significant market penetration of new equipment particularly air-conditioning systems which have contributed to increases and shifts of the active power maximum demand (measured in MW) in any one year from winter to summer.

(ii) General development and improvement in the country's infrastructure and services such as:
   a. the construction and commissioning of a new airport terminal in 1992,
   b. the construction and commissioning of a number reverse osmosis plants between 1982– 1994 to satisfy potable water demands,
   c. the construction Malta Freeport in 1988 and various projects subsequently undertaken to expanding the facilities and increasing the equipment fleet. This has resulted in an increase from 94,500 TEUs handled and 231 ship calls in 1990 to 1,461,174 TEUs handled and 1,698 ship calls in 2004 (Malta Freeport Terminals Ltd, 2007)
   d. construction of a number of yacht marinas and general upgrading of the country's tourism's infrastructure,

(iii) Development and investment by the private sector including:

   a. construction of various tourism related, large scale commercial and residential development, private hospitals, nursing homes etc. which have all contributed to a higher quality of life and improvement in services in Malta as well as associated increases in electricity demand;

   b. investment and setting up and/or expansion of operations of various industries such as ST Microelectronics (Malta) Ltd, Playmobil (Malta) Ltd., Trelleborg Dowty Malta Ltd, Lufthansa Technik Malta etc.,

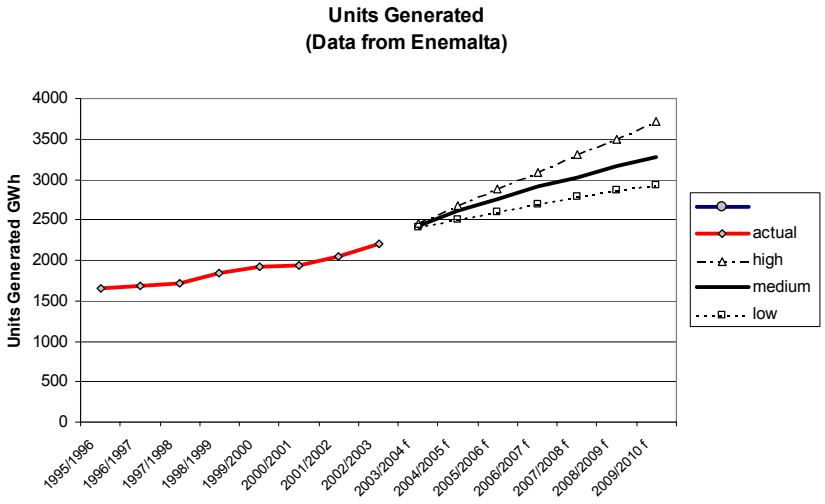
Table 2: Total Electricity Demand

Year	Used in station - MWh	Consumption by Industrial Sector - MWh	Consumption by Commercial Sector - MWh	Consumption by Domestic Sector - MWh	Street Lighting - MWh	Lost in distribution and unaccounted for
1990/91	100,246	361,479	247,439	320,865	22,881	225,592
1991/92	105,972	406,462	274,689	357,747	22,493	272,603
1992/93	114,046	426,567	294,242	340,575	22,822	265,496
1993/94	117,648	488,266	317,414	381,596	25,585	211,132
1994/95	112,790	488,962	340,095	425,659	28,270	262,589
1995/96	105,512	509,876	367,397	430,413	29,180	215,135
1996/97	108,465	452,620	411,940	461,779	29,757	221,370
1997/98	111,408	406,844	348,835	501,996	24,442	326,989
1998/99	118,737	477,003	423,731	463,668	28,759	328,448
1999/00	116,979	477,379	457,142	539,796	27,551	297,776
2000/01	117,661	482,908	503,660	540,265	42,733	256,123
2001/02	123,987	504,760	501,582	561,907	44,901	317,936
2002/03	125,093	499,230	553,804	623,679	35,220	370,989
2003/04	127,777	505,535	592,158	623,672	29,068	365,750

Source: Enemalta Corporation

The development of electricity demand as well as a forecast developed by Enemalta is shown in Figure 4.

Figure 4: Development and forecast electricity demand (units generated)



Source: Enemalta Corporation

1.2.3 Evolution and structure of production

1.2.3.1 Electricity Generation

Malta's electricity system is a small isolated system. All energy for power generation is derived from imported fossil fuel. Coal which was formerly used for power generation was abandoned in the nineties. The amount of fuel that is used for purposes other than power generation and that can be replaced by gas is small.

Two power plants are operated by Enemalta Corporation, Marsa Power Station and Delimara Power Station. These power plants utilise heavy fuel oil for conventional steam plant (boiler/turbo generation) and gas-oil for gas turbines and supply all the electrical power needs of the country. There are also three open cycle gas turbines, one at Marsa Power Station (16 years old) and two at Delimara Power Station (11 years old). These are expensive to operate and generally are reserved for peak load or emergency duty.

Marsa Power Station has a total installed generation capacity of 267MW. The average age of the steam turbines at Marsa Power Station is 45 years and the age of the boilers ranges from 19 to 37 years. Over the years a number of turbines have been refurbished.

Delimara Power Station was first commissioned in 1992 and has a total installed generation capacity of 340 MW. Two steam units are 14 years old and the combined cycle plant (CCGT) is 8 years old.

The average operating efficiency of the operational steam plant at Marsa Power Station is 27% compared with an average efficiency of the steam plant at Delimara Power Station of 32% and of the CCGT plant of 40%. (Enemalta Corporation, 2006b).

The energy sector is facing extensive reform with Malta's accession to the EU and the implementation of the EU Directives. Legal Notice 511/2004 establishes rules for the licensing of activities in the electricity sector and lay down the rules relating to the organisation and functioning of the electricity sector in Malta, access to the market, the operation of the system and the regulation of electricity tariffs, with a view to achieving a competitive, secure and environmentally sustainable market in electricity.

Forecast of Electricity Consumption

The calculated present growth rate in peak demand (MW) is about 3% per annum over the present peak load with the peaks occurring both during the summer and winter months. This increase in peak demand is associated with an increase in electrical energy consumption (MWh) of just over 2% of present demand (Enemalta Corporation, 2006b)

Enemalta Corporation (2006b) have estimated the anticipated increase in electricity consumption over the period 2005 to 2020 and is shown in Table 3. This estimate was based upon an annual natural increase of approximately 2% of the present consumption (linear), with an expected decrease in this rate of increase brought about by the increased utilisation of energy efficient appliances and buildings and programmes for energy conservation.

It was noted that concurrently a number of major developments are expected to be operational during the period which would increase the electricity consumption in a step manner. In a small isolated system such as Malta's major developments such as the construction and commissioning of the new Mater Dei Hospital and the construction of Tigne – Manoel Island residential and commercial development has a disproportionate effect on demand. Electricity consumption is thus estimated to increase from 2.26 TWh in 2005 to 3.29 TWh in 2020.

Table 3: Forecasts of Electrical Energy Consumption

Year	Generation - MWh
2005	2,263,145
2006	2,311,145
2007	2,389,145
2008	2,507,145
2009	2,625,145
2010	2,693,145
2011	2,781,145
2012	2,859,145
2013	2,937,145
2014	3,015,145
2015	3,093,145
2016	3,133,145
2017	3,173,145
2018	3,213,145
2019	3,253,145
2020	3,293,145

Source: Enemalta Corporation 2006b

1.3 IMPACTS AND RISKS OF THE OBSERVED AND FORECAST EVOLUTIONS

1.3.1 Energy dependence and Energy bill

ENE_ CO1: External Energy Dependency:

Share of energy imported in national consumption = 100 %

Number of supplier countries : *Fuel oils imported from various countries*

Malta is totally reliant on imported fossil fuels for its energy needs. Fossil fuels in the form of oil and gas are the primary energy sources utilised in Malta. These products are imported from several countries including Libya, Iraq and Russia and are typically uplifted from locations in Sicily, Italy, France, Spain, Israel and the Black Sea bordering countries.

Fuel oils are currently purchased as refined products. In the past, oil was purchased as crude stock and was shipped to refineries where it was refined into various distillates. Those products that were not used on the local market were sold or traded.

The fuels that are imported for inland use are fuel oils of varying sulphur content; gasoil of varying sulphur content and including EN590, light cycle oil leaded and unleaded gasoline, kerosene, Jet A1, aviation fuel, liquefied petroleum gas. Coal was also imported and used in the generation of electrical power up to 1995.

There are also a number of companies operating in the oil bunkering and storage business which operate fuel storage facilities.

In 2006 Government decided in favour of an HVDC cable interconnection with Sicily to supplement or enhance on island generation. A consultancy study on the optimal sizing of the interconnection and feasibility and other studies on options for diversification of fuels for on island generation – by considering natural gas and liquefied natural gas as alternatives to the existing fuel oil/gas oil mix is expected to commence shortly.

1.3.2 Greenhouse gas effect

ENE_PO3: Greenhouse gas effect emission; CO_2 emitted from energy production and use.

Year	CO_2 Emissions from Electricity Generation - Gg	Total CO_2 Emissions from the Energy Sector - Gg
1990	1,937	1,895
1991	1,547	2,075
1992	1,638	2,187
1993	1,637	2,236
1994	1,724	2,310
1995	1,727	2,336
1996	1,709	2,339
1997	1,716	2,346
1998	1,749	2,384
1999	1,802	2,450
2000	1,784	2,444
2001	1,780	2,439
2002	1,906	2,562
2003	1,973	2,636

Sources: Sammut and Micallef, 2004
Ministry for Rural Affairs and the Environment, 2004
Ministry for Rural Affairs and the Environment, 2006

Malta submitted its report to the first communication to the United Nations Framework Convention on Climate Change. This Communication provides a national greenhouse gas inventory for the period 1990-2000. Malta's total CO_2 emissions increased from 1,895 Gg in 1990 to 2,450 Gg in 1999. It has been noted that energy sector (power generation and transport) is a major contributor to GHG emissions in Malta. The sector contributes approximately 63 percent of Malta's direct GHG emissions, with approximately 75 percent of national CO_2 emissions. (Sammut and Micallef, 2004)

CO_2 emissions from electricity generation stood at 1,397 Gg in 1990, 1,727 in 1995 and rising to 1,784 Gg in 2000 and to 1,973 Gg in 2003.

At the same time energy consumption has seen a growth of 61 percent between 1990/1991 and 2001/2002. The domestic and commercial sectors have contributed most significantly to the increase in demand.

Between 1990-1995 electrical energy production increased around 5.6 % annually. This increase eased off after 1995 because of the decline in electrical energy use by the Water Services Corporation (WSC), the largest single consumer, where electrical energy is used for desalination.[1]

Transport is also a major contributor to Malta's total GHG emissions. Between 1999-2000, the number of private cars increased by an annual average of 7%. CO_2 emissions from transport were estimated at 342 Gg in 1990, 440 Gg in 1995, 496 Gg in 2000 and rising to 525 Gg in 2003. Transport constitutes approximately 20% of the emissions from the energy sector. Road transport is the major contributor at 96-97 % of the CO_2 emissions from transport.

1.3.2.1 Malta's GHG Emissions Obligations

Malta ratified the United Nations Framework Convention on Climate Change (UNFCCC) as a non-Annex I party on 17th March 1994, and on the same basis, subsequently ratified the Kyoto Protocol on 11th November 2001. Malta is a non-Annex I party to the Kyoto Protocol. It is also excluded from the list of EU Member States forming part of the burden-sharing agreement under Council Decision

[1] Desalination contributes to around 50% of Malta's potable water supply.

2002/358/EC concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the UNFCCC and the joint fulfilment of commitments thereunder.

Currently Malta does not have any quantified mandatory targets for the limitation or reduction of greenhouse gas emissions. It is however obliged to comply to various EU Directives including the Emission Trading Directive as well as other various EU Directives on emission limitations, air and fuel quality.

Malta has submitted to the EU Commission its 2nd National Allocation Plan for the period 2008 -2012 and this was prepared pursuant to obligations under Emissions Trading Directive 2003/87/EC. This Plan highlights Malta's overall greenhouse gas emissions are small compared to those of the European Union as a whole (at 0.058% of the total EU-25 emissions). This is due to the small size of the country in geographical, population and economic terms. Malta also has one of the lowest emission rates per capita within the EU (7 tonnes of CO_2 equivalent per capita, compared to an average of 11 tonnes for the EU- 25).

The specific GHG emissions per unit of gross domestic product (GDP) for Malta are 924 tonnes of CO_2 equivalent per million Euro of GDP, as against the EU average of 607 tonnes. Malta's NAP notes that this reflects more Malta's (relatively low) GDP rather than high emissions along with the fact that Malta is too small to benefit from 'economies of scale' (for example, in electricity production) and that it is (at present) an isolated energy system with a limited choice of fuels.

The National Allocation Plan proposed that Malta's proposed total quantity of allocation for the period 2008 to 2012, is therefore 14,777,981 tonnes of CO_2. A total of 10,946,653 tonnes of CO_2 would be allocated to Enemalta, with 3,831,328 tonnes of CO_2 held in reserve for new entrants (Ministry for Rural Affairs and the Environment, 2006).

The EU Commission is requesting Malta to make a number of changes to the NAP including a reduction in the total quantity of allowances to be allocated by Malta to installations and to new entrants to 2.143061 million tonnes. This is equivalent to a reduction of 0.812539 million tonnes per year for the trading period (Commission of the European Communities, 2006).

1.3.3 Other impacts on the Environment

Apart from greenhouse gas emissions, air quality is also a major environmental issue in Malta and the energy sector is also a contributory party. In 1995 for example coal for electricity generation was phased out due to air quality concerns in the vicinity of Marsa Power Station.

Various EU environmental directives exist which Malta has transposed and obliged to adopt to limit the emissions to the air resulting from various sources. These include the Large Combustion Plants Directive, the National Emission Ceilings Directive, the Integrated Pollution Prevention and Control Directive, Ambient Air Quality Assessment and Management Regulations, and the Greenhouse Gas Emissions Trading Scheme.

There is no fixed energy infrastructure connecting Malta to potential fuel product suppliers. All fuels are transported to Malta by ocean going vessels.

The transportation of fuels to Malta by sea going vessels poses inherent risks in terms of potential marine pollution. The risks from marine pollution in view of the country's geographical location are recognised particularly since Malta lies at the heart of major shipping routes.

Other environmental impacts associated with fuel storage include hydrocarbon losses and leaks from storage tanks and pipelines, which can contaminate the local terrain as well as surface, coastal and ground water resources. Typically such losses and leaks can arise out of insufficient asset maintenance or accidental damage. Apart from this, land use and siting impacts including the effects on visual amenity associated with the location of the storage facilities.

ENE_C04: Number of energy infrastructures on coastal areas :

Power Stations = 2
Fuel Storage facilities = 11
Distribution network including submarine cables between Malta and Gozo

ENE_C13: Ozone peaks frequency

	2004	2005
No of days / year when ozone level above threshold level of 180 $\mu g/m^3$	1	0
No of days / year when ozone level above threshold level of 240 $\mu g/m^3$	0	0

Source: Malta Environment & Planning Authority

1.4 FINANCING AND INVESTMENT NEEDS

A National Strategic Reference Framework (NSRF) document has been drafted through an intensive dialogue process and an extensive assessment of the country's needs and challenges, strategic objectives for development for the medium and longer term. This document provides the goals and the basic strategic framework for the operational programmes on the objective of sustaining economic competitiveness through innovation and entrepreneurship and facilitating a knowledge-based economy through investment in the necessary physical and social infrastructural capabilities, education and social inclusion. (Government of Malta 2006c)

In 2006 Enemalta Corporation published its Electricity Generation Plan for the period 2006 to 2015. This Plan notes that the existing generation plant has aged considerably while their operating efficiency is relatively low. In addition given expected new developments which will increases expected peak demand and consumption, the existing generation capacity is only expected to meet this demand until 2010. Further loss due to faults to one of the larger units could also mean a shortfall in generation in summer 2007. Enemalta Corporation further notes that environmental obligations arising from various EU Directives (Large Combustion Plant directive, National Emissions Ceiling Directive, Emission Trading Directive and the National Allocation Plan) and the Gothenburg Protocol pose additional constraints on existing and planned generating plant. This Plan highlights the need for 200 MW of local generation to be replaced either by new generating plant or by a cable interconnection (Enemalta Corporation, 2006b).

It has been noted that the energy sector requires massive investment (generation and distribution) to sustain the growth in demand created by changing standard of living of citizens and increased economic activity.

Investment is also required in certain critical sections of the distribution system to prevent distribution failures.

Enemalta Corporation 2006b estimate that the expected expenditure levels for the following infrastructure projects are as follows:

- 130MW CCGT plant - Lm35-40 million (€ 81.5 - € 93.2 million)
- 132kV DC's and cables Lm20 million (€ 46.6 million)
- 200MW electric cable interconnection Lm55 million (€ 128.1 million)
- 33kV Distribution Centre's and reinforcement Lm10 million (€ 23.3 million)
- Malta Sicily gas pipeline (if adopted) Lm65 million (€ 151.4 million).

2. RATIONAL ENERGY USE (RUE) AND RENEWABLE ENERGIES (RE): POLICIES, TOOLS, PROGRESS, RESULTING EFFECTS, CASE STUDIES

2.1 RUE AND RE POLICIES

Sustainable energy use is the prime objective of any energy policy. As reported earlier the Government of Malta in 2005 highlighted its intention to evaluate the implications of Malta's dependency on fossil fuels and adopt such necessary measures in order to reduce this dependency. Government has embarked on a series of measures to address this situation including:

- carrying out feasibility studies on the purchase of electricity through the European grid as well as through the installation of a pipeline or gas storage plant in order to introduce gas as another source for the generation of electricity;
- greater use of alternative sources of energy;
- raising public awareness on energy efficiency and alternative energy sources.

2.1.1 Rational energy use (RUE) policies

An energy efficiency policy is being prepared using a structured approach based on the following methodology.

- Establish quantitatively how energy, imported into Malta as fossil fuel, is transformed or otherwise made available to consumers in the required convenient forms.
- Identify the uses to which this energy is put.
- Identify whether and how increased energy efficiency can be achieved in the transformation processes and in energy use. – technical measures, attitude change by consumers, educational programs, etc.
- Quantify the potential for achieving this increased efficiency, investigate holistically the costs involved and hence determine cost-effective measures to be taken.
- Set plans and programs to achieve this cost-effective energy efficiency, including the resources required, priority in allocating resources, targets and timeframes and the responsibility to achieve them.
- Monitoring and reporting.

This action plan covers all fuels imported for final consumption in Malta, including those used for combustion for electricity generation. It excludes marine and air bunkering fuels.

2.1.2 Renewable energy (RE) development policies

A draft RES policy document was published by the Government of Malta in August 2006. This document identified three key objectives namely:

(i) Promotion of RES;
(ii) Quality of Life;
(iii) Support facilities and services.

Complementary to these key policy objectives, Government also identified a series of strategic measures and actions. It is stated that Government intends to pursue these measures to attain its policy objectives.

This policy document notes that Government is committed towards the promotion of renewable energy:

- by identifying and keeping under review what natural resources can be exploited in Malta at any time in the light of available technology and the balance of their benefits and costs;
- by setting clear, feasible goals and ambitious national indicative targets for penetration of the market by these energy sources;
- by keeping its policy under constant review to encourage best practice standards to promote rather than inhibit RES together with energy efficiency;
- by putting in place appropriate support mechanisms and financing options and establish regulatory and administrative procedures that minimise as much as possible the burden associated with them;
- by leading by example and encouraging the Maltese public to take up renewable energy as a matter of economic, social and environmental choice (Government of Malta, 2006a).

In addition the draft RES Policy notes that:

- in managing the introduction of renewable energy sources, Government will ensure that on balance, the overall quality of life of citizens is not adversely affected or compromised. Diverse technologies have different characteristics and their impact on the quality of life needs to be determined individually.

- Government will seek the holistic, proper and robust adoption of RES by ensuring that support services and development facilities are available and accessible. These facilities and services include access to and dissemination of information, the promotion of public participation and acceptance of RES projects as well as human resource development to participate meaningfully and with excellence in the development and uptake of RES (Government of Malta, 2006a).

2.2 Instruments and measures to be taken in favour of RUE and RE

2.2.1 Tools and measures in favour of rational energy use (RUE)

2.2.1.1 Administrative and legislative measures

Energy end use

Government has introduced various legal notices to address and promote energy efficiency and in line with harmonisation and transposition requirements associated with Malta's accession to the European Union. These include:

- Efficiency Requirements for New Hot-Water Boilers Fired with Liquid or Gaseous Fuels Regulations, 2002 (Legal Notice 62 of 2002)
- Energy Efficiency Requirements for Household Electric Refrigerators, Freezers and Combinations thereof, 2002 (Legal Notice 63 of 2002)
- Energy Efficiency Requirements for Ballasts for Fluorescent Lighting Regulations, 2002 (Legal Notice 100 of 2002)
- Indication by Labelling and Standard Product Information of the Consumption of Energy and other Resources by Household Appliances (Amendment) Regulations. (Legal Notices 99 of 2002, 27 of 2003 and 235 of 2003)

Combined Heat and Power

EU Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC was transposed into Maltese legislation through Legal Notice 2 of 2007.

This Legal Notice seeks to promote cogeneration based on useful heat demand. Promotion measures transposed by the legal notice include the facilitation of access to the grid and the issue of guarantees of origin certificates for CHP installations.

At this stage, the potential for CHP in Malta is relatively unknown.

Energy Performance in Buildings

Regulations have been introduced with the aim to improve the energy performance of buildings in line with the requirements of Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings. These are legislated by Legal Notice 238/2006 "Minimum Requirements on the Energy Performance of Building Regulations, 2006" under the Malta Resources Authority Act. These regulations set out requirements, by means of any technical guidance document, with regards to:

1 the application of minimum energy performance requirements for newly constructed buildings;
2 the application of minimum energy performance requirements for large existing buildings that are subject to major renovation;
3 the general framework for a national methodology for the calculation of the integrated energy performance of buildings;
4 the energy performance certification of newly constructed buildings and large existing buildings subject top major renovation when these buildings change ownership or are rented out;
5 the regular inspection of boilers and of air-conditioning systems in buildings with regard to reducing energy consumption and limiting carbon dioxide emissions.

Minimum requirements for the energy performance of buildings in Malta have been set for separate building elements - floors, windows, walls and roofs.

Educational Campaign on Sustainable Energy Use

A national educational campaign is being planned to increase the level of the general public and consumers' awareness on sustainable energy use. The aims of this campaign are:

1. to educate consumers through dissemination of information and knowledge :
   (a) on Malta's dependency of oil;
   (b) associated measures that may be implemented to reduce this dependency on oil including energy efficiency measures, energy conservation measures and integration of renewable energy sources;
   (c) benefits of sustainable energy use to the environment and society as a whole;

2. to increase public participation and change consumers' behaviour towards more sustainable energy use.

The educational campaign will address the following key issues:
(i) Energy efficiency and conservation of electricity;
(ii) Micro-generation through renewable energy sources and promotion of solar thermal systems;

(iii) Energy efficiency in transport;
(iv) Energy performance in buildings.

The project is divided in 3 phases with the target audiences in Phases 1 and 2 being domestic consumers, school children and environmental NGOs and opinion leaders. The specific objectives of the Phases of the campaign are to:

(i) raise public awareness on energy efficiency, energy conservation and integration of renewable energy resources in Malta;
(ii) educate consumers on measures and best practices for sustainable energy use;
(iii) educate school children on sustainable energy use,
(iv) disseminate information on Government's policies, measures and support mechanisms to assist consumers in energy efficiency, energy conservation and use of renewable energy sources;
(v) ensure that consumers become more aware of their energy consumption and understand the benefits associated with energy efficiency and conservation and contribution of micro generation from RES (wind and solar);
(vi) change consumers behaviour towards energy saving and sustainable energy use.

Phase 3 of the campaign seeks to target professional bodies and associations, government departments and entities, importers and industry associations and organisations and other heavy consumers. The specific objectives in this phase are to:

(i) raise target specific groups awareness on energy efficiency, energy conservation and the integration of renewable energy resources in Malta;
(ii) educate heavy consumers on measures and best practices for sustainable energy use;
(iii) disseminate information on Government's policies, measures and support mechanisms to assist heavy consumers in energy efficiency, energy conservation and use of renewable energy sources;
(iv) ensure heavy consumers are aware of their energy consumption and understand the benefits associated with energy efficiency and conservation and contribution of micro generation from RES (wind and solar).

2.2.1.2 Financial Instruments

With effect from 1st January 2006 Government introduced a financial support scheme aimed at increasing energy efficiency at domestic premises through a grant of 25% on the purchase price of roof thermal insulation material at domestic residences [subject to a maximum of LM 100 (€ 233)].

In November 2006, Government introduced another financial instrument to increase energy efficiency by the domestic sector. This consist in a scheme for grants on the purchase of household appliances for domestic use certified as being efficient in the use and consumption of energy is offering a 20% refund (up to a maximum of Lm 50 (€ 233) for cooling appliances and Lm25 (€ 58) for other appliances) on energy efficient washing machines, fridges, freezers and their combinations, tumble dryers, dishwashers and air conditioners for domestic use. Equipment eligible for the rebate has to be labelled A or better in accordance with the

directives issued under the framework Council Directive 92/75/EEC[2] (transposed into LN 99/2002)[3].

Case Study 1: Energy Efficiency in Desalination - Water Services Corporation

Water in the Maltese islands is a scarce resource and with high population density, small surface area and high percentage of urban development as well as an semi-arid climate, pressures on existing water resources are intense. Water to meet the needs of the population is obtained from two main sources: groundwater and desalination. Desalination facilities were introduced in the 1980s in response to water scarcities arising from increasing demand and insufficient natural supplies. Today desalination contributes to around 50% of the potable water supply in Malta.

The first desalination plant was constructed in Malta at Lapsi with a capacity of 20,000m^3/day in 1982 and increased to 24,000 m^3/day in 1986.

Table 4: Desalination Plants

Location	Commissioned	Feedwater type	Nominal Capacity m^3/day	Number of trains	Recovery %
Lapsi	1982 – 20,000m^3 /day 1986 increased to 24,000 m^3/day	Seawater	24,000	12 x 2,000 m^3/ day	33
Cirkewwa	1989	Seawater	18,600	2 x 3,000 m^3/ day 3 x 4,200 m^3/ day	42
Pembroke	Phase 1 (17,600 m^3/day) in 1991 Phase 2 (further 8,800 m^3/day) in 1993 Completion – 1994	Seawater	54,000	6 x 4,400 m^3/ day 6 x 4,600 m^3/ day	45

Source : *MDS Sea and Brackish Water Desalination*

Energy usage is a major cost element and environmental impact in the operation of desalination plants.

In 2000/2001, the total energy consumption for operation of the RO plants amounted to 103,562 MWh. The energy consumption of the WSC during 1999/2000 was 131,043 MWh or 8.8% of the total energy sales by Enemalta Corporation (WSC, 2001).

The Water Services Corporation is thus a major consumer of electricity in Malta and careful monitoring of its electricity consumption has been carried out through energy audits. Variances between actual data and design parameters are noted and recommendations to improve the plants' operating efficiency (including membrane additions or replacement) are considered and where applicable implemented (Water Services Corporation 2001).

2 Directive 92/75/EEC of 22 September 1992 on the indication by labelling and standard product information of the consumption of energy and other resources by household appliances

3 Budget Speech 2007 (Government of Malta, October 2006).

Case Study 1: Energy Efficiency in Desalination - Water Services Corporation (cont.)

Various projects have also been undertaken by the Water Services Corporation to improve the energy efficiency of the RO plants between 2000-2002. Modern energy recovery technology was incorporated in existing plants as follows:

- Pelton wheels were installed on 6 trains employing reverse running pumps at Pembroke Phase II. This consisted in a simple replacement of the latter equipment. This project contributed to a reduction in the specific energy consumption from 4.5 kWh/m^3 to 3.6 kWh/m^3.

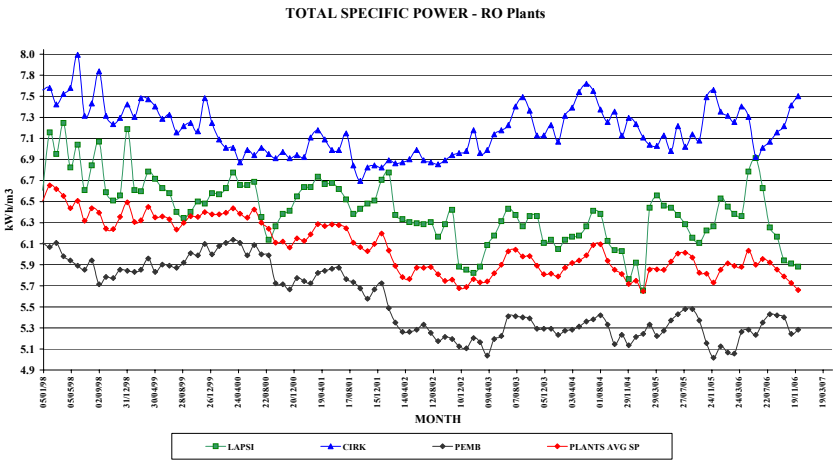
- Pressure exchangers as incorporated in Lapsi R.O. Plant. This required a complete re-engineering of the equipment including replacement of the high pressure pump and two trains of previous rating were incorporated in the process. The specific energy consumption was reduced from 4.8 kWh/m^3 to 3.2 kWh/m^3 through this project.

Figure 6: Pressure Exchangers at Lapsi R.O. Plant

Source: Water Services Corporation

Figure 6 shows the total specific power (production and distribution) of the RO plants between 1998 – 2007 and in particular the improvements registered in energy consumption at Pembroke and Lapsi R.O. Plants.

Figure 6: Total Specific Power – RO. Plants



Source: Water Services Corporation

Case Study 1: Energy Efficiency in Desalination - Water Services Corporation (cont.)

Following these projects, the Water Services Corporation is planning further projects including procurement of further pressure exchangers and new membranes with the intention of :

(i) increasing the production capacity of RO plants;
(ii) improving the quality of the desalinated water;
(iii) decreasing the energy consumption in the RO plants;
(iv) decreasing the reliance on groundwater for potable water supply.

The planned projects consist in installation and commissioning:

(i) two complete systems at Cirkewwa R.O. Plant and consisting in new pumps, pressure exchangers and membrane replacements;
(ii) two complete systems at Lapsi R.O. Plant and consisting in new pumps, pressure exchangers and membrane replacements;
(iii) three complete systems at Pembroke Phase 1;
(iv) replacement of membranes at Pembroke Phase 2.

The production capacity is expected to increase from 70,000 m^3/day to 97,000 m^3/day, the chloride levels reduced from 250 mg/l to 150 mg/l while the specific power reduced from 5.5 kWh/m^3 to 4.4 kWh/m^3. This is expected to contribute to an annual electricity savings of approximately 13 million kWh (Water Services Corporation, 2006).

2.2.2 Tools and measures in favour of renewable energy (RE)

ENE_C08: Expenditures in RE and RUE: RE and RUE programmes share in energy investments and R&D expenses:

Data not available

ENE_C05: Final consumer energy price per fuel and per sector:

Refer to Annex 1 Table 12 for detailed breakdown of current electricity and fuel prices

Table 5: Average Electricity Prices

	Industrial Users €/kWh	Households - €/kWh
1991	0.0654	0.0538
1992	0.0658	0.0541
1993	0.0591	0.0486
1994	0.0606	0.0498
1995	0.0588	0.0484
1996	0.0578	0.0476
1997	0.0596	0.0490
1998	0.065	0.0587
1999	0.0635	0.0573
2000	0.0675	0.0609
2001	0.0683	0.0617
2002	0.0698	0.0631
2003	0.0636	0.0652
2004	0.062	0.0636
2005	0.0706	0.0727
2006	0.0711	0.0904

Source: Eurostat, 2006

ENE_C11: Share of fuel and electricity expenditures in household budgets

	Average annual household expenditure for all households (for year 2000)	% of Average household disposable income[4] (for year 2000)
Water and electricity bills:	Lm 150.8	1.83%
Gas and liquid fuels :	Lm 21.7	0.26 %
Solid fuels:	Lm 1.3	0.02 %
Fuels and lubricants; maintenance, repair and other services related to personal transport equipment:	Lm 432.7	5.28 %

Source: National Statistics Office, 2003

[4] Average household disposable income (Lm) : LM 8,202.2 (for year 2000) based on National Statistics Office, 2003

ENE_C06: Existing incentive measures and policies for RE and RUE development at national level

(i) Specific legislation for RUE and RE: YES :
(a) energy efficiency in building regulations,
(b) energy labelling

(ii) Incentive measures for local scale actions (cities, regions): YES
(a) park and ride scheme for Valletta

(iii) Capital subsidies and consumer grants: YES
(a) Capital grants on solar PV installations, micro-wind installations, electric vehicles, solar water heaters.

(iv) Feed in tariff: No

(v) Investment tax credit: Yes
(a) Soft loans for energy and water conservation – Implementation through Malta Enterprise

(vi) Net metering: YES
(a) Net metering for electricity generated from solar PV installations and micro-wind installations and with a spill tariff set at 3 c/kWh (€ 0.07/kWh).

(vii) Production tax credit: No
(viii) Renewable portfolio standard (RPS): No
(ix) Renewable energy target: No
(x) Tradable renewable energy certificates: No
(xi) Renewable energy funds: No

ENE_C07: Cities/regions/provinces with an existing energy audit and/or a carbon audit and/or with objectives in terms of RE and RUE - None

ENE_P04: total sum of investments made within the Kyoto Protocol's Flexibility Mechanism : 0

2.2.2.1 Administrative and Legislative Measures

Various measures have been introduced by Government to implement and support greater penetration of renewable energy sources in Malta. This includes both financial instruments and administrative measures.

EU Directive 2001/77/EC on the promotion of electricity generated from renewable energy sources, was transposed into Maltese legislation through Legal Notice 186 of 2004. Malta also submitted its report to the EU Commission on the implementation of the EU Directive 2001/77/EC in accordance with the reporting obligations under Article 3 (3) for the publication period ending 27 October 2005. This report includes an analysis of the success in meeting the national indicative targets taking into account in particular climatic factors likely to affect the achievement of those targets and which indicates to what extent the measures taken are consistent with national climate change commitment.

Wind Energy

Following various studies on RES potential and options available for Malta, Government in 2006 decided that the best option for Malta to seek a significant contribution from RES in the energy mix is through the exploitation of offshore wind energy. It has been noted that relatively shallow water sites (< 20 m) are very limited around Malta and this appears also to limit the potential of exploitation of this resource.

A call for expressions of interest for offshore windfarm development from interested parties willing to undertake offshore wind projects with a final capacity of between 75 and 100 MW in Maltese territorial waters on a public private partnership basis has been issued and the responses submitted to this Call are being assessed by Government. This approach also coincided with a decision taken by the Government that the national electricity distribution grid was to be interconnected with the European grid. Such an interconnection would render the system stable and robust and permit a scale of operations sufficient to make the project economically feasible.

Solar Energy

Government has also sought to increase penetration of micro generation from RES. Administrative barriers associated with the application for permitting and licensing of small scale auto-generators (e.g. households or small businesses generating electricity using PV systems) have been reviewed and reduced or eliminated. A fast-track notification process has been developed for micro-generating renewable energy systems and small combined heat and power installations. In addition revisions have been included in MEPA's Policy and Design Guidance 2005 to reduce planning barriers for solar photovoltaic installations and solar water heaters.

Most of the solar energy used is solar thermal energy (particularly solar water heaters for domestic use) rather than electricity generated using PV. The Government has over the years introduced subsidies to support and increase penetration of RES aimed at the domestic consumer. The introduction of a fuel surcharge in 2005 to compensate for higher fuel prices as well as these Government support schemes are proving an increasing incentive for end consumers to invest in solar water heaters.

During 2006, Government granted subsidies to around 1564 consumers for the installation of a solar water heater compared to around 360 consumers in 2005.

Waste

The first mechanical biological treatment plant (MBT) is expected to start treating and receiving waste by mid 2008 and this would treat approximately 71,000 tonnes of municipal solid waste which would generate approximately 7 GWh/annum of electricity (equivalent to 0.26 % of electricity consumption in 2010). Two further MBTs are also planned to be constructed and when operational would generate an additional 18.68 GWh of electricity annually. This equivalent to around 0.66 % of electricity consumption of 2010.

In addition existing closed landfills are also being rehabilitated and collection systems constructed to enable utilisation of good quality gases for production of electricity. In addition the production of biogas from Ta' Zwejra and Ghallis engineered landfills is being undertaken and it is expected that by mid 2007 capability for an estimated 2.63 GWh/annum may start to be generated annually. The installed power is expected to increase towards 2010 with an additional 1.3 MW of electrical power producing 11.4 GWh of electricity annually.

Biofuels

EU Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport was transposed into Maltese legislation through Legal Notice 528 of 2004. Malta has also submitted its national reports to the EU Commission in accordance with Article 4 on the implementation of this directive for 2004, 2005 and 2006. These annual reports outline:

- the measures taken to promote the use of biofuels or other renewable fuels to replace diesel or petrol for transport purposes;
- the national resources allocated to biomass for energy uses other than transport;
- total sales of transport fuel and the share of biofuels pure or blended, and other renewable fuels placed on the market for the preceding year.

Biofuel production and use has seen significant penetration rates in Malta. Biodiesel accounted for 0.52% of total fuel used for road transport in 2005, a significant improvement on the 0.1% achieved in 2004 and 0.02% in 2003. This figure is in fact higher than the national indicative target of 0.3% which had been set for 2005. (Ministry for Resources and Infrastructure, 2004, 2005b, 2006b).

Case Study 2 : Biofuel Production - Edible Oil Refining Co. Ltd.

Edible Oil Refining Co. Ltd. started operations in the early 1950s. Up to 1993 the company enjoyed a quasi-monopoly in vegetable oils in the Maltese internal market, but market share started being gradually eroded with a liberalization process

In 2000 the EORC group embarked on a pilot project on the production of biodiesel from vegetable oils and fats. Trials were carried out for a 3 year period and during this time the company also carried out house trials on its fleet to ensure that optimum product would be developed prior to its launch on the market. In 2004, EORC launched its biodiesel and sold some 150,000 litres. In 2006 sales of biodiesel surpassed 1.7 million litres. Apart from reducing the amount of waste cooking oil finishing in the sewers, presently this process is serving as the only source of indigenous production of biofuels in Malta.

The company considered that the most important issue was the sourcing of a reliable but competitive feedstock for the production of biodiesel since the use of virgin oils would have been far too expensive given the low price of fossil fuel prevailing at the time. The company realized that used cooking oil was a useful resource in this respect and which up to that time was being discarded and disposed in the waste stream. The company estimated that based on the total market sales of some 9,000 tons of material and taking into account European recovery statistics, the residual amount being disposed in the waste stream was some 3600 tons of fats and oils.

Thus EORC implemented the following measures to recover used cooking oils from the waste stream:

1. the catering sector was incentivized by offering up to 33% rebate in fresh oil for those clients returning used cooking oil.

2. A number of strategic partnerships were struck between EORC and key entities including;

   (i) Malta Tourism Authority (MTA) where an audit trail and accountable system for all establishments processing and disposing of oils and fats were established . The document was also integrated and formed part of the licensing renewal conditions issued by the MTA.
   (ii) Wasteserve Ltd. for the use of biodiesel by government entities and corporations and the launch of a household collection scheme.
   (iii) Malta Hotels and Restaurants Association (MHRA) where members of MHRA were given special terms for the return of used oil .

To address quality issues in the production of biodiesel EORC together with the University of Malta (Department of Engineering) set up a testing and evaluation process to test the biodiesel produced. The Malta Standards Authority on its part also defined the quality norms for biodiesel to be sold in Malta.

Case Study : Biofuel Production - Edible Oil Refining Co. Ltd. (cont.)

Marketing and Raising Consumer Awareness

In marketing the product and to increase public awareness EORC implemented various measures. These included:

1. An agreement reached with Enemalta on the retailing of fuels for transport in licensed service stations.
2. Appointment of Malta's largest independent fuel distributor as its agent in the market for industry.
3. Setting up a sales team and invested in an educational programme through the ministry responsible for the environment.
4. Opening up of a good dialogue with the Malta Resources Authority (the authority regulating the fuel sector in Malta) and agreement was reached on the form and manner in which biodiesel could be sold in the absence of a liberalized market
5. Sending diesel mechanics overseas to get educated in bio diesel and its role
6. Hosting three national seminars where the general audience, as well as specific audiences (engineers and key stakeholders such as station owners) were targeted. Foreign speakers were also invited to attend during these seminars.
7. Joining Government's campaign on the "Clean the world";
8. Launching a mass media and public relations campaign including a household mail shot.
9. A promotional and educational campaign was set up in schools where audio visual aids were used to support the project and its benefits. This included in station promotions where franchise girls in bio wear gave promotional material to young children. Consumers were educated on the use and application of biodiesel from an individual perspective as well as the environmental benefits associated with its use.

Government Incentives

Government on its part de-taxed biodiesel, and legislated its incorporation with fossil diesel at a maximum of 5% in line with the EU directive on the promotion of biofuels for road transport. Government also established a green procurement policy.

Project's Recognition, Key Outcomes and Results

Bio diesel can today be sourced from 46% of the stations in Malta and Gozo. The project is mopping up some 1200 tons of waste material produced locally which would have otherwise been thrown in the waste stream.

During 2005, total production of 100% biodiesel was around 1.492 Mlitres, of which 60% was used for transport purposes, and 40% for industrial use. The total amount of biodiesel sold for the transport sector was of 0.895 Mlitres. This increased compared to 0.18 Mlitres of biodiesel for road transport in 2004.

Case Study : Biofuel Production - Edible Oil Refining Co. Ltd. (cont.)

The project has also reached international acclaim when in 2005 it placed second in the BBC world challenge – (an international competition where 78 countries competed with 476 environmental projects) and sponsored by BBC World, Shell and Newsweek. The project was also featured in the Newsweek magazine and on BBC World.

The company has also attracted the participation in the world record breaking circumnavigation attempt being carried out in March / April 2007 and powered exclusively with 100% bio diesel. This will include the refuelling with biodiesel in Malta

The key issues which have contributed to the success of the project have been

- Research
- Product development
- Testing and road worthiness
- Education
- Marketing
- Promotion
- Institutional support and legislative modification.

2.2.2.2 Financial Instruments

Government has introduced various financial support schemes aimed at increasing micro-generation from as well as passive use of RE. This includes:

(i) an increase in the refund on the purchase price of solar energy products for domestic premises from 15% to 25% [subject to a maximum of Lm100 (€ 233)]. In addition the network connection fee of Lm 70 (€ 163) is waived by Enemalta Corporation in the case of new households installing these systems.

(ii) a grant of 25% on the purchase price of microwind systems (with a maximum generation capacity of 3.7 kW) and which are installed on domestic premises [subject to a maximum of Lm 100 (€ 233)]..

(iii) a grant of 20% on the purchase price of photovoltaic installations with a minimum size of 1 kWp and less than 3.7 kWp on domestic premises. This grant is subject to a maximum of Lm 500 (€ 1166) with an additional grant of Lm 250 (€ 582) for every additional 1 kWp (±5%) above the minimum 1 kWp. In addition other support measures for such installations include:

- waiving of the meter costs by Enemalta Corporation and amounting to Lm 20 (€ 47) fee for the installation of the meter necessary for the operation of the photovoltaic technology;
- Net metering for electricity generated from renewable energy sources with a spill tariff of 3c/kWh (€ 0.07/kWh) for any excess electricity fed into the grid.

In addition Government has also introduced tax incentives measures for the promotion of biofuels, whereby the biomass content (i.e. percentage element) in biodiesel is exempt from the excise duty.

In addition to the above in the Draft RES policy it is further noted that:

(i) Government will on its part seek to increase state funding in support schemes. Surplus electricity exported to the grid will be fairly valued taking into account the benefits associated with distributed generation;

(ii) Government will give priority and seek to incentivise RES industries especially the solar thermal and solar photovoltaic industries. These include fiscal incentives, such as advantageous tax rates, special loans and loan guarantees, training grants and subsidised property rates;

(iii) Permitting of large scale RES projects will be facilitated, with public-private partnership schemes encouraged.

(iv) Government will consider revisions to the building regulations and planning permits to make inclusion of solar water heating a mandatory element in all new housing, tourism and major retrofit projects. Exceptions will need to be approved where applicant clearly demonstrates that other energy efficiency measures have been included. (Government of Malta, 2006a)

2.3 ENERGY EFFICIENCY EVOLUTION - DECOUPLING

ENE_P01: Total energy intensity and by sector

		Gas Oil	Diesel	Unleaded	Premium	Kerosene	Jet A-1	Aviation gasoline	Fuel oil	Light heating oil	LPG	Propane	TOTAL
	tonnes	160,512		13,583	58,464	18,091	102,997	147	454,110	0	17,598	257	
1995	TOE	163,817		14,518	62,488	18,978	110,775	158	442,743	0	19,397	284	833,159
	tonnes	158,394		15,447	62,154	18,964	111,643	112	474,200	0	16,302	253	
1996	TOE	161,655		16,510	66,433	19,893	120,075	120	462,330	0	17,969	280	865,266
	tonnes	198,515		20,958	62,853	15,791	126,001	121	525,739	103	15,193	95	
1997	TOE	202,602		22,401	67,180	16,565	135,517	130	512,580	107	16,747	105	973,934
	tonnes	153,572		21,267	54,119	3,635	89,270	108	463,511	10,893	16,397	304	
1998	TOE	156,734		22,731	57,844	3,813	96,012	116	451,909	11,286	18,074	336	818,856
	tonnes	245,327		25,281	52,403	9,209	106,465	160	523,271	6,035	16,822	195	
1999	TOE	250,378		27,021	56,010	9,660	114,505	172	510,173	6,253	18,542	216	992,931
	tonnes	170,721		27,220	42,692	9,677	113,740	135	428,318	0	16,135	224	
2000	TOE	174,236		29,094	45,631	10,152	122,330	145	417,597	0	17,786	248	817,218
	tonnes	45,619	111,767	29,172	37,501	9,992	89,070	133	545,894	3,000	16,383	131	
2001	TOE	46,558	114,068	31,180	40,083	10,482	95,797	143	532,230	3,108	18,059	145	891,853
	tonnes	53,420	56,617	43,577	31,113	12,386	87,083	160	529,323	3,098	17,369	123	
2002	TOE	54,520	57,783	46,577	33,254	12,993	93,660	172	516,073	3,210	19,145	136	837,523
	tonnes	71,672	109,550	70,186	0	14,719	76,602	98	547,826	3,783	16,997	318	
2003	TOE	73,148	111,805	75,017	0	15,441	82,388	106	534,114	3,920	18,736	352	915,025
	tonnes	22,228	137,851	58,012	0	15,640	98,284	129	577,440	7,274	16,816	195	
2004	TOE	22,686	140,689	62,005	0	16,407	105,707	139	562,986	7,537	18,536	216	936,906
	tonnes	67,731	97,710	68,028	0	0	88,138	151	607,644	15,789	18,177	421	
2005	TOE	69,125	99,722	72,711	0	0	94,794	162	592,434	16,359	20,036	466	965,810

Sources: National Statistics Office and Enemalta Corporation

ENE_C03: Efficiency of Energy conversion and distribution

Efficiency in energy conversion - Average operating efficiency:

(i) Marsa steam plant = 27%

(ii) Delimara Steam plant = 32%

(iii) CCGT = 40%

Note: Refer also Annex 1 Table 9 and Table 10

Efficiency in electricity distribution:

Losses in distribution and unaccounted for = 16 -18 %

(Refer also Table 2)

2.3.1 Energy Intensity

Energy intensity is the ratio between gross inland consumption of energy (kgoe) and the GDP (000 EUR at constant 1995 prices). The gross inland consumption of energy is calculated as the sum of five energy types being coal, electricity, oil, natural gas and renewable energy sources.

The energy intensity for Malta improved slightly from 337 to 292 between 1993 and 2004. An increase was registered in the mid- nineties as shown in Table 6. The energy intensity is however relatively high compared to EU 25 and EU 15 averages.

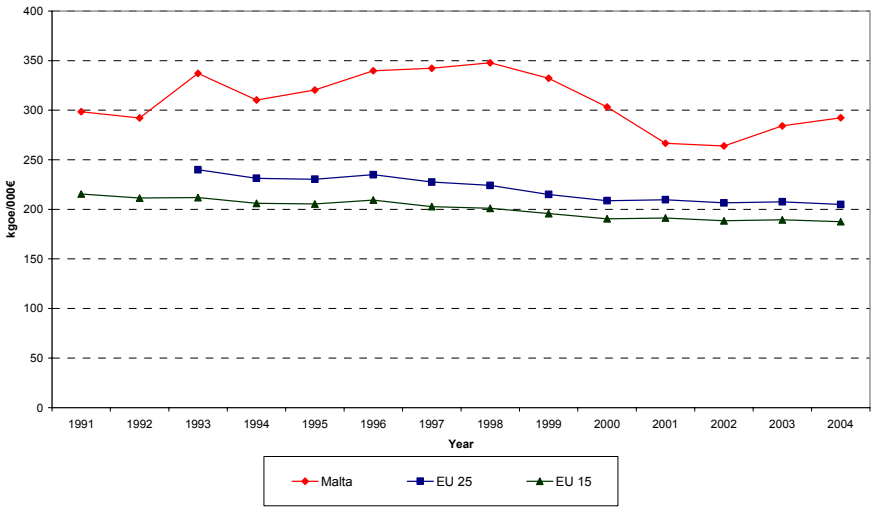
The energy intensity was at its highest in 1998 at 347.7 kgoe/€ 1000.

Table 6: Energy Intensity of the Economy (kgoe/1000 EUR)

	Energy Intensity of the Economy (Kgoe/1000 €)		
	Malta	EU 25	EU 15
1993	337.04	239.89	211.85
1994	310.28	231.34	206.10
1995	320.23	230.39	205.38
1996	339.67	234.98	209.35
1997	342.32	227.58	202.71
1998	347.70	224.16	201.03
1999	332.28	214.94	195.69
2000	303.23	208.76	190.53
2001	266.59	209.71	191.35
2002	263.88	206.51	188.42
2003	284.16	207.56	189.48
2004	292.35	204.89	187.48

Source: Eurostat, 2006

Figure 7: Energy Intensity of the Economy



Source: Eurostat, 2006

Table 7 gives an overview of the final energy consumption in households, trades, services, etc. covers all energy products consumed by private households, small-scale industry, crafts, commerce, administrative bodies, services (with the exception of transportation, agriculture and fishing) (Eurostat 2006).

Table 7: Final Energy Consumption by households, trades, services, etc. (1000 toe)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
EU (25 countries)	430493	420343	427073	457612	440217	442350 (p)	439731	440802	463627	450910 (p)	470440 (p)	471730 (p)
EU (15 countries)	363550	355823	362486	392982	376947	381663 (p)	378928	382866	402200	390452 (p)	409511 (p)	411361 (p)
Malta	123	99	104	120	120	112	121	128	131	136	146	142

Source: Eurostat 2006

2.3.2 Efficiency in Electricity generation and Distribution

The conversion efficiency in Malta's power stations is related to the age of the infrastructure where the average age of the steam turbines at Marsa Power Station is 45 years and the age of the boilers range from 19 to 37 years. At Delimara Power Station, the two steam units are 14 years old while the combined cycle plant (CCGT) is 8 years old. The open cycle gas turbine at Marsa Power Station is 16 years old while those at Delimara Power Station are 11 years old. The average operating efficiency of the operational steam plant at Marsa is 27% compared with an average efficiency of the steam plant at Delimara Power Station of 32% and of the CCGT plant of 40% (Enemalta Corporation, 2006b).

During the past few years, various capacitors have been installed in key areas of the distribution network to improve the power factor, and further reduce losses. This has been accompanied by upgrading works to the 132 kV network to reduce current and losses in the network.

Further opportunities exist to increase the efficiency and reduce energy losses in the generation and distribution processes. This includes:

(i) Replacement of old and inefficient power generation equipment with new plant;
(ii) Greater use of renewable energy sources for power generation as well as for passive devices;
(iii) Greater use of demand management to reduce need to generate electricity using inefficient peaking plant;
(i) improvements in the power factors in the distribution network to reduce losses due to unnecessarily high currents.

2.4 RENEWABLE ENERGY EVOLUTION

ENE_P02: Renewable energy share[5] in the total energy (2006) = 0

ENE_C02: RE capacity installed per inhabitant: wind, photovoltaic and thermal solar

	Estimated capacity		
	2006	**2005**	**2004**
RE capacity per inhabitant (wind) (W/inhabitant) (1)	0 W/inhabitant	0 W/inhabitant	0 W/inhabitant
RE capacity per inhabitant (solar photovoltaic) (2)	0.12 W / inhabitant	0.04 W / inhabitant	0.01 W / inhabitant
RE capacity per inhabitant (solar thermal) (3)	42.9 W_{th} /inhabitant	34.7 W_{th} /inhabitant	27.5 W_{th} /inhabitant

Sources:

1 & 2. Malta Resources Authority

3. European Solar Thermal Industry Federation, 2006 for 2004 and 2005

Government of Malta (Ministry of Finance) data for 2006

Population data based on: National Statistics Office and Ministry of Finance, 2006

The renewable energy share (electricity generated from RES) of the total energy balance is zero. Electricity generated from renewable energy sources in Malta is negligible (approximately 0.003% of electricity consumption).

Currently solar thermal applications constitute Malta's main contribution to renewable energy and these also offset electricity generation. When solar thermal applications are included in the renewable energy share[6] then the contribution is estimated at 0.18% of the total energy share in 2006. The contribution of solar thermal applications is also estimated to be around 0.28% of the electricity generated in 2006.[7] Solar thermal water heaters have seen a significant uptake in 2006 over previous years. In 2006 there were approximately 1564 applications for subsidy on solar water heaters compared to around 360 in each of the two previous years – an increase of around 334 %.

The other schemes however (photovoltaic and micro-wind) were insufficient to stimulate the market with only a limited number (2 participants) applying under the PV scheme and no take-up to the micro-wind scheme.

5 For the purposes of calculating the RES share only "commercial energy" i.e. electricity generated from solar , hydraulic, wind and geothermal is required to be included in the calculation according the Plan Bleu Methodological Sheet for Priority Indicators MSSD7 ENE_P02 and from correspondence with Plan Bleu. Solar thermal applications (solar water heaters) are therefore being excluded for the purposes of reporting on this indicator.

6 When biodiesel use is included, then the total renewable energy share (biodiesel + solar thermal applications) in the total energy share (electricity generation + road transport) in 2006 is estimated at 0.33 %

7 Estimated based on 8,037 solar water heaters in operation with an average daily consumption of 3 kWh spread over 270 days

The causes to the lack of response may also have been diverse for solar photovoltaic and for micro-wind. Despite the grant given to consumers, solar photovoltaic are still considered to be expensive and have relatively long payback periods. The total number of installations notified to, or authorised by, the Malta Resources Authority amount to 24 for a total capacity of 48 kWp.

On the other hand, the lack of market response to micro-wind installations may also be attributed to general lack of knowledge by consumers to RES as well as planning barriers. Property owner intending to install a micro-wind turbine are required to be obtain a full development permit for this installation.

2.5 EXISTING OR EXPECTED EFFECTS AND BENEFITS OF RE AND RUE

ENE_C12: Job creation through the development of renewable energies and rational use of energy

Data not available

ENE_C08: Expenditures in RE and RUE: RE and RUE programmes share in energy investments and R&D expenses

Data not available

2.5.1 Job Creation and Investment

The Draft Renewable Energy Policy for Malta highlights that additional benefits are expected to occur through job creation and investment in local production of components and systems, and in the training and certification of installers. Amongst the policy measures being proposed are:

(i) the strengthening and promotion of institutional capacities in education and information particularly through participation in the Mediterranean Renewable Energy Programme;
(ii) the promotion of continuing professional development with respect to RES. Training, accreditation and certification of providers of RE equipment is essential to prevent against the negative effects of bad workmanship, poor installations and poor quality equipment.
(iii) collaboration and cooperation between the different agencies (University of Malta, Institute of Energy technology, Malta Council for Science and Technology (MCST), the Employment and Training Corporation (ETC), the Malta College for Arts, Science and Technology (MCAST))
(i) Government will promote human resource development and training in these technologies to attract further enterprise and private investment to the country and creation of new jobs in the sector.
(iv) Government encourages the participation of private enterprise. It will identify projects which are appropriate for implementation through 'public private partnership' arrangements, where the risks are shared between the parties (Government of Malta, 2006a).

2.5.2 Research and Development

The Malta Council for Science and Technology (MCST) has been established as the national advisory body to Government on science and technology policy. The MCST is also the national agency responsible for management of the local RTDI programme and the national contact organisation for the Sixth Framework Programme.

In 2006 the Government of Malta published the National Strategic Plan for Research and Innovation (NSRI) 2007-2010. This strategy presents a vision for Research and Innovation (R&I) in Malta based upon a set of underpinning strategic principles namely through

(i) addressing national issues;
(ii) focusing on selected areas of economic performance;
(iii) enabling SMEs to innovate;
(iv) exporting locally generated R&I;
(v) expanding Malta's science, engineering and technology human capital base;
(vi) establishing the nexus between the knowledge institutions and business;
(vii) developing a national pro-Innovation culture supportive of invention, risk-taking and entrepreneurship (Government of Malta, 2006b).

The NSRI notes that Malta Enterprise is currently engaged in a number of R&I policy development actions. It currently operates 22 schemes to support foreign direct investment and local enterprise.

Amongst the support measures are soft loans (Regulation 8 and article 2B) to support enterprise through loans at low interest rates for part financing investments in qualifying expenditure. It is also aimed to encourage investment in ….plant and machinery first used in Malta and for …. research and development. The NSRI notes that the scheme is particular ideal for enterprises intent on increasing competitiveness through the acquisition of tangible and intangible capital assets for more effective and efficient production and supply of service; Innovation; and energy and water conservation.

The NSRI recommends amongst others that "*Government must leverage state R&I finances / funding to address pressing national issues relating to water, energy and the environment*."

The NSRI notes that Government financing and State intervention over the period of the strategy should focus on various areas designated as platforms of strategic importance (PSI). These PSI include amongst other environment and energy resources with focus on solar, wind, and bio energy together with energy efficiency technologies, as well as water, desalination, waste rehabilitation technologies, soil and marine management.

The Strategy places R&I as a fundamental pivot / driver of Maltese economy. The NSRI notes that only through establishing R&I within the economic and supporting institutional fabric can Malta aspire to be a knowledge economy. R&I is not seen as end goals but are considered as critical catalysts upon which growth and wealth are highly dependent – which in turn demands a primary focus towards business driven and applied R&I (Government of Malta, 2006b).

The draft RES policy also notes a series of measures with respect to R&D namely:

(i) the MCST will seek to promote participation in research, development and demonstration projects and the development of innovative solutions with a view to reducing costs of solar power and offshore wind power and mitigation of environmental impacts.
(ii) Government will support and promote participation by its own entities and non-governmental organisations in EU funded RTD projects.
(iii) Government will seek to promote research and innovation in application of RES to local conditions such as in solar thermal and cooling technologies and application of ground source heat pumps particularly for large buildings.
(iv) Government will lead by example in the introduction of renewable energy technologies. Government will promote installation of photovoltaic systems and micro wind energy systems on public buildings and information and results of these demonstration projects disseminated to the public. (Government of Malta, 2006a).

3. PROPOSALS FOR MORE SUSTAINABLE ENERGY DEVELOPMENT

3.1 PROPOSAL FOR A SUSTAINABLE ENERGY DEVELOPMENT

3.1.1 Strategy for Sustainable Development

Government's proposals for more sustainable energy development are outlined in the draft energy policy and the renewable energy policy as highlighted in section 2.1.2.

In addition to this, the National Commission for Sustainable Development (NCSD) was established by the Environment Protection Act (Cap 435 of the Laws of Malta). Its functions are established in the same act. These include identification of relevant processes or policies which may be undermining sustainable development and propose alternative processes or policies to the Government for adoption and preparation of a National Strategy for Sustainable Development.

The Commission is made up of representatives of a wide spectrum of Maltese society. It includes all Ministers or their representatives, two members of the House of Representatives, the Chairman of the Malta Council for Economic and Social Development, representatives of various public entities, the association of local councils and representatives of organisations which represent or have an interest in business, industry and/or industrial relations, scientific and academic bodies, the media, and other non-governmental organisations.

The NCSD has since 2002 been involved in proposing and drafting a National Strategy for Sustainable Development. This National Strategy is now in its fourth draft. The process leading to its development included extensive public consultation and the involvement of government ministries, departments and public sector agencies. The Strategy has been adopted by the Commission for submission to the Cabinet of Ministers for possible endorsement by the Government of Malta.

The sustainable development strategy proposes 20 priority areas for Malta. These areas were given major importance during the consultation process and the NCSD considered them as warranting foremost attention for the attainment of sustainable development goals in Malta. These priority areas were accompanied by indicators and targets. Of particular and direct relevance are the following priority areas:

3.1.1.1 Climate Change

The NCSD is recommending that steps are taken to reduce greenhouse gas emissions through transport policy and an energy policy that seeks to promote environmental protection, competitiveness and security of supplies, and as a result decouple the rate of growth of GHG emissions from economic growth.

3.1.1.2 Air Quality

The NCSD is proposing that remedial action is taken to control emissions of air pollutants (ambient levels of particulate matter, sulphur dioxide, carbon monoxide, benzene, lead, ozone, heavy metals and nitrogen oxides) and achieve compliance with European standards (National Commission for Sustainable Development, 2006).

ANNEX 1

A1.1 - FUNCTIONS OF THE MALTA RESOURCES AUTHORITY

Article 4 of the Malta Resources Authority Act, 2000 (Chapter 423 of the Laws of Malta) establishes that the Authority shall have the following functions:

(a) to regulate, monitor and keep under review all practices, operations and activities relating to energy, water and mineral resources;
(b) to grant any licence, permit or other authorisation, for the carrying out of any operation or activity relating to energy, water and mineral resources;
(c) to regulate and secure interconnectivity for the production, transmission and distribution of the services or products regulated by or under this Act;
(d) to ensure fair competition in all such practices, operations and activities;
(e) to establish minimum quality and security standards for any of the said practices, operations and activities and to regulate such measures as may be necessary to ensure public and private safety;
(f) to secure and regulate the development and maintenance of efficient systems in order to satisfy, as economically as possible, all reasonable demands for the provision of the resources regulated by or under this Act;
(g) to carry out studies, research or investigation on any matter relating to the resources regulated by or under this Act;
(h) to provide information and issue guidelines to the public and to commercial and other entities on matters relating to the said resources;
(i) to regulate the price structure for any activity regulated by this Act and where appropriate to establish the mechanisms whereby the price to be charged for the acquisition, production, manufacture, sale, storage and distribution thereof is determined;
(j) to establish the minimum qualifications to be possessed by any person who is engaged or employed in any activity regulated by or under this Act;
(k) to establish measures for the protection of the environment in the practices, operations and activities regulated by or under this Act;
(l) to ensure that international obligations entered into by the Government relative to the matters regulated by or under this Act are complied with;
(m) to advise the Minister on the formulation of policy in relation to matters regulated by this Act, and in particular in relation to such international obligations;
(n) otherwise to advise the Minister on any matter connected with its functions under this Act;
(o) to formulate and implement the policies and strategies with short-term and long-term objectives, in relation to the activities regulated by this Act;
(p) to perform such other functions as may from time to time be assigned to it by the Minister.

In addition with respect to energy resources the Authority is also responsible for:

(i) promoting, encouraging and regulating the harnessing, generation and use of all forms of energy; and
(ii) encouraging the use of alternative sources of energy and for such purpose in accordance with such regulations as may be prescribed, to impose levies on energy produced by non renewable sources and grant subsidies in connection with the production of energy from renewable sources.

Table 8: Power generated 1970- 2006

Year	Power generated - MWh
1970/1971	284,703
1971/1972	309,991
1972/1973	334,362
1973/1974	347,325
1974/1975	310,274
1975/1976	351,170
1976/1977	386,920
1977/1978	432,469
1978/1979	469,613
1979/1980	509,823
1980/1981	550,333
1981/1982	558,559
1982/1983	652,168
1983/1984	715,471
1984/1985	767,283
1985/1986	826,233
1986/1987	933,409
1987/1988	995,233
1988/1989	1,095,024
1989/1990	1,143,573
1990/1991	1,180,396
1991/1992	1,336,137
1992/1993	1,351,802
1993/1994	1,425,921
1994/1995	1,547,512
1995/1996	1,553,960
1996/1997	1,580,787
1997/1998	1,611,512
1998/1999	1,723,722
1999/2000	1,801,646
2000/2001	1,825,689
2001/2002	1,931,086
2002/2003	2,082,922
2003/2004	2,116,183
2004/2005	2,214,892
2005/2006	2,263,145

Source: Enemalta Corporation

Table 9: Installed generating plant at Marsa Power Station

Unit	Commissioning date1	Age of plant (years) [1]	Nominal Rating (MW)	Actual Rating (MW)	Efficiency [2] %	Remarks
Steam T/A 3	1970	36	30	30		
Steam T/A 4	1970	36	30	30	25	
Steam T/A 5	1982 (1952)	24 (54)	30	30		
Steam T/A 6	1983 (1952)	23 (54)	30	30		
Steam T/A 7	1984 (1952)	22 (54)	30	30		
Steam T/A 8	1987 (1959)	19 (47)	60	60	29	
Gas T/A 1	1990	16	37.5	W 36.5 S 30	32 (at base load)	Typical efficiency at part loads < 19 %
Bolier 3	1969	37	35	25		In service
Bolier 4	1969	37	35	25		In service
Bolier 5	1982	24	35	25		In service
Bolier 6	1982	24	35	35		In service
Bolier 7	1984	22	70	70		In service
Bolier 8	1987	19	70	60		In service

Notes: 1 Figure in brackets represents original commissioning abroad for reconditioned plant
2 Efficiency given is total unit efficiency (from combustion of fuel and includes auxiliary consumption).

Source: Enemalta Corporation 2006b

Table 10: Installed generating plant at Delimara Power Station

Unit	Commissioning date	Age of plant (years)	Nominal Rating (MW)	Actual Rating (MW)	Efficiency %	Remarks
Steam Unit 1	1992	14	60	60	32	
Steam Unit 2	1992	15	60	60	32	
Gas Turbine No 1	1995	11	37.5	W 36 S 30		Part load efficiency 20%
Gas Turbine No 2	1995	11	37.5	W 36 S 30		Part load efficiency 20%
Combined Cycle Plant	1998	8	110	W 110 S 90	46 (at base load)	Efficiency of 39% at typical operation

Source: Enemalta Corporation 2006b

Table 11: Current Retailed Petroleum Products (as on 1st January 2007)

Unleaded Petrol	42c6 / litre
Lead Replacement Petrol	45c6 / litre
Diesel	38c9 / litre
Kerosene	39c0 / litre
Light Heating Oil	24c0 / litre
Thin Fuel Oil 200 sec	LM 136.50 / tonne
Thin Fuel Oil 450 sec	LM 130.00 / tonne
Thin Fuel Oil 950 sec	LM 120.00 / tonne

Table 12: Summary of Electricity Tariffs (with effect from 1st January 2007)

Summary of Electricity Tariffs applicable to supply Final Customers by Enemalta Corporation (From 1st January 2007)

		Type Of Consumer	Meter Rent	Consumption Charge			Fuel Surcharge
Domestic	Tariffs Inclusive of VAT	All (including charitable organisations)	Lm 12 per annum	Block 1	0 - 600 units	Free	A 54% surcharge on the net billed consumption of water and electricity is applicable from 1st January 2007.
				Block 2	1 person 800 units	2c per kWh	
					2 persons 1050 units		
					3 persons 1375 units		
					4 persons 1800 units		
					>5 persons 2350 units		
				Block 3	up to 6400 units	4c per kWh	
				Block 4	more than 6400 units	4c5 per kWh	
		Social Assistance	Free	Block 1	0 - 600 units	Free	Not Applicable
				Block 2	1 person 800 units	2c per kWh	
					2 persons 1050 units		
					3 persons 1375 units		
					4 persons 1800 units		
					>5 persons 2350 units		
				Block 3	up to 6400 units	4c per kWh	
				Block 4	more than 6400 units	4c5 per kWh	

Type Of Consumer				Meter Rent	Consumption Charge		Fuel Surcharge	
Commercial	Tariffs Exclusive of VAT	All (including garage, marine, craft, temporary installations, street lighting but excluding hotels and guesthouses)	Option 1: Tariff measured in kWh	Lm 24 per annum	0 -200 units	Free	A 54% surcharge on the net billed consumption of water and electricity is applicable from 1st January 2007	
					more than 200 units	3c7 per kWh		
			Option 2: Tariff measured in kVAh (applicable only if consumption is >100 A/Phase)	Lm 24 per annum	all units	3c4 per kVAh		
		Hotels & Guesthouses	Option 1: Tariff measured in kWh	Lm 24 per annum	0 -200 units	Free	A 54% surcharge on the net billed consumption of water and electricity is applicable from 1st January 2007	Consumption p.a. <= Lm10,000; Surcharge <=Lm6,300p.a.
					more than 200 units	3c6 per kWh		Consumption p.a. >Lm10,000 but <Lm20,000; Surcharge <=Lm8,400p.a.
								Consumption p.a.>Lm20,000 but <Lm30,000; Surcharge <=Lm12,600p.a.
								Consumption p.a.>Lm30,000 but <Lm40,000; Surcharge <=Lm16,800p.a.
			Option 2: Tariff measured in kVAh (applicable only if consumption is >100 A/Phase)	Lm 24 per annum	all units	3c3 per kVAh		Consumption p.a.>Lm40,000 but <Lm50,000; Surcharge <=Lm21,000p.a.
								Consumption p.a.>Lm50,000 but <Lm100,000; Surcharge <=Lm25,200p.a.
								Consumption p.a.>Lm100,000 but <Lm150,000; Surcharge <=Lm29,400p.a.
								Consumption p.a.>Lm150,000; Surcharge <=Lm33,600p.a.

Type Of Consumer				Meter Rent	Consumption Charge		Fuel Surcharge
Industrial	Tariffs Exclusive of VAT	Over 100A/Phase	Tariff 1: Consumption metered in kWh and kW	Lm 24 per annum	0 - 200 units	Free	A 54% surcharge on the net billed consumption of electricity and water is applicable from 1st January 2007 . Provided that in the case of factories the applicable surcharge shall not exceed the amount of Lm 21,000 per annum
					more than 200 units	2c8 per kWh	
					Maximum Demand	Lm8.00 per kW	
			Tariff 2: Consumption metered in kVAh and kVA	Lm 24 per annum	all units	2c6 per kVAh	
					Maximum Demand	Lm7.50 per kVA	
		Consumption Exceeding 5.5 GVAh or 5 GWh	Tariff 1: Consumption metered in kWh and kW	N/A	Between 0600 hrs and 2200 hrs	2c5 per kWh	
					Between 2200 hrs and 0600 hrs	2c3 per kWh	
					Maximum Demand	Lm6.70 per kVA	
			Tariff 2: Consumption metered in kVAh and kVA	N/A	Between 0600 hrs and 2200 hrs	2c4 per kVAh	
					Between 2200 hrs and 0600 hrs	2c2 per kVAh	
					Maximum Demand	Lm6.70 per kVA	

These tariffs are regulated by regulations 33, 34, 37, 38 and 39A of the Electricity Supply Regulations (as amended by Legal Notice 27 of 1999, Legal Notice 99 of 2003 and Legal Notice 132 of 2005, Legal Notice 409 of 2005,Legal Notice 37 of 2006, Legal N

These tariffs may be subject to conditions, exceptions and exemptions that are not reproduced in this summary.

Source: Malta Resources Authority

REFERENCES:

Commission of the European Communities, 2006. *Commission Decision of 29 November 2006 concerning the national allocation plan for the allocation of greenhouse gas emission allowances notified by Malta in accordance with Directive 2003/87/EC of the European Parliament and of the Council.*

Enemalta Corporation 2006a. *Electricity Distribution* **http://www.enemalta.com.mt/page.asp?p=927&l=1** accessed on 21st December 2006

Enemalta Corporation 2006b. *Electricity Generation Plan 2006 – 2015.* Enemalta Corporation. Malta

European Solar Thermal Industry Federation, 2006. Solar Thermal Market in Europe (Trends and Market Statistics 2005. **www.estif.org** accessed on 2nd February 2007.

Eurostat, 2006, *Environment and Energy*. **http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/&product=Yearlies_new_environment_energy&depth=4** accessed on 18th October 2006

Government of Malta, 2006a. *A Draft Renewable Energy Policy for Malta.* Government Press. Malta

Government of Malta 2006b. *National Strategic Plan for Research and Innovation 2007-2010. Building and Sustaining the R&I Enabling Framework*. Government Printing Press, Malta.

Government of Malta, 2006c. *National Strategic Reference Framework. Malta 2007-2013. Draft Document for Consultation.* Malta

Hackl, A. 2005. *Report Waste to Energy. Scenarios for Waste Management Treatment in Malta*. Report submitted to WasteServ Malta Ltd. 9th June 2005. Unpublished.

Malta Environment and Planning Authority, 2006. *State of the Environment Report, 2005.*

Malta Freeport Terminals Ltd. 2007. *Container Terminals – Traffic*. **http://www.freeport.com.mt/ContainerShipCalls.asp** accessed on 22nd February 2007.

Malta Resources Authority, 2005. *Offshore Wind Resource Potential. Part 1: Main Report. Part 2: Annexes*. Draft Report. Unpublished.

Malta Resources Authority, 2005. *Offshore Wind Resource Potential. Part 1: Main Report. Part 2: Annexes*. Draft Report. Unpublished.

Ministry of Finance, 2006. *Economic Survey October 2006.* Government Press, Malta.

Ministry for Resources and Infrastructure 2007. *Oil Exploration Department* **http://www.mri.gov.mt/oed.htm** accessed on 8th January 2007

Ministry for Resources and Infrastructure, 2004. *Report on the application of Directive 2003/30/EC (promotion of the use of biofuels or other renewable fuels for transport) in accordance with Article 4(1)*. Government of Malta, Malta.

Ministry for Resources and Infrastructure, 2005a. *Report by Malta to the European Commission on the implementation of Directive 2001/77/EC on the promotion of electricity from renewable energy sources.* Government of Malta, Malta.

Ministry for Resources and Infrastructure, 2005b. *Report submitted to fulfil requirements of Article 4 of Directive 2003/30/EC on the promotion of biofuels and other renewable fuels for transport*, Government of Malta, Malta.

Ministry for Resources and Infrastructure, 2006a. *A Proposal for an Energy Policy for Malta*. Malta

Ministry for Resources and Infrastructure, 2006b. *Malta's Annual Report for 2005 submitted to fulfil requirements of Article 4 of Directive 2003/30/EC on the promotion of biofuels and other renewable fuels for transport.* Government of Malta, Malta.

Ministry for Rural Affairs and the Environment). 2004. *National Allocation Plan for Malta (2005-2007)* submission to the EU Commission, 18th October 2004;

Ministry for Rural Affairs and the Environment). 2006. *National Allocation Plan for Malta (2008 – 2012)* submission to the EU Commission, September 2006.

Ministry for the Environment, 2001. *A Solid Waste Management Strategy for the Maltese Islands.* Office of the Director General, Floriana, Malta.

Mott MacDonald, 2005. *Strategy for Renewable Electricity Exploitation in Malta.* Final Report. Volume 1 & Annexes A – I. July 2005. Unpublished.

National Commission for Sustainable Development, 2004. *A Sustainable Development Strategy for the Maltese Islands 2007-2016*. Unpublished.

National Statistics Office, 2003. *Household Budgetary Survey, 2000.* National Statistics Office, Malta.

Sammut, C. and Micallef A. (ed), 2004. *The First Communication to the United Nations Framework Convention on Climate Change.* Ministry for Rural Affairs and the Environment, Malta.

Suri, M. Huld, T.A., Dunlop, E., 2004. *Regional Differences of the PV Electricity Production in EU25 Countries*, in 19th European Photovoltaic Solar Energy Conference and Exhibition 7-11 June 2004, Paris, France

Sustech Consulting, International Biogas and Bioenergy Competence Centre IBBK, 2005. *Agricultural Waste Management Plan for the Maltese Islands*. Draft Final Report. Unpublished.

Water Services Corporation, 2000. *The Report for 1999-2000.* Water Services Corporation, Malta.

Water Services Corporation, 2001. *Annual Report 2000-2001 activities, statistics, environmental and water quality reviews.* Water Services Corporation, Malta.

Water Services Corporation, 2006. *Drinking Water Quality Project. ERDF 28.* Unpublished.