Malta Indicative National Energy Efficiency Target for 2020 in accordance with Article 3 of Directive 2012/27/EU

April 2013

Contents

Glossary of Terms

Abbreviations	Description
BAT	Best Available Technology
BRB	Buildings Regulations Board
CCGT	Combined Cycle Gas Turbine
CCTV	Closed Circuit television
DC	Distribution Centre
DPS	Delimara Power Station
EPBD	Energy Performance in Buildings and Dwellings
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
GVA	Gross Value Added
HV	High Voltage
HVAC	High Voltage Alternating Current
IPPC	Integrated Prevention Polluted Prevention
ITMS	Intelligent Traffic Management System
ITS	Intelligent Transport Systems
kV	Kilo Volt
LCPD	Large Combustion Plant Directive
LNG	Liquid Natural Gas
MBT	Mechanical Biological Treatment Plant
MEPA	Malta Environment and Planning Authority
MPS	Marsa Power Station
MRA	Malta Resources Authority
MSW	Municipal Solid Waste
MW	Megawatt
NEEAP	National Energy Efficiency Action Plan
NREAP	National Renewable Energy Action Plan
NSO	National Statistics Office
NZEB	Nearly Zero Energy Buildings
PCI	Project of Common Interest
RDF	Refuse Derived Fuel
SPA	Special Protected Area
TEN-E	Trans Energy Networks
TJ	Terrajoules
VMS	Variable Message Service

Malta Indicative National Energy Efficiency Target for 2020 in accordance with Article 3 of Directive 2012/27/EU

1. Overall Context of the Report

Article 3 of Directive 2012/27/EU provides for the establishment of an indicative national energy efficiency targets for 2020 in each member state. This national energy efficiency target has to be based on primary or final energy consumption, primary or final energy savings or energy intensity.

This report describes the basis of the calculation of the Malta Indicative National Energy Efficiency target for 2020.

2. Calculation methodology

2.1. End-use measures and final energy savings

The methodology in the "Recommendations on Measurement and Verification Methods in the Framework of the Directive 2006/32/EC on Energy End-Use Efficiency and Energy Services" has generally been used for the calculations of the savings in the 2nd National Energy Efficiency Action Plan (NEEAP) 2011. These forecasted savings have been used for the transport sector and for the other end-use measures for the calculation of the 2020 indicative energy efficiency target. It was assumed that the savings will continue to grow at the same rate till 2020. The bottom up approach used in the second NEEAP for energy savings of individual measures have been used in the calculation.

Energy savings for the improvement in power generation have been estimated by calculating the difference between the generation of the old electricity plants and the new electricity plants. The power generation savings have not been taken into consideration for the calculation of the energy savings in final energy consumption.

The a-priori assessment of the energy efficiency savings does not take into account the effects of multiplier effects and free-riders. These calculated savings are to be taken as indicative only, and are generally realistic and achievable.

2.2 List of strategies with an impact on final energy demand

The NEEAP is an action plan that fits in, as well as reports on, specific energy efficiency actions proposed in, various Government policies. Synergy with action undertaken at various levels of government is essential. The following national policies have an impact on energy efficiency:

2.2.1 Policy/Strategy

- National energy policy
- National strategy for policy and abatement measures relating to the reduction of green house gas
- emissions
- Operational programme 1 – Investing in competitiveness for a better quality of life 2007 — 2013
- National budgets
- Vision 2015 for the Maltese Islands – OPM
- Structure plan (spatial policy)
- Policy guidelines on micro-wind turbines – MEPA
- National Environment Policy
- National Action Plan for Green Public Procurement

2.3 Energy Policy[1]

The Energy Policy for Malta has been published in December 2012. The policy is based on three overriding and horizontal objectives; security of supply, competitively priced energy services and environmental responsibility. The policy addresses these objectives in six policy areas:

- Energy efficiency
- Reducing reliance on imported fuels
- Stability in energy supply
- Reducing the emissions from the energy sector
- Delivering energy efficiently and effectively
- Ensuring that the energy sector can deliver

In addressing the country's energy challenge, Malta's energy policy is significantly influenced by a number of EU energy and environmental policies. The targets set by the relevant EU Directives for Malta are as follows:

- Energy End Use Efficiency: 9% by 2016;
- Energy Efficiency Directive 2012/27/EU: 22% by 2020 (refer to Annex 1)
- Renewable Energy Target: 10% of final energy consumption by 2020;
- Bio-fuel contribution in the fuel mix: 10% of final energy consumption of fuels by 2020;
- Energy Performance of Buildings Regulations 2010/31/EU: Tightening of existing minimum standards as from 2013 and a further tightening by 2017. By 2018 Public Authority Buildings will qualify for nearly zero energy buildings
- Reduction in GHG emissions under Effort Sharing Decision: +5% over 2005 levels by 2020.

Energy efficiency is a key policy area outlined in the Government's energy policy for Malta. It can have a significant impact on the demand for energy, and so can reduce the country's energy consumption and the release of GHG emissions. The draft national energy policy commits to co-ordinate all initiatives set out within NEEAP and to propose new initiatives.

2.4 National targets for nearly zero energy buildings

The carbon footprint of all building categories still has to be established by means of expert studies and analyses of data collected from energy performance certificates and other sources. This will make it possible to re-define targets more precisely in order to achieve real energy savings by means of the cost optimal methodology.

The strategies for achieving the national targets for "zero energy" buildings are twofold:

1. Tighten existing minimum requirements of energy performance for the Building Envelope in new buildings and buildings undergoing major renovation by 30% to 50% of current threshold in building fabric requirements as from 2013. These minimum requirements will be upgraded by a further tightening of 20% to 30% as from 2017. The percentage tightening depends on the building category and cost optimality.

2. Increase the energy harvest from renewable energy sources to decrease the use and dependency on fossil fuels by regulating (a) the allocation of use of at least 50% of the roof space in new buildings for the installation in such space of renewable energy sources, or (b) providing an alternative permanent structure to cater for such a requirement and (c) by providing subsidies for the installation of RES equipment.

Both of these strategies will reduce the carbon dioxide emissions from energy use in buildings.

[1] The National Energy Policy for the Maltese Islands

It is envisaged that by the end of 2018 all new buildings being constructed for the use of public authorities will qualify as nearly-zero energy buildings.

The refurbishment and transformation of existing buildings into nearly zero-energy building stock will be encouraged. The feasibility of adopting market-based instruments such as grants, tax deductions and others to achieve such objective will also be assessed. Such instruments may be applied for those owners who will enter into a commitment that clearly shows that their building will have higher energy efficiency and nearly-zero net energy use. The Energy Performance Certificate will be the main document displaying this improvement.

The above policy is mainly governed by the recently transposed Directive 2010/31/EU, on the Energy Performance of Buildings, into Maltese law through the Energy Performance of Buildings Regulations, 2012 (LN 376/2012 of 30 October 2012).

2.5 Review of energy saving targets and achievements

The calculations in the second NEEAP and Annex 1 of this document indicate that the target of 3% for 2010 has been achieved, and marginally exceeded. It has been reported in the second NEEAP that mainly results have been achieved from the industrial sector (including early actions in the water sector), the domestic sector (due to schemes to replace appliances, change lighting systems and install solar water heaters), as well as in the transport sector (due to changes in the fleet composition that brought about changes in the vehicle registration system).

Primary energy savings assumes that the power extension and the interconnector count towards the target, and that in primary energy, aviation is capped at 4.12%. National Navigation is included in the calculation.

Final energy consumption does not include maritime bunkering[2]. Final energy savings do not include the power station extension and the interconnector savings[3], aviation is capped at 4.12% [4]and maritime bunkering is excluded from the calculations.

Year	Primary Energy Projections (in absolute terms (toe)) refer to annex 1		Final Energy Projections (in absolute terms (toe)) refer to annex 3	
	Savings	Consumption	End-use Savings	Consumption less end-use Savings
2020	237,019	825,492	30,358	493,473

Table 1 Overview of 2020 Target and Projections

2.6 National context of energy savings

The main tangible efforts during the past three years have been on promoting energy efficiency in the domestic sector, tourism and industry. A number of schemes have been issued targeting these sectors and the uptake was very successful. Measures for the Public sector and Transport sector were also devised but more effort is to be made in these sectors since there is more

[2] This is in line with Article 3(a) of Directive 2006/32/EC of the European Parliament and of the Council of the on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC2006/32/EC.

[3] The power station extension and interconnector savings are not included as these are primary energy savings, which do not feature in final energy savings.

[4] This is in line with Article 5(6) of Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directive 2001/77/EC and 2003/30/EC.

potential to be realised in both sectors. SMEs were the least focused on. Government accepts the commitment to improve energy efficiency in the Public Sector and Industry in accordance to the requirements of Articles 5 and 8 of the Energy efficiency Directive 2012/27/EU. Government will also make an effort to identify measures to promote energy efficiency measures in SMEs.

3 PRIMARY ENERGY SAVINGS

3.1 Primary energy targets, primary energy consumption projections

The indicative target for 2020 is based on primary energy consumption for Malta, capped for aviation in the same manner as the target for renewable sources of energy. It is based on national models of energy consumption projections, and assumes primarily that the energy end use savings envisaged in the NEEAP are achieved and that the new interconnector with Sicily is commissioned.

Indicative National Energy Efficiency target 2020: 22% or 237,019 toe in primary energy

Baseline 2010 Energy Efficiency 3% or 23,321 toe in primary energy

The basis for this target is that aviation is capped at 4.12% in line with Directive 2009/28/EC on the promotion of the use of energy from renewable sources. The business as usual scenario assumes the power station conversion efficiency of 30.31% of 2009 remaining unchanged.

3.2 List of strategies addressing primary energy savings

The main use of fossil fuels in Malta is for the generation of electrical energy for onward distribution and consumption within the Maltese Islands.

Electrical power is generated by two conventional thermal power stations owned by Enemalta Corporation and located in Marsa and in Delimara. These power plants utilise heavy fuel oil for conventional steam plant (boiler/turbo-generation) and gasoil for gas turbines.

The Marsa Power Station houses the older generation plant, some of which is past its expected useful life both from a technical and economic perspective. A large portion of the steam plant at this station was purchased second hand and dates back to the early 1950s. The Delimara Power Station houses plant installed in the early 90s, which was commissioned between 1992 and 1998 mostly using modern and cleaner technologies.

Government has established energy efficiency as an important consideration for the authorisation of any new generation plant by the Malta Resources Authority. Energy efficiency is also one of the environmental criteria stipulated in the IPPC Directive. Use of Best Available Techniques (BAT) is also a criterion for allocation of allowances to new entrants under ETS directive. The IPPC Directive is an important regulatory instrument for large industrial installations. A main requirement is the utilisation of BAT in operation of plants. Current as well as future operators will have to abide by the provisions in this directive – it would be useful to present the implications both on current and any future operators within the sector and the possible impacts on final consumers.

Key actions considered in the indicative energy efficiency target calculation:

- Interconnector with Sicily, that will raise the conversion efficiency to an average of 40%;
- Extension of the power station at Delimara, with an investment of €165million which was completed in December 2012. In addition, the boilers at the existing plant in Delimara have been modified in-house to reduce emissions.

3.2.1 Load Considerations[5]

The daily electricity demand for the Maltese Islands exhibits a profile that is typical of a small isolated system and based on such a profile the different machines are dispatched to cover base load conditions or peak demand conditions. Figure 1 illustrates a typical load dispatch chart showing the different dispatching period for the different machines.

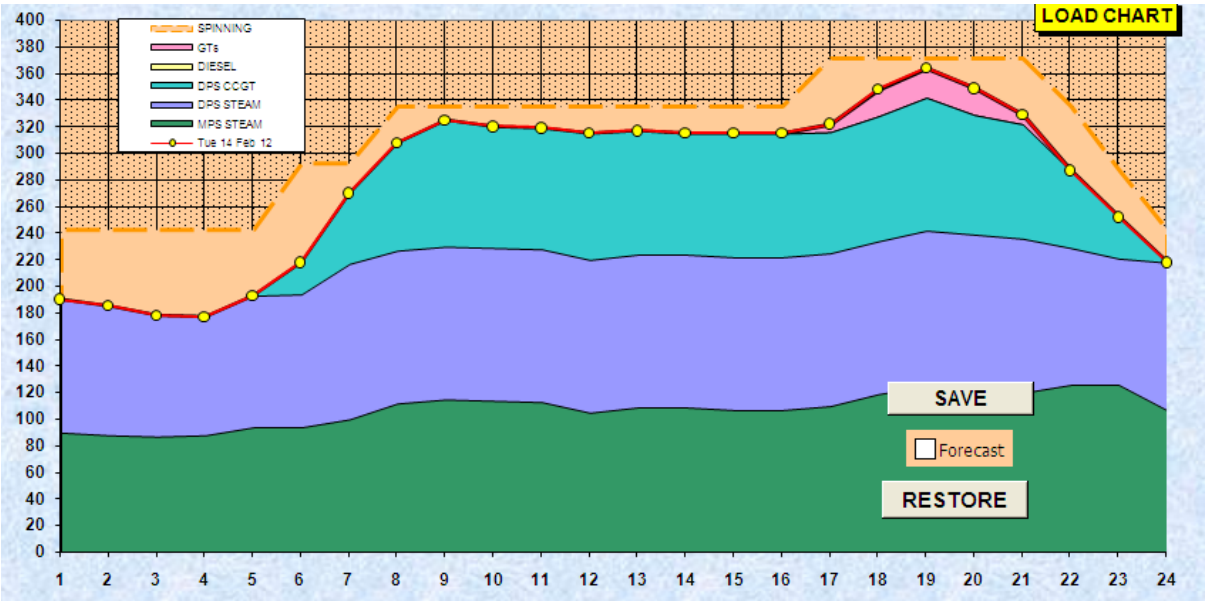

Figure 1 A typical load dispatch chart showing the different dispatching period for the different machines.

The seasonal variation in demand for a period of 24 hours is shown in Figure 2. The occurrence of a peak demand is highly dependent on seasonal variation and weather conditions, with demand peaks in summer occurring during the early afternoon period and demand peaks in winter occurring during the evening.

Figure 2 shows the monthly generated units for the last nine years, which clearly depict the summer and winter peaks. Figure 3 shows the total annual production of electricity in Malta between 1980 and 2012. The total electricity generated during the calendar year 2012 was 2.269 TWh.

[5] Enemalta Corporation Data

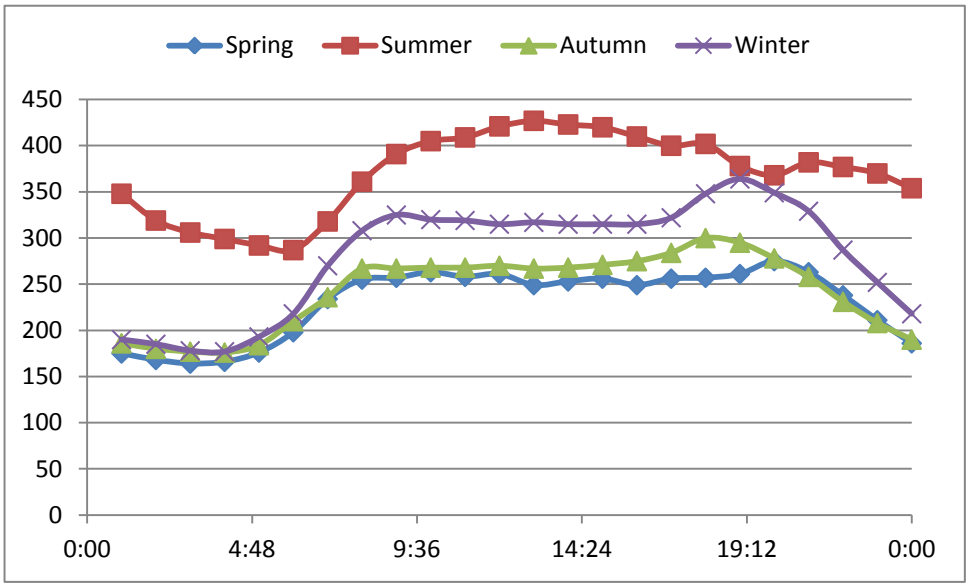

Figure 2: Monthly generated units for the last nine years

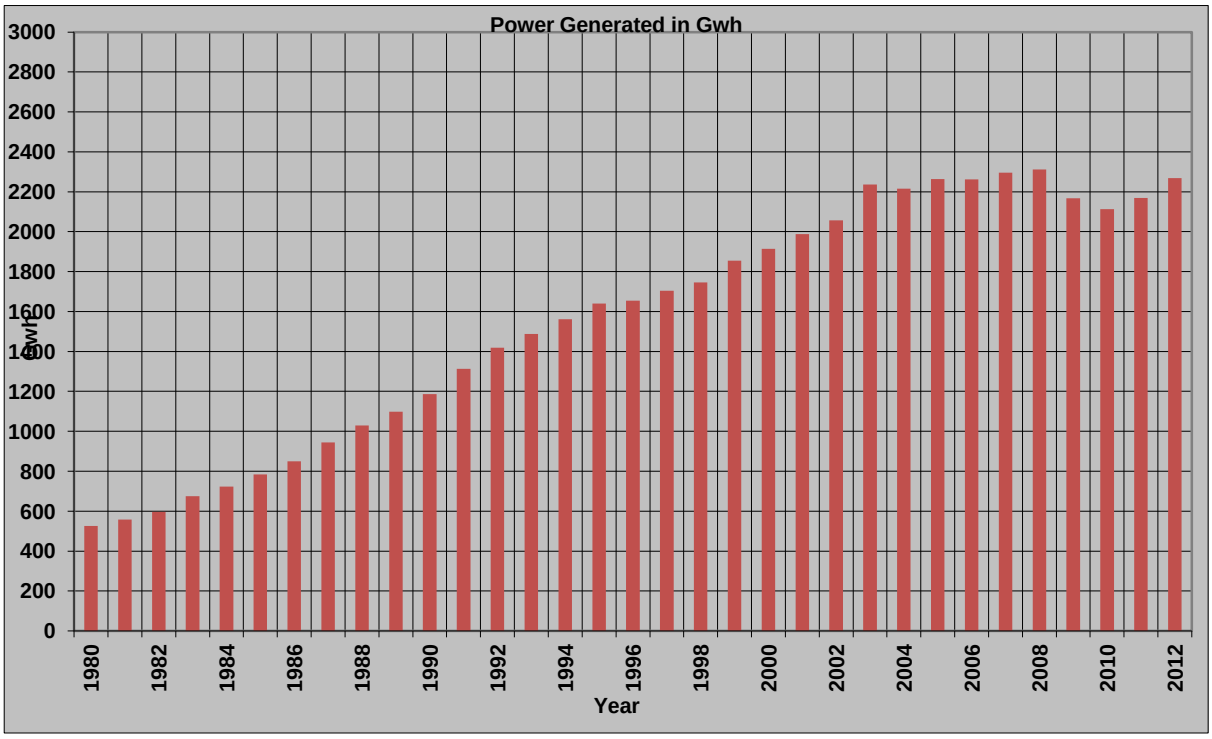

Figure 3: *Total annual production of electricity in Malta between 1980 and 2012*

Demand Projections for 2010-2020[3]

Based on past demand growth rates Enemalta produced a forecast for the electricity demand between 2013 and 2020. Figure 4 illustrates the results of the forecast analysis.

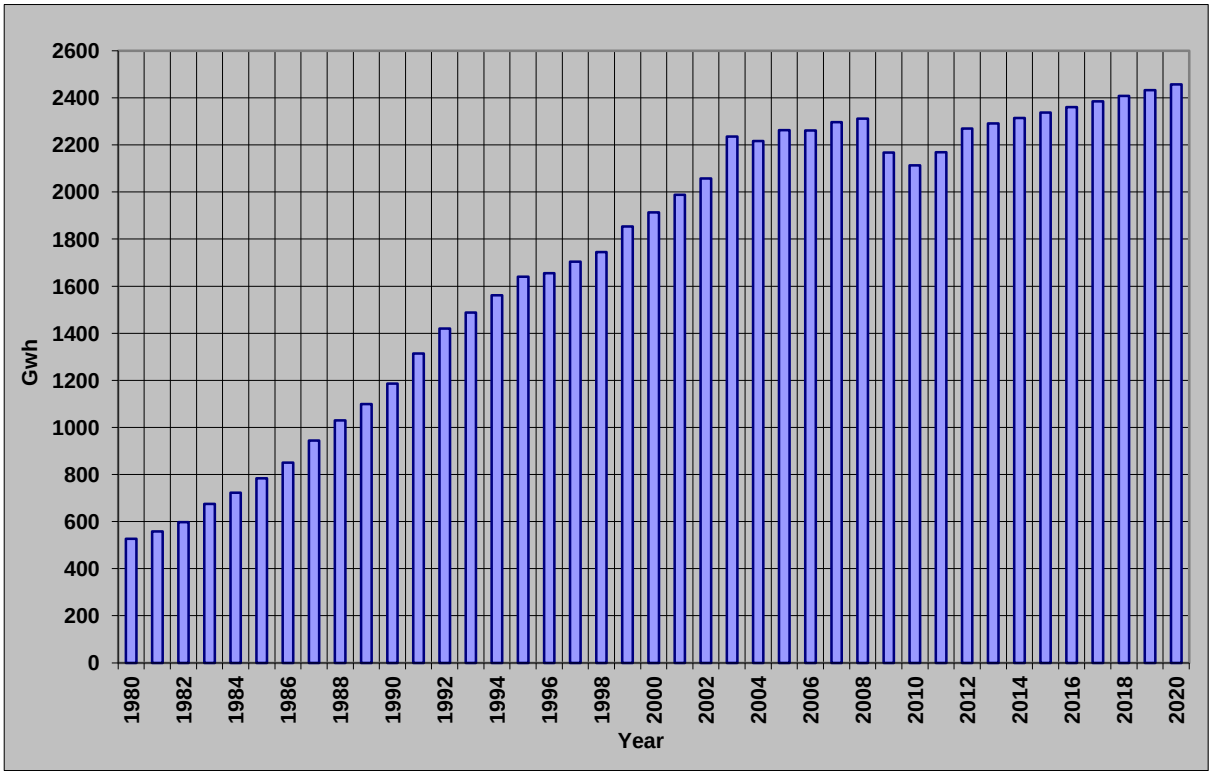

Figure 4: Forecast Electricity Demand

3.3 Measures for primary energy savings

As provided for in the energy services directive, and as described in the first NEEAP, there are a number of supply side measures-

3.3.1 Plant load and fuel switching

The Marsa Power Station (MPS) currently still provides about one quarter of the national installed electricity generating capacity. Enemalta has availed itself of the derogation available under the LCPD for this installation, wherein the plant will continue to be operated for a limited time only and the remaining inefficient plant will be decommissioned following the placing in service of the new 200MW HVAC sub-sea interconnector to Sicily in 2014.

Since 2008, plant dispatch and load management has changed, with a larger proportion of the load being met by the CCGT and the new Diesel Engine (DE) plant in DPS. Due to the higher efficiency of these two generating plants at DPS, less fuel is used to generate each MWh leading to a reduction in CO_2 emissions.

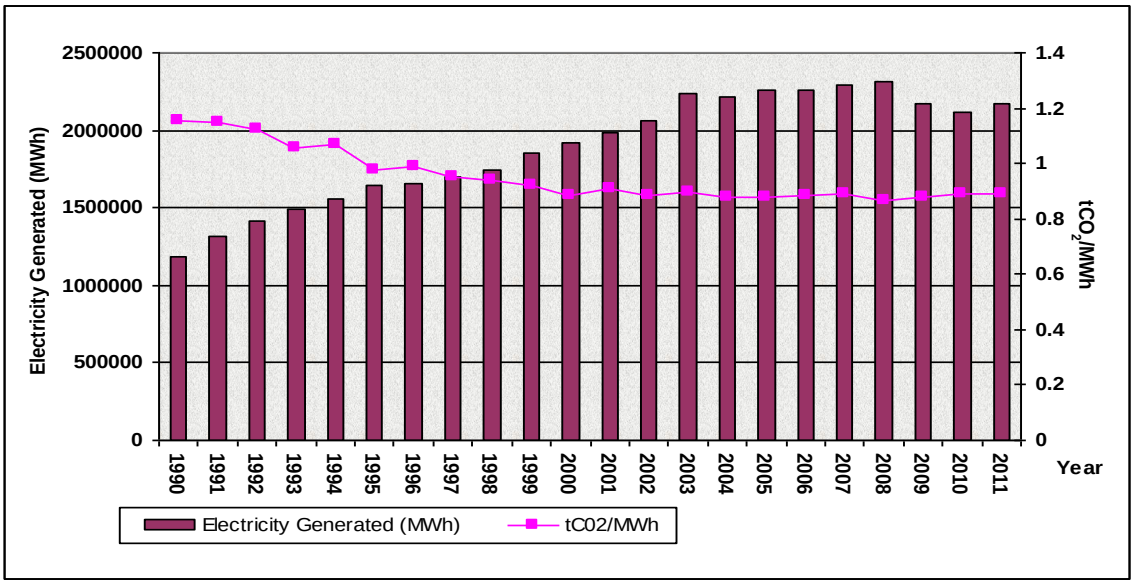

Figure 1: Electricity Generated and tCO_2/MWh[6]

3.3.2 Installation of new efficient generating capacity

Enemalta Corporation has installed and commissioned 149 MW of new DE generating capacity at the Delimara in 2012. The generation from this plant has resulted in the reduction of output from the less efficient plant at the Marsa Power Station.

The plant has a capacity of 149MW and consists of eight diesel engines of 17 MW each, plus a 13MW Steam Turbine in combined cycle mode. The total efficiency is 46.8% at maximum continuous rating and CO_2 emissions will be less than 0.63kg/kWh. Construction works commenced in mid-2010 and the plant has been in commercial operation since December 2012. Although the plant will be continuously operating on liquid fossil fuels as the main energy source, it can be converted to natural gas firing, to allow for fuel switching in the near future.

One of the main policy aims of the Government is to reduce the cost of electricity generation and to minimise the environmental impact through the switching of fuel from liquid fuels to gas. To meet these objectives in the short term, the government's policy is to promote independent investment in Malta's energy infrastructure in the form of new facilities, favouring the import, storage and re-gasification of liquefied natural gas new high efficiency generating plant at the site of Enemalta's Delimara power station.

Enemalta, the state-owned energy utility responsible for providing electricity to the Maltese Islands, shall therefore seek to enter into new energy contracts for the procurement of electricity and gas on this basis, consistent with its strategy of meeting the Islands' energy demands at lowest long-term cost, taking full account of safety, environmental and all related responsibilities as follows:

- supply and deliver natural gas to Enemalta under the terms of a long-term gas supply agreement to fuel Enemalta's own gas-fired power plant
- supply and deliver electricity to Enemalta under the terms of a long-term power purchase agreement.

[6] MRA Data

The energy for the above mentioned gas and electricity agreements shall preferably be sourced from new facilities that the independent operator would build, own, operate and maintain at Enemalta's Delimara Power Plant site by 31 March 2015 comprising (a) a new LNG delivery, storage, re-gasification and natural gas supply facility; and (b) a new natural gas fired combined cycle gas turbine electricity generation plant together with all necessary connections to Enemalta's electricity distribution network and to the relevant site services outlined in this document. However notwithstanding the above, Bidders are free to propose alternative solutions to meet the requirements of the Energy Supply Agreements required by Enemalta.

For the long term energy needs Malta will continue to pursue the viability of gas interconnection with Europe. In line with the conclusions of the European Council of 4 February 2011, where the Council noted that "No EU Member State should remain isolated from the European gas and electricity networks after 2015 or see its energy security jeopardized by lack of the appropriate connections", the Government of Malta intends to implement a connection to the trans-European Natural Gas Network to deliver Natural Gas (NG) to the Maltese final consumer for domestic, commercial and industrial purposes including its potential use for the generation of electrical power.

A comprehensive study that includes a cost-benefit analysis to determine the commercial viability of such a project, as well as its effect on the Maltese economy, is currently being prepared. The study will also look into other externalities of the project such as security of supply, competitiveness, sustainability, and shall identify those aspects that make it a potential Project of Common Interest (PCI) as defined by the proposed Regulation on guidelines for trans-European energy infrastructure (which repeals Decision 1364/2006/EC on TEN-E). The study may be used to support an application to the European Commission for financial assistance from the 'Connecting Europe Facility' funding instrument under the Commission's energy infrastructure package.

3.3.3 Submarine electrical interconnection to European network

The first electrical interconnection to the European energy grid, of capacity 200MW, will be commissioned by 2014. This placing into service of this cable will result in the decommissioning of the remaining inefficient generating plant at Marsa Power Station.

Since electricity acquired via the interconnection will not be generated locally this will considerable reduce national CO2 emissions and other pollutants.

The contract for the turnkey design and build of the 1 X 200MW 220kV HVAC interconnector was awarded in December 2010. It is expected that the cable interconnection will be commissioned in 2014.

The Malta Environment and Planning Authority (MEPA) board unanimously agreed to grant a permit in late April 2012, and site works at Maghtab commenced in early June of the same year. These works have progressed significantly and it is planned that equipment will be installed by June 2013. The Malta Resources Authority (MRA) has also issued a permit for the submarine cable to be installed in Maltese waters.

In Italy, the authorisation process has been concluded with the issue of the Authorisation Decree by the Italian Authorities on 28 March 2013. However Enemalta has been requested to reroute the submarine cable slightly to accommodate the exploitation of hydrocarbon resources south of Ragusa. The authorisation also includes a number of conditions that have to be respected by Enemalta. These include a number of studies to be carried out before works can begin, and monitoring during activities on land and in the sea.

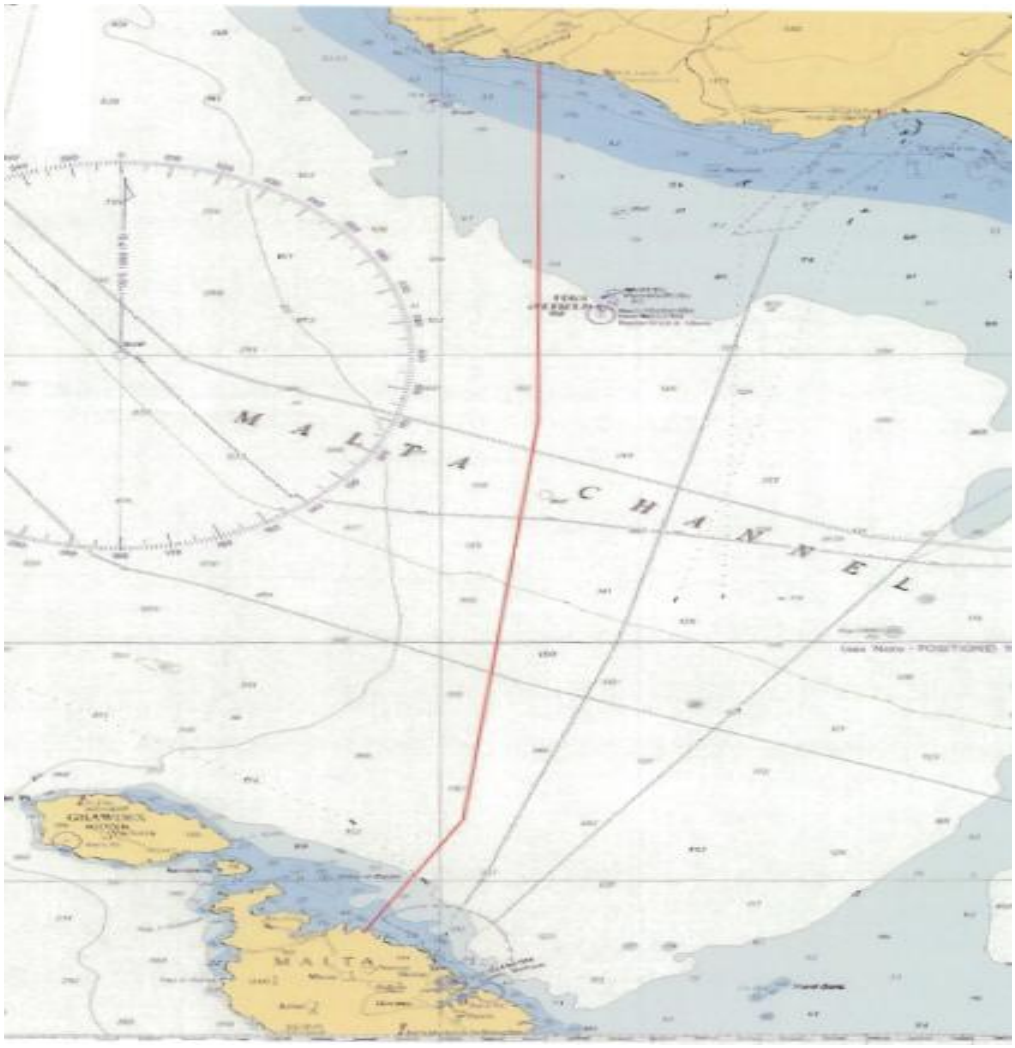

Figure 5 Electricity Interconnection between Malta and Sicily

3.3.4 Distribution of Electricity[3]

The high-voltage (HV) network requires continuous development in order to meet the energy needs and expectations of the customer in a safe, secure and efficient manner which is both environmentally and economically sustainable.

The high voltage (HV) network essentially consists of 132kV, 33kV and 11kV underground cables and overhead lines connected to the two Power Stations, the Distribution Centres (DC's) and the Distribution Substations. The 132kV and 33kV circuits are the backbone of the HV network and convey power from the power stations to 18 strategically located distribution centres. 11kV circuits distribute power from the distribution centres to approximately 1300 distribution substations dispersed all over the inhabited parts of the Maltese Island to serve around 250,000 consumers. Large industrial and commercial establishments are connected directly to the distribution substations, whilst the small to medium industrial and commercial entities, and the domestic consumers are serviced through a low voltage network supplied from the distribution substations.

The 132kV distribution network has been extended in order to connect to the electricity interconnector between Malta and Sicily. The extension of the network was necessary to be able to transmit and distribute the electricity imported. It will also be used to connect the supply from the proposed offshore wind-farm at Sikka il-Bajda to the network.

Figure 6 shows the expected distribution system in Malta in 2015, following the commissioning of the sub-sea interconnector.

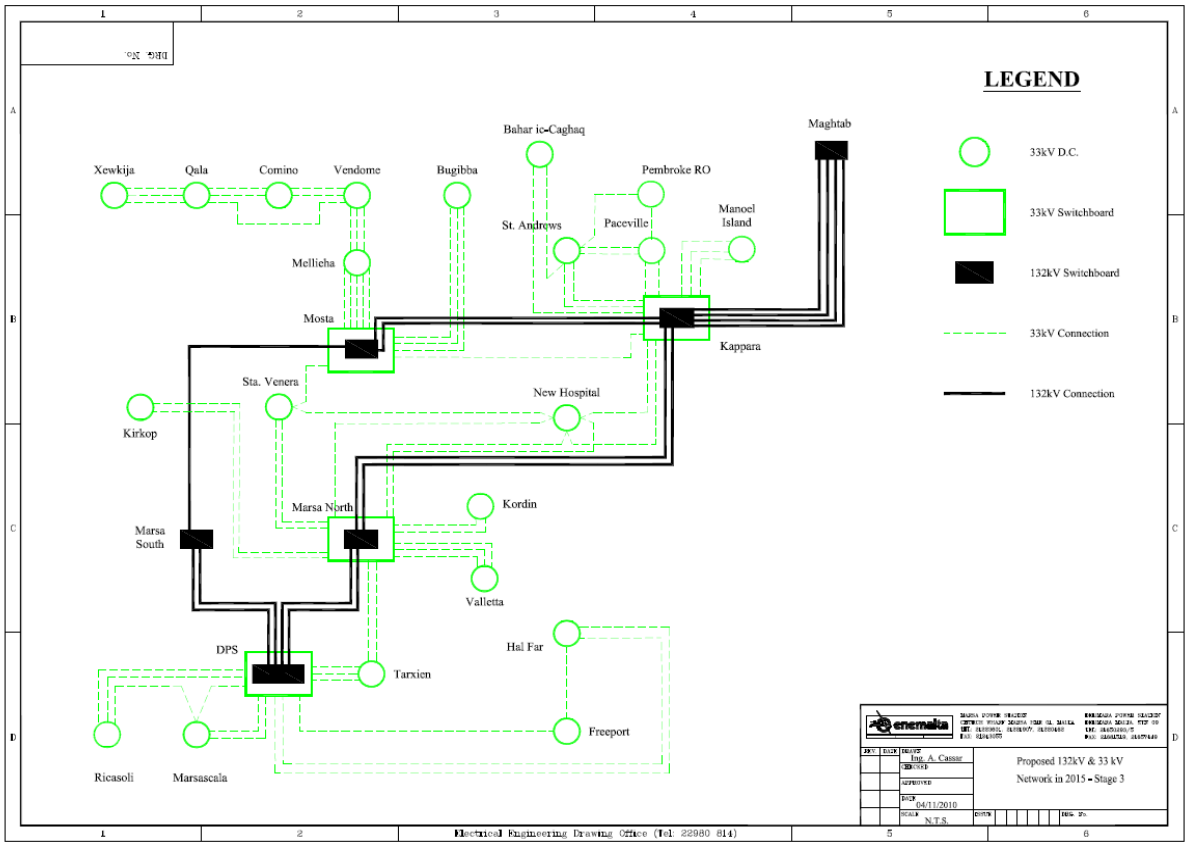

Figure 6: The expected distribution system in Malta in 2015, following the commissioning of the sub-sea interconnector.

For the purposes of this exercise, it is assumed that the conversion efficiency of the electricity imported using the interconnector is generated at an average energy efficiency of 40% in line with Directive 2012/27/EU.

3.4 Additional supply side measures

According to the formal NREAP, Malta plans to achieve its 2020 renewable energy targets of 10% renewable energy share of final energy consumption through a number of major projects involving wind, waste to energy CHP plants and solar energy. However a relatively great share of renewable energy will be generated from a relatively higher number but smaller capacities of renewable energy sources distributed across all the Maltese Islands mainly integrated in existing building infrastructures due to Malta's limited space and the conflicting use by other activities.

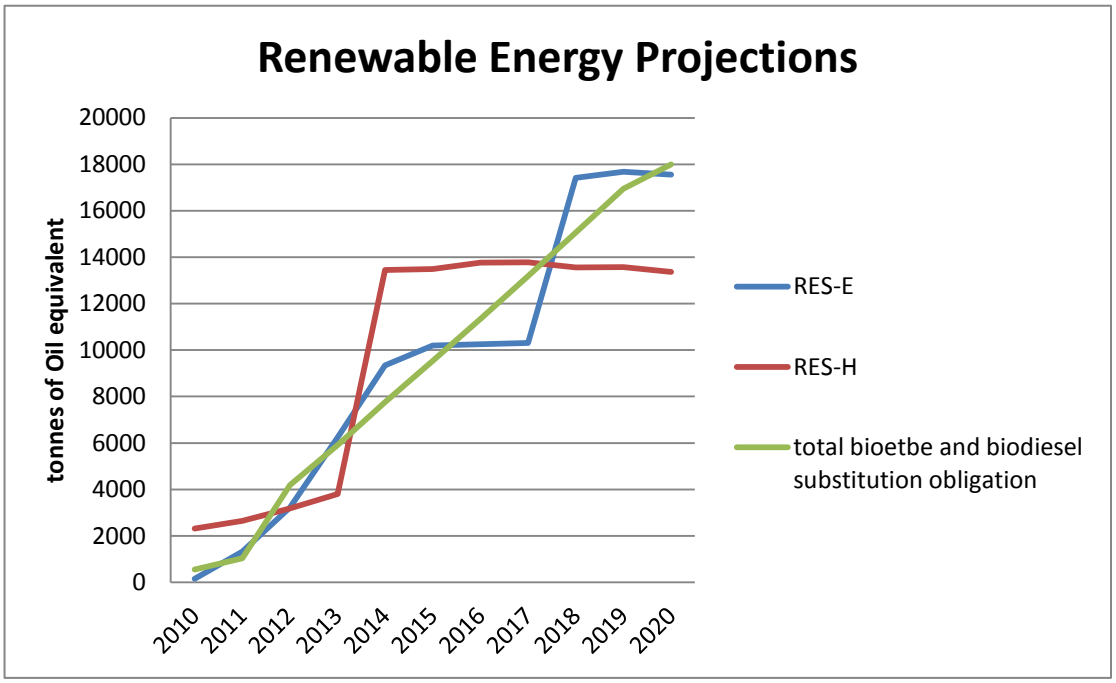

Figure 7 Renewable Energy Projections

The concerns about barriers to the development of the major projects are being addressed already and are being treated on a case by case basis. The Government had identified the sites for wind-farm development with potentially minimal impact on other activities and the environment. The An 80-metre Wind Monitoring Mast was installed in October 2009 at Aħrax Point, limits of Mellieħa, as part of a project to assess the viability of the wind resource at Sikka l-Bajda, where an offshore windfarm is projected.

Malta's National Renewable Energy Action Plan (NREAP) calls for the establishment of three wind farms as part of its 2020 targets.

The largest of the three is a 72MW-95MW offshore wind farm at Sikka l-Bajda, l/o Mellieħa. The development was aimed at providing a source of clean, renewable electricity that would contribute towards meeting 3.48% of Malta's 10% target of final energy consumption from renewable energy sources by 2020. The identified site itself faces environmental challenges. The environmental impact assessment has indicated that the proposed development might have a negative environmental impact on avifauna, the site being a main rafting site for the protected Yelkouan Shearwater. In order to address this issue, further studies have been recommended and government has applied for ERDF funds to finance a prototype wind turbine for measuring potential impacts. However, funds for this project have not been approved. The comments that were raised by the local environment and planning authority to the submitted environmental impact assessment were submitted in February 2013.

The other two identified onshore sites, Ħal-Far and Wied Rini, are also next to SPAs (Special Protected Areas). In a recently finalised appropriate assessment for the Ħal Far project, which is close to Natura 2000 sites, concerns have been expressed on the impact of the development on birds and bats. An appropriate assessment for birds has expressed concern about the shearwater species. Since the level of knowledge of the interaction of species and wind turbines is low, the precautionary principle applies. The main concerns relate to the displacement/disturbance effects during the operational phase of the project. The appropriate assessment for this project is ready for submission to MEPA. The environmental impact assessment and the appropriate

assessment for Wied Rini have been completed in February 2013 and have not yet been submitted to MEPA.

In view of the fact that the assessments for the wind farm projects are still not finalized, these measures were not taken into consideration in the calculation of the indicative energy efficiency target.

3.4.1 Micro PV installations and solar water heaters

Micro-generation of electricity from renewable energy sources in the domestic sector and combined heat and power applications in industry and the tertiary sector are included as part of eligible energy saving measures for the calculation of the indicative target.

Measures being taken to facilitate the uptake of renewable energy resources include financial incentives in the form of grants on the initial capital investment made available for residential and non residential sectors through grant schemes launched by Government from time to time in addition to its own direct investment where most, if not all, Ministries have been fitted with PV systems. Schemes have been launched to assist domestic households using both national and ERDF funds, the commercial sector using ERDF funds and local councils using national funds. All calls have been fully subscribed.

The PPCD is currently evaluating a recommendation to launch a new scheme for PVs in 2013.

The total PV installed capacity in December 2012 was 18MWs. An additional approximate amount of 4.0MWs are to be installed in the coming months from the tender just awarded for the installation of PV systems on government buildings. The total useful area of the rooftops of these government buildings are estimated to reach 67,000m^2 and will be given on lease for the purpose of establishing, operating and maintaining photovoltaic systems for a period of 25 years and selling the electricity generated to Enemalta Corporation.

3.4.2 Energy to Waste

Energy to Waste projects include the municipal waste and waste water treatment plants at Wasteserv Ltd and Water Services Corporation. These plants are presently operating at part load but are expected to operate at full load in the next couple of years. New plants are also envisaged to operate in the Gozo and the Southern part of Malta. These include:

1. A Mechanical Biological Treatment (MBT) Plant for the North of Malta for treatment of MSW and animal manure. At this facility waste shall be processed to have the organic fraction and the Refuse Derived Fuel (RDF) extracted from the remaining waste which shall be directed from the landfill. The digestion plant shall treat the organic fraction resulting from MSW and will also include a potential for the treatment of the animal manure not managed directly by farmers. This plant shall contribute to the achievement of Malta's 2013 and 2020 targets for reduction of biodegradable waste going to landfill.
2. An Anaerobic Digestion plant in Gozo for the digestion of the organic fraction of MSW and animal manure generated in Gozo.
3. An additional digestion facility for the treatment of animal manure in Siggiewi.
4. A waste to energy facility for the treatment of refuse derived fuel (RDF) and other waste streams which cannot undergo other treatment. The process related to the preparation of the relevant studies to establish this facility has been initiated.

3.4.3 Biofuels

In the local Regulations of the importation and wholesale of petroleum in the inland market, a biofuel substitution obligation has been imposed on importers/wholesalers of fuel for the transport sector to place on the market, as a minimum, an increasing share of biofuel as a percentage of the total energy content of petrol and diesel. Thus, biofuels are an important tool for Malta to reach the aim of increasing the share of energy from renewable sources in the transport sector.

RES share in road transport in 2012 was 3.3% (pending fuel supplier audit reports). Malta is facing a number of issues in attaining the final target, mainly: local climatic conditions, the lack of progress in fuel standards (EN590, high blends of biofuel in fossil fuel, biofuel in marine) to reflect the changes in European policy and the lack of comfort from international associations, as well as storage capacity limitations and availability of raw material due to the inherent small size of the country. Given these particular circumstances, during the discussions of the proposal for a Directive of the European Parliament and of the Council amending Directive 98/70 relating to quality of petrol and diesel fuels and amending Directive 2009/28 on the promotion of the use of energy from renewable sources, Malta has presented to Commission its proposal that the necessary flexibility in the legislation is ensured, thus allowing certificate trading, as is the case for the global RES target.]

3.5 Energy Efficiency Measures

The Energy Efficiency savings measures mentioned and estimated using the bottom up approach in the 2nd National Energy Efficiency Action Plan 2011[7] have been taken into consideration for the calculation of the indicative energy efficiency target. The measures requested in the Energy Efficiency Directive 2012/27/EU have not been considered in the calculation of the indicative target since measures have not been quantified at this stage. However, the measures mentioned in the 2nd NEEAP have been assumed to continue beyond 2016. Savings have been assumed to grow at the same rate as 2011-2016.

The measures include actions in the building sector, public sector, industry and SMEs, energy, transport, agriculture and fisheries sector and horizontal/cross sectoral measures. They are measures mainly related to building envelope, micro RES, energy efficient equipment and measures related to modal shift in transport.

3.5.1 Measures in the Building Sector

Malta is in the process of revising the minimum requirements of energy performance of buildings in the National Energy Efficiency Action Plan. These targets will affect energy savings in new and refurbished buildings. The Building Regulation Office (on behalf of the Building Regulation Board) is about to commission cost-optimal studies on the existing national minimum requirements. The same studies will analyse and recommend the best and most appropriate upgrades of the same requirements as required by the Recast EPBD 2010/31/EU which have to take place over a number of years. The revision of the minimum requirements is legally cast in the Energy Performance of Buildings Regulations, 2012 (LN 376/12).

According to the provisions set out in LN 376/12 the national minimum requirements shall be reviewed at least once every 5 years by the Building Regulation Board (BRB).

To meet this end, tenders have been issued to commission a series of studies that will analyse the existing minimum Energy Performance requirements for buildings in the Maltese islands by utilising mathematical models established by the Commission Delegated Regulation (EU) No

[7] 2nd National Energy Efficiency Action Plan 2011 http://www.buildup.eu/publications/20816

244/2012 to work out the cost optimal increase and tightening of the minimum requirements[8] (Technical Guidance Document F presently legislated through Legal Notice 376 of 2012) enabling the setting up of a realistic and economically feasible 2018- and 2020- national plan for Maltese Nearly Zero Energy Buildings (NZEBs).

Reference benchmarks for each building category, i.e., at least one reference building for new buildings and two for existing buildings subject to major renovation shall be established. The results of this assessment including all input data and assumptions used for such standards and the results thereof will be reported to the Commission and changes will have to be introduced if the minimum requirements are outside cost-optimal limits.

The national competent entity and the Commission shall be informed about such reports and the results will help clarify and determine the roadmap in the National Energy Efficiency Action Plan (NEEAP).

3.5.2 Measures in Land Transport

1) Modal shift and electro-mobility remain key Government targets with specific deadlines. These include the following:
    a. Continuous improvements to the Public Bus Transport System to further encourage modal shift from private to public transport by improving timeliness and reliability
    b. Establishment of more bus priority access by end of 2014 (ITS enabled bus lanes and bus gates)
    c. Improvement of bus interchanges and other pedestrian/traffic conflict junctions by using up-to-date Intelligent Transport Systems (ITS) technology by end 2014
    d. Establishment of core Intelligent Traffic Management System (ITMS) to allow improved traffic management by deploying real-time controlled and adaptive technology at crucial junctions to react to traffic flows and incidents that cause traffic blockages, the deployment of state of the art CCTV technology for continuous traffic monitoring, providing on-road real time information to drivers by installing a national Dynamic Message Signs System (including car parking management) for better information to flow to road users and to adaptively manage junctions and react to incidents that cause blockages (control centre, VMS, on-road CCTV). This will be completed by end 2014.
    e. Review of public transport routes to make public transport more efficient.
    f. Consideration of additional clean public transport services are currently being considered.
    g. Establishment of a National Traffic Management Plan to identify operational bottlenecks and help deal with congestion
    h. Promotion of the use of the established cross harbour ferries and vertical connectivity
    i. Promotion of Green Travel Plans
    j. Deployment of a National Electric Car Charging Network by 2014. This includes the installation of electric car charging pillars in public car parking places supporting Malta's deployment as envisaged for the "Proposal for a Directive of the European Parliament and of the Council on the deployment of alternative fuel infrastructure". This deployment is being supported by the LIFE+ Action Programme.

2) Reduce bottlenecks in infrastructure
    a. Further development and revision of TEN-T network

[8] Technical Guidance Document F presently legislated through LN 376/12

b. Further study as to the feasibility of improving the Malta-Gozo link

3) Introduction of Electromobility: Two demonstration projects to improve citizen perception (especially reliability and range) of this new technology and potentially encourage uptake and demonstrate efforts towards carbon neutral transportation using photovoltaic infrastructure.

   This includes procurement of the latest electric vehicles and the solar-powered car charging infrastructure for public use by the end of 2014.

4) Promotion of energy efficient vehicles: Fiscal and other measures aimed to encourage the uptake of new environmentally friendly vehicles with more efficient engine technology and discourage the importation and registration of older more environmentally damaging vehicles.

4 Primary Energy Consumption Projections

The projections for the indicative energy efficiency target for 2020 were based on the electricity and fuel projections of gross inland consumption including national navigation. These projections were prepared by the Economic Policy Department of the Ministry of Finance,. Projections were based on historical data dating back from 2010 to 1990 in most of the sectors. Factors that influenced the demand for fuel were the level of economic activity, disposable income and energy prices. Calculations were based on Gross Domestic Product at constant 2000 prices.

Renewable energy projections were based on measures that are expected to take place within the 2020 time period and on historical penetration of the renewable energy technology.

The model for household electricity demand was based on population, the share of total employment in the total population and the price of electricity for households. The country's population was assumed to be a measure of the number of households while the share of total employment in the total population was assumed to be a measure of the change in household's income. The employment share in total population was preferred to Gross Domestic Product (GDP) per capita because it is considered more stable over time and is less sensitive to issues such as income disparity. In addition, over recent years a larger share of GDP has been remitted abroad to multinational parent companies rather than contributing to Maltese household income. Consequently, using GDP as a measure of income would overestimate Maltese households'' 'true' income. Hence, the number of persons in employment was assumed to be a better indicator for changes in household income.[9]

The model for Transport demand were based on the output for land transport, the total share of total employment in total population and the price of the fuel involved. The Output (used instead of Gross Value Added) in land transport was used as a proxy for the expansion in the sector. Similar to the model of household electricity demand, the total share of total employment in total population is assumed to be a measure of the change in household's income. The future price of fuel is assumed to be linearly related to the international price of oil.[2]

[9] Projecting Energy Demand: Electricity & Transport- Economic Policy Department December 2012

Industry and Commercial Electricity demand was based on real GDP, GDP per capita and the price of electricity for industry. Changes in GDP are assumed to be a measure of changes in the general level of economic activity which typically has an important affect on electricity demand. Changes in income per capita were assumed to be a measure of changes in the level of economic development[4].

There are some uncertainties which concern the statistical fit of the projections. Indeed, the price of certain fuel type was regulated for most of the time under observation. This implies that the historical sensitivity of demand to price was minimal, at best. There were also issues with regards to the use of specific type of fuel by certain economic sectors which impinged negatively on the statistical fit. As a result, some specifications suffer from the point of view of robustness – a case in point is the equation of thin fuel oil used in manufacturing.[2] GDP figures were based on 2000 constant prices.

The historical dataset consist of annual observations and ranges from 1990 to 2010/11. Data for electricity consumption categorized by user (household or industry) were obtained from the Malta Resources Authority. Population and GDP data were obtained from Malta's National Statistics Office (NSO) whereas the data source for electricity prices (by user) is Eurostat, the European Commission's statistical arm.

4.1 Sectorial Primary Energy Consumption Trends

The sectorial energy consumption trends and projections indicate that the largest energy consumption is in the electricity and the transport sector. The growth rate of the energy consumption in these sectors decreased after the year 2000. There was a sharp drop in electricity consumption in 2010 as a result of the increased electricity prices and the removal of most of the electricity subsidies. After that year growth rate in electricity consumption was back to the pre 2009 trends. This was likely due to acquaintance of households and industry/services end users to the new electricity prices.

In the transport sector growth rate was similar to the electricity consumption growth rate. This was a mainly a result of the increased vehicle fleet[10].

Growth rate in the other sectors was quite stable however low compared to the electricity and transport sectors.

The energy projections of all the sectors indicate that the growth will remain stable until 2020. This can be justified by the growth in GDP and population indicating a greater economic activity and energy consumption. However, the projected savings in Primary energy until 2020 will indicatively decrease the total energy consumption by 22%.

[10] http://www.nso.gov.mt/statdoc/document_view.aspx?id=2673&allEditions=true

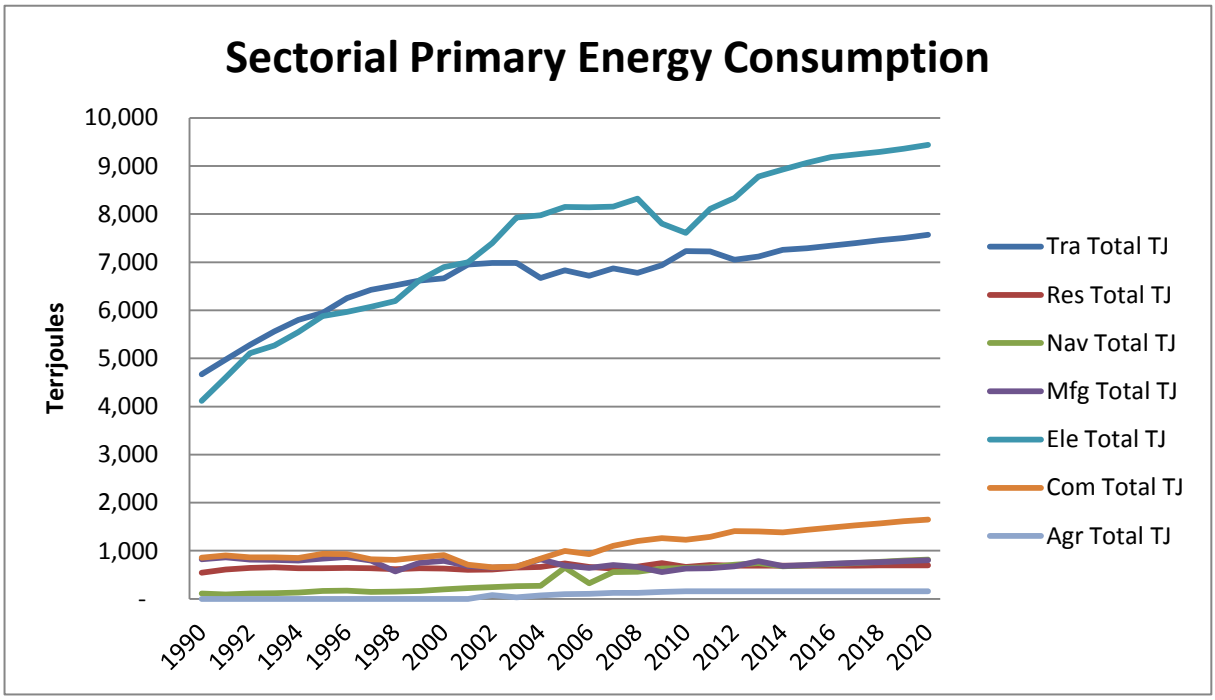

Figure 4: Sectorial Primary Energy Consumption

5. Limitations

The exercise has been subject to a number of limitations. These are mentioned below:

- The forecast exercise requires a consistent information set over a reasonably long duration. Data was only available from 1990, limiting the dataset to only 20 observations.
- The exercise does not differentiate between different industries' demand and does not accurately account for changes in households' income.
- The exercise relies on forecasts for explanatory variables. Changes in these forecasts may significantly affect the results. For example, the assumptions for world oil prices were basis on projections released in 2011. Consequently, the baseline forecast does not reflect recent oil price hikes.
- The exercise fails to capture the role of certain household attitude changes and policy measures which may affect significantly electricity demand. These include incentives for the use of energy efficient appliances, the possibility of joining the EU electricity grid, etc.
- It is assumed that the electricity company that supplies the market is able to meet the demand from households and industry.
- Any changes in the Renewable Energy Plans will change the final primary consumption. Uncertainties in the implementation of waste to Energy technologies exist.
- Large wind farm plans that were included in the national renewable Energy action plan were not taken into consideration since cost benefit analysis and environmental impact assessments are still in progess. A new renewable energy action plan will be prepared later on this year. This may affect the supply side primary energy.
- Energy Efficiency Measures that will not be implemented or are terminated will affect the estimates of energy savings.

- The measures requested in the energy efficiency directive 2012/27/EU have not been considered in the calculation of the indicative target since measures have not been quantified at this stage. However, the measures mentioned in the 2nd NEEAP have been assumed to continue beyond 2016. Savings have been assumed to grow at the same rate as 2011-2016.

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3. Energy Policy for the Maltese Islands
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8. Technical Guidance Document F presently legislated through Legal Notice 376 of 2012
9. Projecting Energy Demand: Electricity & Transport- Economic Policy Department – Ministry for Finance the Economy and Investments December 2012
10. http://www.nso.gov.mt/statdoc/document_view.aspx?id=2673&allEditions=true(accessed15.04.2013)

Annex 1 **Calculation for Indicative Energy Efficiency Target**

Compliance with targets													
in toe		**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	
Business as usual													
Total final consumption													
Conventional													
Electricity conventional	A	181,728	193,729	199,147	209,688	213,266	216,579	219,482	220,639	222,002	223,638	225,418	**toe**
Road transport fuels conventional (less biodiesel and bioetbe displacement and modal shift)	B	172,062	169,918	160,922	159,081	158,941	156,274	154,097	152,013	149,912	147,474	146,291	**toe**
Other fuels excluding aviation and LPG incl.biodiesel in industry	C	54,341	56,416	60,808	64,034	59,189	61,053	62,962	64,841	66,743	68,587	70,326	**toe**
Fuels - aviation	D	106,024	106,024	106,024	106,024	106,024	106,024	106,024	106,024	106,024	106,024	106,024	**toe**
LPG	E	24,502	25,420	25,673	25,678	26,091	26,505	26,799	26,992	27,187	27,526	27,552	**toe**
RES contribution													
Total RES-E (toe)	F	149	1319	3231	6249	9341	10198	10251	10305	17417	17685	17553	toe
Total RES-H (toe)	G	2,314	2640	3188	3809	13449	13484	13762	13778	13555	13579	13360	toe
Total bio-fuels (toe)in transport (considering biofuels substitution obligation and bioetbe)	H	549	1,027	4,185	5,918	7,762	9,532	11,338	13,186	15,066	16,952	17,993	toe
Total final consumption	**I**	541,669	556,493	563,178	580,481	594,064	599,649	604,715	607,778	617,906	621,465	624,515	toe
Aviation capping as per RES directive	**J**	22,317	22,927	23,203	23,916	24,475	24,706	24,914	25,040	25,458	25,604	25,730	toe
Conversion efficiency of power generation as at 2009	**K**	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	
Total primary energy (capped)	**L**	875,798	918,825	938,245	980,496	1,002,866	1,016,299	1,028,248	1,034,097	1,047,776	1,055,243	1,062,511	toe
Scenario taking account of energy services directive savings, new delimara plant and 200MW cable													
Energy efficiency (end use) (ref final consumption)	M	9,328	10,769	12,210	13,651	15,092	16,533	17,974	19,415	20,856	22,297	23,738	toe
Energy Efficiency end use transport	N	-	659	1,319	1,978	2,637	3,297	3,956	4,615	5,275	5,934	6,593	toe
Energy efficiency (end use) (ref primary consumption)= {M+N}*2.5	O	23,321	28,572	33,822	39,073	44,324	49,574	54,825	60,076	65,326	70,577	75,828	toe
Conversion efficiency	P	30.3%	30.3%	30.31%	35.0%	35.0%	35.0%	40.0%	40.0%	40.0%	40.0%	40.0%	
Savings from improvement in conversion efficiency= {A-M}/K-{A-M}/P	Q	-	-	-	86,667	87,613	88,440	161,054	160,827	160,764	160,920	161,191	toe
Total savings	R	23,321	28,572	33,823	125,741	131,937	138,015	215,879	220,903	226,091	231,497	237,019	toe
Total primary energy (capped) in this scenario={L-R}	S	852,476	890,253	904,423	854,755	870,929	878,284	812,369	813,194	821,685	823,746	825,492	toe
Total savings=R/L	T	3%	3%	4%	13%	13%	14%	21%	21%	22%	22%	22%	

Annex 2 **Energy and Economic Data**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Final energy consumption by sector												
Industry	14986.34	15246.14	16106.66	18752.86	16386.87	16881.56	17379.55	17842.27	18308.17	18754.96	19196.33	toe
Road Transport	172611.2	172593	168403.7	169944.2	173296.6	174047.3	175325.2	176737.6	178164.6	179260.9	180766.6	toe
Freight Transport	106024.1	106024.1	106024.1	106024.1	106024.1	106024.1	106024.1	106024.1	106024.1	106024.1	106024.1	toe
households	15858.65	16800.19	16537.14	16524.11	16510.65	16505.22	16513.34	16538.58	16578.74	16606.47	16576.87	toe
Services	29378.9	30868.33	33655.65	33493.08	33020.07	34293.94	35443.37	36471.58	37485.71	38603	39344.69	toe
Gross Value added by sector												
Industry (millions of euros)	1,068.64	1,012.82	980.77	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Services (millions of euros)	4345.367	4582.239	4803.493	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Agriculture (millions of euros)	96.42	89.20	93.09	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Disposable Income of Households	3.12E+09	3.24E+09	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Gross Domestic Product at constant 2000 prices euros (billions)	5022	5126	5238	5324	5421	5525	5633	5737	5843	5953	6064	
RES-E	148.866	1319.18	3230.796	6248.918	9341.278	10197.51	10251.08	10304.57	17416.94	17685.28	17553.02	toe
PV	1.73	10.1745	28.6416	52.27704	64.05804	64.67004	65.28204	65.89404	66.50604	67.11804	67.73004	GWh
Microwind	0	0.0748	0.0748	0.0848	0.0948	0.1048	0.1148	0.1248	0.1348	0.1448	0.1548	GWh
Waste to Energy CHP (electricity)	0	5.09	8.851	20.3	44.46667	53.80087	53.80173	53.80173	135.8817	138.38	136.22	GWh
RES-H	2,314.29	2639.558	3187.5	3808.74	13448.72	13484.08	13761.56	13777.88	13555.1	13579.46	13360.1	toe
SWH	1,464.84	1470.772	1539.916	1565.716	1591.516	1617.316	1643.116	1668.916	1694.716	1720.516	1746.316	toe
WSM biogas to RTO	154.80	187.48	212.42	650.16	650.16	650.16	650.16	650.16	402.48	402.48	154.8	toe
WSC tal-Barkat- heat	0.00	0	430	610.6	610.6	610.6	610.6	610.6	610.6	610.6	610.6	toe
Siggiewi cattle farm (Digestion)	0.00	0	0	0	0	0	236.844	236.844	236.844	236.844	236.844	toe
Residue derived fuels - Heat	0.00	0	0	0	9635.371	9635.371	9635.371	9635.371	9635.371	9635.371	9635.371	toe
Biomass imports	614.23	644.90	644.90	644.90	644.90	644.90	644.90	644.90	644.90	644.90	644.90	toe
bio-diesel in industry	80.42	216.871	164.4473	166.2289	145.036	154.6008	169.4368	159.9499	159.0505	157.6148	160.1306	toe
WSM heat from CHP	0	119.54	195.822	171.14	171.14	171.14	171.14	171.14	171.14	171.14	171.14	toe
RES-T												
Biodiesel intransport	539.2564	1020.056	997.3586	866.4851	799.2172	727.4344	899.2366	914.5207	906.8232	828.1586	842.4938	toe
Fuels conventional												
Fuel consumption in power stations	581448.2	640611.9	666912.9	719445.3	737698.3	754788	769914.4	775981.7	783161	791817.3	801288.9	toe
Passenger kilometres	n/a	227.9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Mkm
tonne kilometres	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
combined transport km	0	227.9	0	0	0	0	0	0	0	0	0	
Population	414372	417617	419864	421877	423667	425236	426590	427037.8	427570.2	428194.5	428883.7	

Annex 3 – Total Final Energy Consumption

Compliance with targets													
in toe		**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	
Business as usual													
Total final consumption													
Conventional													
Electricity conventional	A	181,728	193,729	199,147	209,688	213,266	216,579	219,482	220,639	222,002	223,638	225,418	**toe**
Road transport fuels conventional (less biodiesel and bioetbe displacement and modal shift)	B	172,062	169,918	160,922	159,081	158,941	156,274	154,097	152,013	149,912	147,474	146,291	**toe**
Other fuels excluding aviation and LPG incl.biodiesel in industry	C	38,897	40,671	43,802	46,267	43,002	44,351	45,713	47,037	48,362	49,615	50,742	**toe**
Fuels - aviation	D	106,024	106,024	106,024	106,024	106,024	106,024	106,024	106,024	106,024	106,024	106,024	**toe**
LPG	E	24,502	25,420	25,673	25,678	26,091	26,505	26,799	26,992	27,187	27,526	27,552	**toe**
RES contribution													
Total RES-E (toe)	F	149	1319	3231	6249	9341	10198	10251	10305	17417	17685	17553	toe
Total RES-H (toe)	G	2,314	2640	3188	3809	13449	13484	13762	13778	13555	13579	13360	toe
Total bio-fuels (toe)in transport (considering biofuels substitution obligation and bioetbe)	H	549	1,027	4,185	5,918	7,762	9,532	11,338	13,186	15,066	16,952	17,993	toe
Total final consumption	I	526,226	540,747	546,172	562,715	577,877	582,947	587,466	589,973	599,525	602,493	604,932	toe
Aviation capping as per RES directive	J	21,681	22,279	22,502	23,184	23,809	24,017	24,204	24,307	24,700	24,823	24,923	toe
Total final energy consumption (capped)	L	441,882	457,001	462,650	479,874	495,662	500,941	505,646	508,256	518,201	521,291	523,831	toe
Scenario taking account of energy services directive savings													
Energy efficiency (end use) (ref final consumption)	M	9,288	10,736	12,183	13,631	15,079	16,526	17,974	19,422	20,869	22,317	23,765	toe
Energy Efficiency end use transport	N	-	659	1,319	1,978	2,637	3,297	3,956	4,615	5,275	5,934	6,593	toe
Total end use savings	R	9,288	11,395	13,502	15,609	17,716	19,823	21,930	24,037	26,144	28,251	30,358	toe
Total final consumption less total savings	S	432,594	445,606	449,148	464,265	477,946	481,118	483,716	484,219	492,057	493,040	493,473	toe

N.B Maritime Bunkering[2] consumption has been excluded from the final energy consumption