MALTA's
NATIONAL ENERGY EFFICIENCY ACTION PLAN (NEEAP)

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1. Introduction and Background to the NEEAP

Energy Efficiency and a Holistic Energy Policy scope and time

Malta's National Energy Policy (published in December 2012) stresses the importance of the efficient use of energy in households and industry and in the other sectors of the economy. It notes that Energy Efficiency deserves priority over other issues, including the introduction of renewable energy.

The energy policy is built upon the same considerations as the EU's policy for the sector. The importance of Energy Efficiency at EU level is underlined by the publication of Directive 2012/27/EC which builds upon earlier directives.

The current policy and initiatives are steps leading to substantial decarbonisation of the energy (including transport) sector by 2050. The Ministry for Energy has received ERDF funding and will be commissioning a comprehensive study 'An Energy Road Map- towards achieving decarbonisation for the Maltese Islands'. The scope of the Study is to propose scenarios for achieving decarbonisation in line with the EU Energy Roadmap 2050.

The Objectives of the National Energy Efficiency Action Plan

The high-level objectives of the National Energy Efficiency Action Plan are:

- To establish a target of energy savings by 2020, which takes account of national circumstances and is overall a fair share of the EU's effort, to show how the country intends to generate these savings, to demonstrate results achieved so far, to send a strong message to the country in favour of energy efficiency, and to raise awareness of the effectiveness of schemes, incentives and information available from time to time to assist interested stakeholders.

- To satisfy Malta's obligation to provide the action plan to the Commission in terms of Article 24 of the EED 2012/27/EC.

  Thus while the NEEAP is a stand-alone roadmap for the general guidance of the public and stakeholders in Malta, it also serves as the Action Plan for presentation to the European Commission as required by Article 24 of Directive 2012/27/EC. As such, its presentation follows the

Commission's 'Guidance for National Energy Efficiency Action Plans establishing a template for NEEAPs' (Document C(2013) 2882 final)

How the NEEAP is structured

The vision put forward by this NEEAP for the achievement of quantified energy efficiency savings is as follows:

- A target is set, taking into account local circumstances and the savings that must be achieved globally by E.U.
- The targets are to be achieved by tackling certain sectors that are known to be high consumers of energy. Most are particularly relevant to Malta even if not necessarily from the same perspective as mainland Europe. The targeted sectors are:

  - Buildings. The proposals to achieve EE follow requirements in Directive 2010/31/EU.

  - Public Bodies. The aspects tackled are energy use in buildings belonging to Government and public bodies, which are to be gradually refurbished to achieve acceptable levels of efficiency, as well as the efforts to make procurement by these entities 'greener'. Government and public bodies are major players in the economy and hence should lead by example.

  - Electricity and water management have been considered as specific sectors deserving special attention in Malta's action plan. This is done in view of the heavy investment that should yield very significant savings in the case of electricity and the importance of initiatives to ensure efficient use of energy in water management, which relies heavily on energy-intensive non-conventional sources to overcome the scarcity of water in the country.

  - Transport. The main topic relevant to Malta during the period covered by this NEEAP is the public transport reform and the coaxing of commuters away from private transport.

  - Heating and cooling. The climate in Malta is such that so far no business case for district heating and cooling can be made. Nor has CHP on any scale been found to be economically justifiable. Specific technologies have been adopted to meet specific needs. It is wise to ensure that the potential of the most efficient solutions are identified and adopted, hence the need for a 'comprehensive assessment'.

There are some horizontal measures that are considered by the Directive to be indispensable to reach the EE objectives.

- A Knowledge base for success. This ranges from energy audits to identify what needs to be done and to prioritise it for best cost-effectiveness, to information programs and training to empower consumers to take initiatives to achieve savings, to metering of individual consumer's consumption to enable self-regulation of consumption.

- A competence base, ensuring the availability of technical personnel including specialist energy services providers and auditors to deliver results, derived from training, education and compliance with standards and evidenced in accreditation schemes.

- Economic tools, such as billing based on the consumer's metered consumption and energy savings obligation schemes on energy operators designed to ensure that energy is not overused unnecessarily

The Action Plan in a Dynamic Environment.

This action plan (for 2014-2016) follows two earlier Action Plans.

As the Energy Policy document notes, the energy sector is dynamic. This action plan is being drafted in the first quarter of 2014. This is a time of unusually rapid developments in the energy sector in Malta and other sectors relevant to it.

Developments in generation infrastructure will change radically the efficiency of generation of our electricity. These will yield very significant savings in primary energy consumption from previous practices. Enemalta Corporation is being restructured and private investment is being mobilised to implement the major projects in the generation of electricity.

The negotiations for the allocation of funds allocated to Malta under the structural and cohesion funds 2014-2020 have yet to be concluded. This fund is determinant for the financing of several large initiatives in the sector, though the contribution of other sources of funding is significant.

The circumstances of the electricity sector and especially the allocation of the EU funds mean that certain issues cannot be precisely defined in this action plan. Several measures may depend on whether funds are

made available or not. Nevertheless, the best effort has been made to ensure that only realistic measures likely to be funded are included in the plan.

Some Characteristics of Malta relevant to the energy sector

As various measures were being analysed in detail for inclusion or otherwise in the plan, the impact of unique characteristics of Malta became evident. These are pointed out and explained where applicable in the NEEAP document.

The low energy consumption of Maltese households, the type of industry in Malta from the perspective of possible energy savings such as the application of CHP, the level of the consumption of transport fuels, the impact of the Mediterranean climate on the application of centralised heating and cooling and CHP, land scarcity and ownership and the relatively late introduction of a modern framework regulating spatial development, including institutions and legislation, are all relevant to a discussion on the potential for energy savings.

Enhancing the knowledge base

The NEEAP needs to be backed up by statistics so that the measures proposed are knowledge – based and realistic, progress towards the achievement of the target is monitored and corrective action taken where necessary. As this knowledge base is enhanced, future revisions and new plans become even more focussed, accurate and useful.

The NEEAP entails a national effort, including most sectors of the economy, central government and public bodies as well as the private business sectors and households. Monitoring is therefore a significant task. Continual dialogue among stakeholders is necessary. Indeed, in drafting the NEEAP, not enough credit could be given to the significant national EE effort because information was not centralised or otherwise readily available in a suitable format.

These monitoring, data gathering and coordination tasks will be undertaken on a continuous basis by the Energy Agency within the Ministry for Energy. This Agency, in addition to its other tasks, will be cooperating with the National Statistics Office in gathering information to form the best holistic quantitative picture of the energy sector from time to time. It will supplement this by its own efforts where additional specific information is required for its research and analysis to identify needs and trends, and to monitor obligations and measure compliance with targets.

It was clear through the research done in the drafting of this NEEAP and through meetings with stakeholders that much has been done and is being done to achieve efficiency in energy consumption. The measures considered in this Action Plan will most likely achieve the level of savings that is cost-effective and sustainable[1]. Already, or by 2016 – 2020:

- All on-island electricity generation will be at a high level of efficiency because of the ongoing infrastructure modernisation. Enemalta will be making all efforts to secure similar level in the energy imported through the interconnector.

- The impact of the cyclic nature of the demand over operational efficiency can be catered for through the interconnector and Delimara Phase 3 multiple small generating units.

- The public transport reform has led to more efficient buses and is expected to deliver a modal shift away from private transport. The latter will also be gradually rendered more efficient in response to incentive schemes to increase vehicle turnover.

- Large industrial and commercial enterprises have taken steps to reduce their energy consumption and bills, in many cases guided by programs set up by their partners in international groups. More perhaps remains to be done in the SME sector.

- The household sector, favoured by a climate that does not require heating and cooling to the extent required in other EU countries, has traditionally been amongst the lowest energy consumer per capita in the EU. The domestic consumer has also been sensitised to energy efficiency by several successful EE and RES schemes.

Conclusion

It is clear that a lot of effort has already gone into generating energy efficiency by all sectors of the economy and by society in general and results are being achieved. So far, it has been difficult to demonstrate and quantify because of the absence of a centralised structured system of quantitative record keeping of progress and results achieved.

[1] Except perhaps with regard to the building sector. Here turnover is slow and deep renovation on any scale is impractical. However RES uptake will mitigate this difficulty.

Nonetheless, investment will continue to be made and initiatives to maintain awareness will be kept up to ensure that there will be no slippage in meeting the energy efficiency objectives of the energy policy.

2. Background Information on the National Policy Context and Circumstances

Outlining National Policy Context

Malta, as a Member State within the European Union is not only a micro state but is also a micro island state. This is a characteristic that distinguishes Malta from most other MS of the EU. The fact that Malta, and its sister Island, Gozo, are at the southern border of Europe – approximately 90 km to the South of Sicily – and Europe's nearest bridgehead to North Africa renders Malta subject to a number of inherent and permanent social as well as economic issues of vulnerability.

Malta's insularity and its peculiar characteristics of land, sea distance and population density significantly increase the challenges that Malta faces. These include but are not limited to:

- Inability to reap the benefits of economies of scale due to its small size;
- A small domestic market which limits the ability of local firms to build economies of scale so important for them to venture overseas;
- An 'open economy' rendering it vulnerable to global economic conditions – such as, for example, the price of oil and gas;
- A dependence on a very narrow range of exports;
- A dependence on imports exacerbated by limited possibility of imports substitution which render locally manufactured products and goods more expensive than imports;
- High transport costs, consequent to its insularity, in its economic transactions with mainland Europe. This raises the cost of imports and the cost of production, and could lead to time delays, all of which impact negatively Malta's competitivity;
- Increased vulnerability as accessibility to mainland Europe and elsewhere is completely dependent on air and sea.

- Malta's land territory[2] and high population[3] render the implementation of large Renewable Energy Sources (RES) infrastructure in order to replace conventional energy generation by clean RES energy difficult.

- Surrounding deep seas do not compensate Malta for its micro land mass given that to date there is no commercially viable RES sea / marine technologies that could be used in Malta's marine conditions including the bathymetry of its transient and deep sea respectively.

Malta's peculiar characteristics particularly its size, population density, and insularity resulting give rise to specific development issues. To date Malta is isolated in terms of its energy generation and distribution and currently is solely dependent on fossil oil as the primary energy source. Investments are currently underway to address these issues and Malta's energy isolation will change once the 200MW electricity submarine interconnector with Sicily is commissioned in 2014.

Water is a strategic resource in Malta particularly given that the country is under stress in terms of water resources. Malta is heavily dependent on the desalination of water for its national potable water supply – which accounts for over 50% of Malta's potable water. Additionally, despite significant investment made in waste management infrastructure Malta's peculiar characteristics will continue to constrain the country's ability to manage waste.

Malta's Economic Context

Malta's particular characteristics have meant that Malta has had to identify and develop an economic and social development process that reflects its particular strengths. Malta is seen to have the comparative advantages which it has sought to build on - primarily: (i) the human resource capital; (ii) the English and multilingual skills base; (iii) innovative legislative design; (iv) the ability to transform 'smallness' to an advantage by introducing agility in policy design and implementation; and (v) stability.

Malta's approach to economic development has and continues to be two pronged.

The first relates to the restructuring and strengthening of the existing traditional industry base by means of up-grading quality, higher value added, and productivity growth to allow them to successfully foray into new markets as well as to safeguard their external and domestic markets as the case may be.

[2] The archipelago has a surface area of is 315.7km^2
[3] Estimated in 2010 to be 417,617

The second prong relates to a process that has seen Malta strengthen its economic base through diversification and creating a 'new' and knowledge economy base that is built around knowledge and high-tech manufacturing sectors and activities. This diversification process has resulted in the emergence of sectors that include but are not limited to financial services, ICT software houses, pharmaceutical companies, manufacturing of electronic components, and the rapid growth of iGaming and e-billing industries respectively.

Malta's economic performance needs to be taken within the context of the global and EU performance over the said period – which have yet to recover both in Europe and globally. The impact of the international recession generally and the Euro crisis more specifically on public finances in Malta was less significant than that observed in many other MS or third countries. Between 2008 and 2011 Malta registered an increase in the debt-to-Gross Domestic Product (GDP) ratio of less than 9% of GDP compared to a corresponding increase of almost 20% of GDP in the EU.

The Table below shows the GDP for Malta since 2009. For 2008 the GDP was positive. This turned negative in 2009. Indeed, 2009 constituted the year where the impact of the financial and economic international challenges on Malta was at its toughest. Whilst the economy rebounded in 2010 it formally entered into a recession following experiencing a second negative quarter in Q1, 2012.

The contraction in real GDP recorded in the first half of 2012 was driven mainly by negative contributions from the domestic sectors of the economy. The domestic demand contributed to a negative 1.2% points with private consumption acting as the main drag towards growth alongside gross fixed capital formation.

	2009	**2010**	**2011**	**2012**
Overall GDP Growth	-2.8	4.0	1.6	0.8
Domestic Sectors	-2.7	0.9	0.4	0.3
External Sectors	0.3	3.1	2.8	1.7
Stock Building	-0.4	0.1	-1.6	-1.2

Table 1 : Contributions to GDP Growth[4]

The poor performance of the global economy post-2009 and the decline in international trade had a significant impact on the external side of the Maltese economy. Indeed, the net contribution of exports and imports to

[4] Data from different National Statistics Offices releases on GDP

economic growth deteriorated significantly in 2009 but recovered in 2010 and 2011. In 2012, the contribution of the external sector to economic growth remained significant at 1.7 percentage points. Additionally, with the exception of 2009, Malta's deficit in the current account has been declining and eventually turned positive in 2012.

The inflation rate fell from a peak of nearly 4.5% in 2009 to a low of 0.75% in 2010 before it stabilised at 2.9% in 2012 – similar to the average inflation rate of 2.9% in the EU 27.

As can be seen from the table below the impact of the economic crisis was felt mostly in 2009 when the gainfully occupied population fell when compared to 2008. In 2010 the demand for labour started to increase as the economy started to rebound though the unemployment rate remained unchanged. This started to fall the year after and continued to so in 2012.

	2008	**2009**	**2010**	**2011**	**2012**
Gainfully Occupied Population	146,015	145,524	146,917	149,799	152,306
Registered Unemployed	6,208	7,335	7,055	6,570	6,839
Labour Supply	152,223	152,859	153,972	156,369	159,145
Unemployment Rate	6.0	6.9	6.9	6.5	6.4

Table 2 Labour Market[5]

Primary Energy Sources and Energy Consumption

Energy in Malta is, to date, generated from the combustion of imported fossil fuels.[6] The volume of mineral fuels, lubricants and related materials between 2009 and 2012 has increased. This is shown in the Table below.

[5] Data from different National Statistics Office on the Labour Market

[6] The new Government in administration has embarked on a process to diversify energy generation from fossil fuels through the building of a new 215MW generation plant that will be powered by Liquid Natural Gas (LNG).

€000	2009	2010	2011	2012
Import	657,764	1,057,707	1,943,171	2,791,340
Export	446,811	718,934	1,621,721	2,010,756
	210,953	338,773	321,450	780,585

Table 3 Import and Export of Mineral Fuels, Lubricants, etc.[7]

Malta has no locally extracted or refined fuels which are subsequently exported. The export of mineral fuels, thus, reflects the sale of fuel through the bunkering industry. It is to be noted that the net volume of mineral fuels between that imported and exported is primarily directed towards the domestic economy. This has been on the increase since 2009, with a marginal reduction in 2011

The domestic market is constituted of the transport, industry, and the electricity generation sectors. The Table below presents a breakdown of the global energy consumed in Malta as at 2011.

TONNES OF OIL EQUIVALENT	Petrol	Diesel	Biodiesel	Jet A1	Aviation Gasoline	Kerosene	Gasoil	Heavy Fuel Oil	Thin Fuel Oil	Liquefied Petroleum Gas	Propane
Imports	87,578	99,378	1,269	111,769	60	-	327,081	1,640,353	325	23,730	288
International Air Transport	-	-	-	107,993	58	-	-	-	-	-	-
International Navigation							227,890	1,083,676			
Gross Inland Consumption	78,102	98,657	2,024	(0)	0	559	88,502	542,412	3,489	23,698	288
Utilities	-	-	-	-	-	-	65,541	530,872	-	-	-
National Navigation	114	-	-	-	-	-	11,503	-	-	-	-
Domestic Air Transport	-	-	-	200	-	-	-	-	-	-	-
Road Transportation	78,588	91,590	679	-	-	-	-	-	-	-	-
Agriculture, Forestry & Fisheries	-	888	-	-	-	11	2,050	-	-	-	-
Residential	-	-	-	-	-	349	310	-	-	19,670	-
Manufacturing & Construction	-	6,814	76	-	-	125	3,386	-	938	4,029	288
Commercial & Institutional	-	2,515	-	-	-	55	5,711	470	495	-	-
Statistical Difference	600	3,149	(1,269)	200	(0)	(18)	-	(11,070)	(2,056)	-	-

Table 4 Malta's Global Energy Consumption as at 2011[8]

The Figure below shows primary energy imports consumed in the inland market in 2011.

[7] Pg 29, Malta in Figures in 2013, National Statistics Office, http://www.nso.gov.mt/statdoc/document_file.aspx?id=3780
[8] Malta Resources Authority 2012

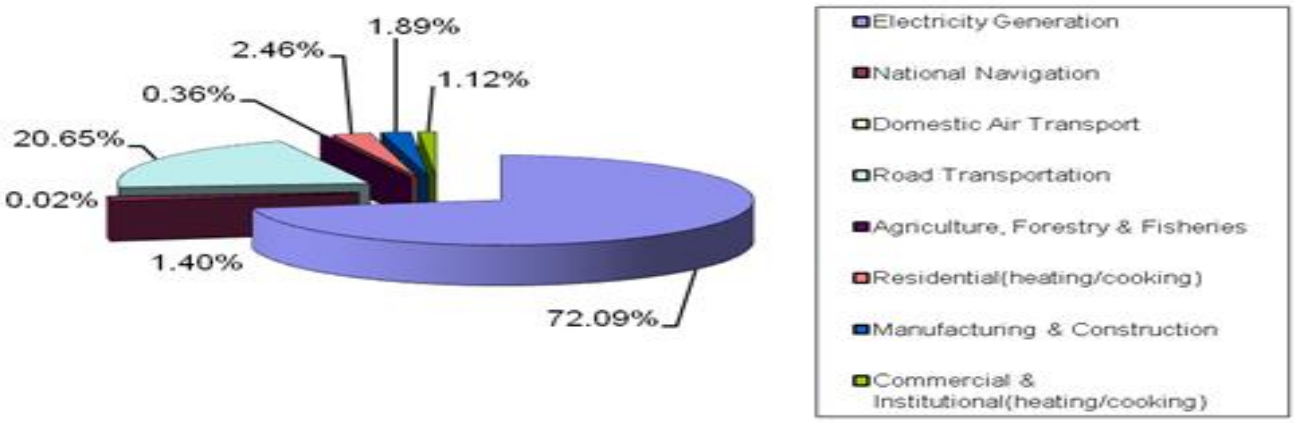

Figure 1 Primary Energy Imports in 2011 (%)[9]

As can be seen from the Figure below Malta experienced a rapid growth in the demand of electricity between 1990 and 2007 as the economy expanded, and the quality of life improved.Demand for electricity, however, fell by 6.2% in 2009 from 2.312TWh to 2.167TWh. In 2010, demand fell by a further 2.5% on 2009 consumption – to 2.113TWh. This fall in consumer demand for electricity was a direct result of the introduction of the new tariffs where people adjusted their behaviour in the management of their energy demand, introduced energy efficient technologies or substituted energy from the grid by RES technology.

In 2011, demand for electricity increased by 2.6% on 2010 – to 2.168TWh. This indicates that consumers' behaviour started to get used to the new tariffs and started to ease off from the stringent consumption management adopted after the increase in the electricity tariffs. Indeed, in 2012, the Enemalta Corporation estimates that demand for energy increased by 5% - to 2.276MWh.

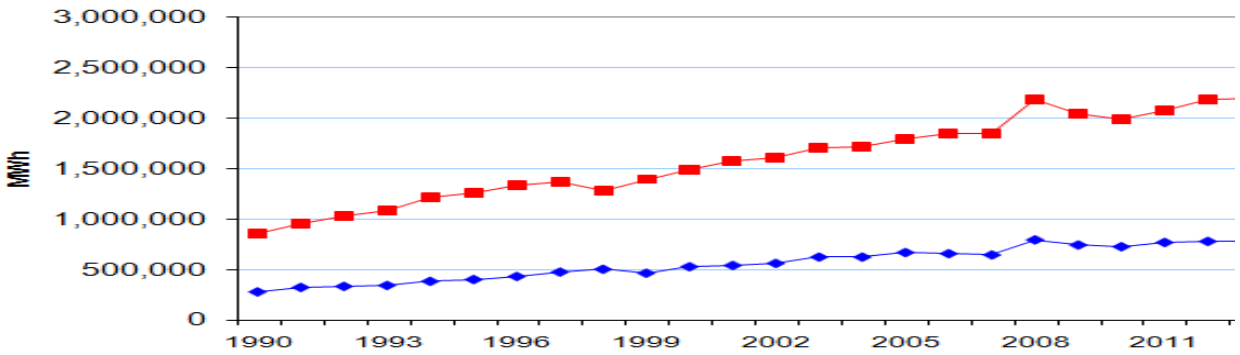

Figure 2 **Electricity Growth for Malta Up to 2012**

Blue: Residential Demand Electricity MWh – Red: Non Residential Demand Electricity MWh

[9] Ibid

It is to be noted that electrical energy generated from photovoltaics steadily increased from 2009 to 2012. The data shows that while in 2009, 530 megawatt hours of electricity was generated, in 2012, 13,620 MWh was generated in the Residential Commercial and Industrial Sector.

	2009	**2010**	**2011**	**2012**
Megawatt hours generated by photovoltaic cells	530	1,730	12392	13,620

Table 5 Renewable Energy Generated

3. Overview of the National Energy Targets and Achieved Savings

3.1 Indicative national energy efficiency target for 2020 as required by Article 3(1) of the EED

The indicative target for 2020 is based on primary energy consumption for Malta, capped for aviation as agreed with the Commission. It is based on national models of energy consumption projections, and assumes primarily that the new interconnector with Sicily is commissioned by end of 2014 and that a new gas-fired 215MW CCGT plant comes online by 2015.

Indicative National Energy Efficiency target 2020**: 264,282** toe in primary energy (equivalent to 27% of the primary energy consumption in 2020 under a BAU scenario).
Baseline 2010 Energy Efficiency 4% or 29,647 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%** as in 2009 remaining unchanged.

3.2 Expected impact of the target on primary and final energy consumption in 2020

MS	Indicative national energy efficiency target for 2020	Absolute level of energy consumption in 2020 [Mtoe]	
		Primary	Final
MT	27% or 264,282 toe savings target by 2020	0.726	0.547

Table 6

The projected energy consumption in 2020 was based on corresponding GDP projections indicated in Figure 3.

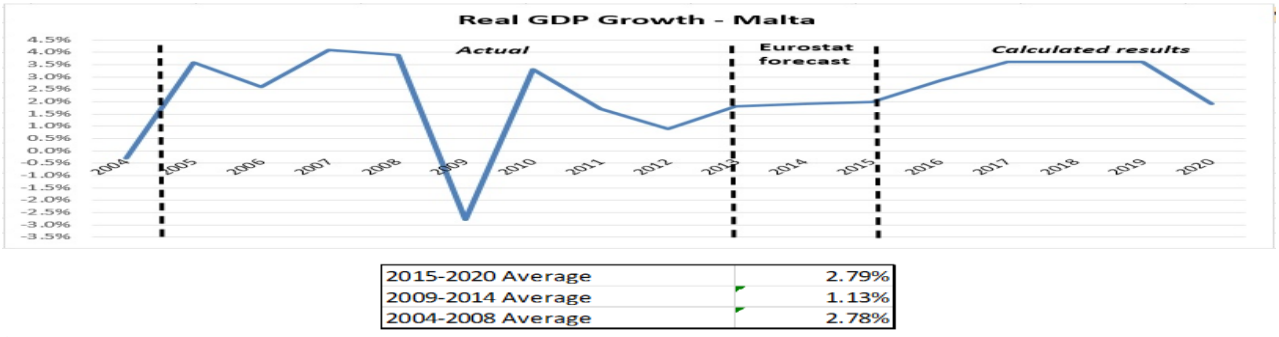

Figure 3

3.3 Rationale for the 2020 target (EED Annex XIV Part 2.2.(a)).

Target was calculated on the basis of a high level energy balance for Malta as indicated in Table10. This takes into account projected electricity and other energy demand up to 2020 derived from national models, energy savings on the basis of quantified identified measures, projected renewable energy production in line with the re-assessed National Renewable Energy Action Plan and projected transformation efficiency taking into account improvements already committed in the electricity generation infrastructure.

This energy savings target is consistent with Malta carrying a fair share of the EU's 20% projected reduction in energy consumption by 2020 (paragraph (2) in the Preamble to the Directive), and, in fact, Malta is committing to a higher level of savings than the EU-level target. These savings shall be achieved through a number of measures, with the most critical measure having already been committed to.

3.4 Estimate of overall primary energy consumption and consumption by sectors in 2020 in accordance with Article 24(2).

Table 7 includes an overview of the projected overall and sector energy consumption in 2020.

Estimate of energy consumption in 2020	Amount	Units
Total primary energy consumption in 2020	0.726	Mtoe
Electricity transformation input (thermal power generation)[10]	0.358	Mtoe
Electricity generation output (thermal power generation)[11]	0.173	Mtoe
Energy distribution Losses	0.013	Mtoe
CHP transformation input –	N/A[12]	
CHP transformation output – thermal	0.0002	Mtoe
CHP transformation output - electrical	0.008	Mtoe
Total final energy consumption	0.547	Mtoe
Final energy consumption - Industry	0.082	Mtoe
Final energy consumption - Transport (Road)	0.181	Mtoe
Final energy consumption – Households	0.087	Mtoe
Final energy consumption – Services	0.113	Mtoe

Table 7

[10] Includes electricity imports over the interconnector.
[11] Refers to electricity sent out to the distribution grid.
[12] Small CHP plants are operated by Wasteserv Ltd and use waste stream as input which is difficult to estimate its energy content.

Error! Reference source not found. ***includes historical data for years 2010-2012 and projected sectoral nergy consumption for years 2013-2020. Together with Table 12 monitoring data for year 2012 is being provided in accordance with Article 24(2) and Annex XIV Part 1.***

3.5 National intermediate target for nearly zero energy buildings for 2015 in accordance with recast EPBD Articles 9(1) and 9(3b) for new buildings.

It is being proposed that a 'nearly zero energy building' in Malta shall be defined as :

"A building with an energy performance not exceeding 90 kWh/m^{2}yr for dwellings and 290 kWh/m^{2}yr for all other buildings, calculated in accordance with the approved methodology and according to the following explanatory notes."

Wherever possible, solar-based renewables shall be encouraged and are being promoted. This issue is highly complicated due to the high density of built-up areas, issues of roof ownership and very limited land resources.

The definitions are still under discussion.

	Existing buildings – target as a percentage of total renovated buildings	**New Buildings – target as a percentage of total newly constructed buildings**
2015	5	5
2020	25	100

Table 8 National targets for nearly Zero Energy Buildings

3.6 Overview of the primary energy savings achieved by the time of reporting and estimations of expected savings for 2020

Readily quantifiable energy savings for the period 2010-2013 are included in Table 10. The same table includes estimates of expected savings for the period 2014-2020 as a result of readily quantifiable measures which were either included in previous NEEAPs and which would still result in savings post 2013, end-user measures quantified under EED Article (7), specific renovation projects which result in net energy savings, and already committed investment in the generation infrastructure. The adopted measurement and verification

methodologies follow those documented in Annex 2, Tables A-C and estimate savings achievable per measure.

	Primary energy savings (ktoe)	**Final energy savings (ktoe)**
2012 – Achieved	35.70	12.65
2016 – Forecast	224.92	32.84
2020 – Forecast	264.28	50.77

Table 9 Overview of the estimates of Primary and final energy savings

3.7 Overview of final energy savings

Table 10 indicates how, through readily quantifiable measures identified in the second NEEAP as well as additional measures committed under the EED, and including savings which shall be achieved through investment in generation infrastructure, Malta expects to reach 24% energy efficiency by 2016. The table covers the period 2010-2020, and includes aggregate expected savings from electricity use, transportation and electricity generation. It should however, be underlined, that a number of additional measures, especially those targeting behaviour, as envisaged in the second NEEAP, have proven difficult to quantify, and shall nevertheless be pursued.

Compliance with targets		**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	
Business as usual													
Total final consumption (toe)													
Electricity Demand	A	151,518	156,991	161,124	164,778	167,270	178,441	190,122	194,429	198,770	203,143	205,843	**toe**
Road transport fuels conventional (including national navigation and less biodiesel and bioetbe displacement and electricity in transport)	B	164,821	159,031	159,600	167,203	169,640	169,589	168,174	168,837	168,875	168,405	170,413	**toe**
Other fuels excluding aviation and LPG incl.biodiesel in industry	C	58,522	53,510	50,832	64,034	59,189	61,053	62,962	64,841	66,743	68,587	70,326	**toe**
Fuels - aviation	D	104,178	107,875	103,122	106,024	106,024	106,024	106,024	106,024	106,024	106,024	106,024	**toe**
LPG	E	23,901	23,986.65	24,516	25,678	26,091	26,505	26,799	26,992	27,187	27,526	27,552	**toe**
RES contribution													
Total RES-H (toe)	G	3,352	4,056	7,349	7,157	7,356	7,710	7,776	7,818	7,869	7,920	7,974	toe
Total bio-fuels (toe)in transport (considering biofuels substitution obligation and bioetbe)	H	538	1,316	3,034	2,741	3,657	4,458	7,151	7,901	9,290	10,856	10,354	toe
Total final consumption (excluding EE savings)	**I**	516,244	518,237	522,223	537,616	539,226	553,780	569,008	576,842	584,757	592,461	598,485	toe
Aviation capping as per RES directive	**J**	21,269	21,351	21,516	22,150	22,216	22,816	23,443	23,766	24,092	24,409	24,658	toe
Conversion efficiency of power generation as at 2009	**K**	30.3%	30.3%	30.3%	30.3%	30.3%	30.3%	30.3%	30.3%	30.3%	30.3%	30.3%	
Total primary energy (capped)	**L**	781,711	792,673	811,080	832,607	840,012	880,851	923,562	941,624	959,845	977,921	990,401	toe
Scenario taking account of energy services directive savings, new delimara plant and 200MW cable													
Energy efficiency (end use) (ref final consumption)	M	8,800	9,834	10,008	11,438	14,006	19,100	26,963	30,788	31,961	35,290	38,590	toe
Energy Efficiency end use transport	N	615	1,637	2,640	1,969	2,123	2,865	5,877	7,559	9,277	11,038	12,179	toe
Energy efficiency (end use) (ref primary consumption)= (M/P)+N	O	29,647	34,083	35,658	38,867	45,621	50,343	69,080	78,680	83,261	92,898	102,069	toe
Conversion efficiency	P	30.3%	30.3%	30.31%	31.0%	32.2%	40.2%	42.7%	43.3%	43.2%	43.1%	42.9%	
Savings from improvement in conversion efficiency= {A-M}/K-{A-M}/P	Q	-	-	-	11,260	29,680	129,629	155,837	161,880	164,211	164,428	162,213	toe
Total savings	R	29,647	34,083	35,658	50,128	75,300	179,972	224,917	240,560	247,472	257,326	264,282	toe
Total primary energy (capped) in this scenario={L-R}	S	752,064	758,590	775,422	782,479	764,711	700,878	698,645	701,064	712,373	720,595	726,119	toe
Total final consumption in this scenario		506,829	506,765	509,576	524,209	523,097	531,815	536,169	538,495	543,519	546,133	547,716	toe
Total savings=R/L	T	4%	4%	4%	6%	9%	20%	24%	26%	26%	26%	27%	

Table 10

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Final energy consumption by sector												
Industry	68327	68917	71917	69630	67674	71068	73861	75996	78146	80290	81654	toe
Electricity end-use (demand) in industry	45476	46856	48866	50877	51288	54186	56481	58154	59838	61535	62458	toe
Diesel	9424	9186	9391	8832	6228	6466	6700	6922	7137	7341	7540	toe
Biodiesel	139	172	233	166	145	155	169	160	159	158	160	toe
kerosene	181	120	154	123	123	123	123	123	123	123	123	toe
gasoil	5846	5192	5302	5700	5933	6162	6386	6613	6830	7036	7238	toe
Thin fuel oil	6383	6518	7076	2938	2960	2984	3011	3038	3069	3106	3144	toe
LPG/Propane	878	874	896	994	998	992	990	986	990	992	991	toe
Road Transport	161657	159296	160284	169944	173297	174047	175325	176738	178165	179261	180767	toe
Petrol	78232	77860	76871	83454	83759	84083	84175	84033	83908	84044	83946	toe
Diesel	83017	80929	82729	85623	88738	89237	90251	91790	93350	94389	95979	toe
Biodiesel	408	507	685	866	799	727	899	915	907	828	842	toe
households	70309	72189	72713	70767	72354	77223	83925	84624	85345	86061	86726	toe
Electricity end-use (demand) in households	52717	55193	54958	54243	55843	60717	67412	68086	68767	69454	70149	toe
kerosene	572	378	486	744	738	735	738	750	774	789	739	toe
gasoil	2578	2289	2338	404	404	404	404	404	404	404	404	toe
LPG/Propane	13828	13761	14106	14727	14720	14717	14722	14735	14751	14764	14785	toe
Biomass imports	614	568	825	649	649	649	649	649	649	649	649	toe
Services	76521	77576	80753	93151	93159	97831	101672	104661	107651	110757	112581	toe
Electricity end-use (demand) in services	53325	54942	57300	59658	60139	63537	66229	68190	70165	72154	73236	toe
Diesel	5764	5619	5744	10192	8782	9127	9479	9832	10184	10511	10817	toe
kerosene	73	48	62	50	50	50	50	50	50	50	50	toe
gasoil	3920	3481	3555	7030	7443	7845	8244	8629	9011	9379	9723	toe
Thin fuel oil	4330	4422	4800	6263	6372	6477	6583	6690	6796	6894	6980	toe
LPG/Propane	9109	9064	9292	9958	10374	10797	11088	11270	11445	11770	11775	toe
RES-E	238	1510	1938	3209	5633	9456	12951	17076	26059	29336	32584	toe
PV	3	12	14	30	54	97	136	175	214	252	289	GWh
Microwind	0	0	0	0	0	0	0	0	0	0	0	GWh
Waste to Energy CHP (electricity)	0	5	9	7	11	13	14	23	89	89	89	GWh
RES-H	3352	4056	7349	7157	7356	7710	7776	7818	7869	7920	7974	toe
SWH+roof tank potential	29	34	45	46	47	47	48	48	49	50	50	GWh
WSM biogas to RTO	2	2	2	1	1	5	5	5	5	5	5	GWh
WSC tal-Barkat- heat			6	6	6	6	6	6	6	6	6	GWh
Biomass imports	8	8	8	8	8	8	8	8	8	8	8	GWh
bio-diesel in industry	1	3	2	2	2	2	2	2	2	2	2	GWh
WSM heat from CHP	0	1	2	0	2	2	2	2	2	2	2	GWh
heat pumps industrial and domestic			21	21	21	21	21	21	21	21	21	GWh
RES-T	538	1316	3034	2741	3657	4458	7151	7901	9290	10856	10354	toe
renewables electricity in transport	0	0	0	0	0	0	1	1	1	11	1	GWh
Expected additional part consumption of bio-fuels from waste, residues, non-food cellulosic and lingo-cellulosic material in transport	6	15	35	32	42	51	38	47	49	57	62	GWh
Bioetbe	0	0	0	0	0	0	44	44	58	58	57	GWh

Table 11

Gross Value added by sector												
Industry (millions of euros)	1069	1013	981	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Services (millions of euros)	4345	4582	4803	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Agriculture (millions of euros)	96	89	93	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Disposable Income of Households	3115087277	3239206213	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
GDP volume, base 2005 (millions of euros)	5533	5621	5657	5790	5894	6006	6177	6401	6633	6873	7045	
Fuel consumption in power stations (toe)	615606	579333	598594	607169	527197	497010	136237	300699	290176	285299	285527	toe
Passenger kilometres	n/a	228	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	228	0	0	0	0	0	0	0	0	0	
Population	414372	417617	419864	421877	423667	425236	426590	427038	427570	428194	428884	

Table 12

4 Policy measures implementing EED

4.1 Horizontal measures - Energy efficiency obligation scheme and alternative policy measures

4.1.1 Introduction.

It is appropriate that energy utilities and retailers offer to final customers energy services that promote energy use efficiency. This can be ensured by means of obligation schemes.
It is also appropriate that market conditions and other relevant parameters are taken into account in formulation of these schemes, while ensuring that the expected savings are achieved. It has been agreed in Directive 2012/27/EU that this flexibility to respond to different circumstances and thereby optimise the results obtained could extend to replacing some of the obligation by an equivalent amount of energy savings. Small retailers could be exempt from the obligation so as not to create disproportionate administrative burden and overheads.
The following describes the magnitude of the obligation in terms of target energy savings, how and the extent to which the EE obligation scheme will be applied in Malta and what other measures are planned to ensure that the target savings are achieved.

4.1.2 Quantifying the overall amount of energy savings required

(i) Methodology of the calculation of the amount of energy savings required.

Article 7 of Directive 2012/27/EU on energy efficiency sets out two alternative methods to calculate the target savings to be achieved. Malta has opted for the method set out in Article 7(2).
In terms of this latter option, the target energy efficiency saving is equivalent to achieving new savings each year from January 2014 to December 2020 equivalent to an agreed percentage of the average final energy consumption registered over the last 3 years of available data – i.e. 2010, 2011 and 2012. The agreed percentages are 1% for each year of 2014 and 2015, 1.25% for 2016 and 2017 and 1.5% for 2018, 2019 and 2020.

The energy used in the transport sector will be excluded from the calculation, as will certain other exclusions agreed in the Directive.

In setting targets and subsequently policies and measures to achieve them, the specifications and criteria set out in the Directive for the calculation of the targets, for ensuring the standards of the

measures, and on the quality of the verification and monitoring procedures have been taken into account.

(ii) Calculating the amount of savings required.

Calculating the amount of savings requires:

- The average annual energy sales to final customers to be established.
- The cumulative percentage annual savings required according to the Directive.
- Adjustments allowed in the Directive to be incorporated.

The Average Annual Energy Sales to Final Customers

The average annual energy sales to final customers over the most recent three-year period for which statistical data is available – 2010, 2011 and 2012 – is the base figure.
Malta opts to exercise the option to deduct the final energy consumption in transport from the total final energy consumption, as in Table 13 below.

Final Energy Consumption[13]	**Year**	**2010**	**2011**	**2012**
Total Final Energy Consumption: Final energy consumption includes all energy delivered to the final consumer's door (in the industry, transport, households and other sectors) for all energy uses. It excludes deliveries for transformation and/or own use of the energy producing industries, as well as network losses.	**toe**	**454.7**	**450.5**	**448.5**
Final Energy Consumption by Transport: Final energy consumption by transport covers the consumption of energy products in all types of transportation, i.e. rail, road, international and domestic air transport and inland navigation/coastal shipping, with the exception of maritime shipping.	**toe**	**281.4**	**271.00**	**264.4**
Final Energy Consumption Excluding Transport	**toe**	**173.3**	**179.5**	**184.10**
Average over the three years	**178,967**	**2081GWH**		

Table 13 Final Energy Consumption 2010 - 2012

[13] Eurostat data: http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/data/main_tables

(a) The Savings.

Malta opts to work out the target for achieving the savings using the method specified in Article 7 paragraph 2 of the Directive and described in para (i) above..

The savings, evaluated using the annual percentage target, work out as in Table 14 below.
Cumulative Energy savings: 691.9GWh

Year	***No. of years from start***	***New Savings - Percentage (%)***	***Cumulative Percentage (%)***	***Savings required per Annum (GWh)***
2014	1	1	1	20.8
2015	2	1	2	41.6
2016	3	1.25	3.25	67.6
2017	4	1.25	4.5	93.6
2018	5	1.5	6	124.9
2019	6	1.5	7.5	156.1
2020	7	1.5	9	187.3
Cumulative Energy savings: 691.9GWh				

Table 14 Energy savings required as per Article 7 paragraph 2(a)

(b) Adjustments allowed by the Directive

Article 7 paragraph 2 of Directive 2012/27/EU allows certain adjustments to the 'Cumulative Energy Savings' target as derived in Table 2 above. The maximum downward adjustment is 25% of the target that would have been set had Option 1 been selected.

The Option 1 target works out as in the table below.

Year	***No. of years from start***	***Annual Percentage (%)***	***Cumulative Percentage (%)***	***Savings required per Annum (GWh)***
2014	1	1.5	1.5	31.22
2015	2	1.5	3	62.43
2016	3	1.5	4.5	93.65
2017	4	1.5	6	124.86
2018	5	1.5	7.5	156.08
2019	6	1.5	9	187.29
2020	7	1.5	10.5	218.51
Total Savings required: 897GWh				

Table 15 Energy savings required as per Article 7 paragraph 1 - Option 1

Maximum downward adjustment (25%) 218.5GWh

Final adjusted target not less than 655.5GWh

In order to adopt the adjusted target, however, it has to be shown that the deduction from the Option 2 target (i.e. 692 less 656 = 36GWh) is in line with conditions in paragraph 2(b), (c) and (d) in Article 7, paragraph 2. This is considered below.

Condition (b) - There is no industrial activity in Malta similar to that listed in Annex 1 to Directive 2003/87/EC. No adjustment therefore needs to be made in this regard.

Condition (c) - It is unlikely that cost-effective district heating and cooling or that cost-effective use of large-scale centralised cogeneration can be made in Malta.

Again, no adjustment to the calculated target savings needs to be made in this regard.

Malta had used cogeneration extensively for thermal seawater desalination in the late 1960's to late 1980's. That technology is now superseded by high efficiency reverse osmosis technology and is no longer used.

Condition (d) - Early actions after end-2008 that still deliver savings in 2020.

Various initiatives to promote energy efficiency had been undertaken prior to this Directive. From those that qualify for this adjustment, savings greater than 37GWh have been achieved, for example through the:

- subsidy schemes for building envelope improvement;

- 2011, 2012 and 2013 grant schemes (scrappage schemes) to improve vehicle fleet efficiency; and

- major reform in the motor vehicles registration tax that encourages the use of cleaner and smaller vehicles.

4.1.3 A description of the national Energy Efficiency obligation scheme and its rationale

Malta has chosen to set an obligation scheme only on Enemalta Corporation to cover part of the target set in accordance with Article 7 of Directive 2012/27/EU. It will adopt end-use Energy Efficiency policies and measures to make up the balance needed to achieve the Article 7 target as described in| Annex 2, Tables A-C.

The following are the reasons for this decision.

i) Energy Efficiency Obligation Scheme on Enemalta.

Enemalta Corporation is the only electricity distribution system operator and the only licensed electricity supply company in Malta. It is therefore appropriate that the Corporation is charged with ensuring an efficient distribution system that minimises losses, that it operates the system in an efficient manner in accordance with European Directives and local legislation, that it introduces Smart meters, that its tariffs favour prudent energy use and energy efficiency (EE), and that it fosters such behaviour in its final consumers.

Enemalta Corporation is therefore the designated entity obligated to:

- Roll out a smart meter scheme that covers 100% of consumers connected to the national grid, and including monitors for effective communication with consumers in due course.

- To ensure that the Smart meter system is maintained up-to-date.

- Use these smart meters in innovative ways:

    - to instruct consumers in wise energy use in the home through appropriate activities and messages;

- to interact intelligently with consumers by means of user friendly graphic information on energy consumption patterns, prompting reflection towards energy efficiency;

- to use the smart meter as a tool to overcome consumer complacency towards energy efficiency in the long term and to maintain the momentum towards energy efficiency;

- to control fraud in electricity consumption, which is usually accompanied by waste and avoidable use;

Enemalta Corporation has also been obligated to:

- Adopt a tariff for electricity consumption designed to promote energy efficiency amongst its consumers. In the effective period of the obligation, Enemalta adopts a rising block tariff. It also incorporates in its tariff measures such as the current 'eco-mechanism' that rewards consumption by households that is lower than a stipulated level. The tariff is designed to yield the target revenue (cost-recovery, return on capital investment, etc.) and so higher consumption is relatively penalised.
  This is without prejudice to the Corporation providing electricity at the most competitive rates.

- Enemalta is to mobilize in order to offer (i.e. on a voluntary basis on the part of consumers) energy services at least in the form of free energy audits to domestic consumers. To this end Enemalta will be restructuring a small section of its engineering and technical division within the distribution workforce to come up with the setup to cater for such, including :

  - training and local accreditation of audit team members,

  - providing printed guidelines on energy efficiency practices that will be made available to households and

  - necessary advertising on the media of this service including the appropriate information on its website

Enemalta will be paid for these services as will be negotiated at the time.

ii) Further obligations on Enemalta are not indicated at this point in time.

It is not appropriate to impose obligations upon Enemalta, over and above those in fact imposed at this stage. Enemalta is currently in the process of being restructured, an event that is expected to bring about deep changes in its management and operations. Enemalta is also implementing very ambitious infrastructural projects that will effect very significantly and favorably its core function – that of generating and supplying electricity. Once completed and the older power station shut down, Enemalta will have a number of highly skilled technicians available for redeployment. The current restructuring planning for Enemalta is considering the creation of a subsidiary E.S.Co which will be ideally placed to provide Energy Efficiency and other green services. The current Enemalta infrastructural projects will result in very significant savings in primary energy.

iii) Obligations on other market operators.

The local energy market, apart from Enemalta, is made up of a large number of individual small operators. It is clear that any obligation imposed upon these operators will be difficult to co-ordinate, organise and implement effectively and efficiently. It will also entail disproportionate costs and effort. The section below demonstrates the make-up of the maltese energy market.

iv) A Perspective of the local energy market in numbers.

- Malta imports 97% of its energy needs with the remaining 3% produced from fragmented RES sources.

- Enemalta Corporation, a state-owned entity, is responsible for the importation, storage and wholesale of 89% of all fuels used in Malta and Gozo in 2013.

- Enemalta Corporation is the only licensed electricity supplier in Malta. Electricity generation by other operators can only be licensed if the energy is for own use or for exclusive sale to Enemalta Corporation.

- Fuel used for electricity generation is imported solely by Enemalta Corporation and stored in the Marsa and Delimara primary storage facilities.

- Petrol (for road transport) is imported solely by Enemalta Corporation since it has the necessary primary storage infrastructure to handle this product in accordance with regulatory and safety standards.

- Transport fuel (petrol diesel and biofuel) is retailed through 80 petroleum filling stations. Each station is individually owned and can purchase fuel from any supplier it chooses.

v) Infrastructural projects being implemented by Enemalta.

- Enemalta has just commissioned 8 x 17.1 MW CI engine – driven generators; with heat recovery which yields a total nominal power of 144MW.

- It is constructing the Malta – Sicily interconnector which will for the first time connect Malta to a robust international grid.

- It is negotiating a long-term power purchase agreement with a private consortium that will be constructing a 215MW gas- fired CCGT plant at Delimara Power Station.

- It is negotiating a long term contract for the supply of LNG and the construction of the infrastructure to receive this alternative fuel.

- It is rolling out smart meters.

- Participation in the equity of Enemalta by a private entreprenneur is being negotiated and a deep restructuring process is being planned.

4.1.4 Description of Other Policy Measures

The following 'other policy measures' are being adopted. These additional measures are expected to deliver 663.5GWh. The Enemalta obligation is expected to deliver 111.6GWh thus the target overall savings of 656 GWh is met.

The precautions to avoid double-counting of savings achieved from the various measures include:

- The plan is coordinated by one team whose members fully understand the regulatory and operating framework of the Maltese energy sector.

- A transparent holistic presentation of all the measures in one table.

- Minimum assignment of measures and credit for derived savings in the horizontal measures.

The 'other policy measures' are described below:

(i) Financing schemes or instruments and Fiscal incentives.

Malta has been adopting financing schemes for several years with successful results.
Malta will continue to support such schemes and several such measures are included in Annex 2, Tables A, B and C of Article 7 to the EED.

The Ministry responsible for Energy and/or the Malta Resources Authority (the energy regulator) have been entrusted with the implementation of schemes for households, while Malta Enterprise and the Malta Tourism Authority have been entrusted with schemes for industry and commerce. Transport Malta has been entrusted with schemes relevant to transport. All are subject to audit by the National Audit Office.

(ii) Training and education, including energy advisory programmes.

Numerous training and advisory programmes have taken place and these will continue to happen.
These range from:

- Tertiary and post-tertiary level courses in environmental sciences (including energy efficiency) which have greatly been expanded at the University.

- Practical Training courses at MCAST and ISE directed at operators and installers of RES and EE equipment.

- Participation by experts in popular interactive radio and TV programmes at household level to explain issues and reply to questions related to wise energy use directly to individual consumers.

- Advertising campaigns using TV spots, bill boards and distribution of information brochures with practical energy savings tips.

(iii) Government leading by example.

Government is conscious of the need to improve the efficiency of energy use throughout its buildings, in its infrastructure and in the services it provides. It is investing accordingly and promoting energy efficiency throughout the public service.
Government investments are visible and serve as examples of good practice and direction to the private sector. Government controlled entities are expected to use their initiative to propose good practice and energy use efficiency.

(iv) Direction to the public sector through the budgeting process.

Government is using its budgeting process, and its interaction with that of its entities to drive towards energy use efficiency.

(v) Regulation

Regulators – e.g. the Malta Resources Authority, Malta Enterprise and the Malta Tourism Authority – are in constant dialogue with the regulated entities and sectors to promote energy efficiency, through direct regulation or otherwise. State industries also use their expertise and initiative to advance energy-use-efficiency

4.1.15 Notification of methodology for calculating the impact of energy efficiency obligation schemes and the other complementary measures.

The specific measures that are being adopted as complementary to the energy efficiency obligation scheme are listed Annex 2, Tables A, B and C sets out the details of the impact of the energy efficiency obligation schemes and the other complementary measures and other details required by the Directive.

Reporting Detail	Table where included
(a) obligated, participating or entrusted parties, or implementing public authorities	A
(b) target sectors	A
(c) the level of the energy saving target or expected savings to be achieved over the whole and intermediate periods	B
(d) the duration of the obligation period and intermediate periods	B

(e) eligible measure categories	A
(f) calculation methodology, including how additionality and materiality are to be determined and which methodologies and benchmarks are used for engineering estimates	C
(g) lifetimes of measures	B
(h) approach taken to address climatic variations within the Member State	not applicable to Malta
(i) quality standards	to be determined
(j) monitoring and verification protocols and how the independence of these from the obligated, participating or entrusted parties is ensured	C
(k) audit protocols	C
(l) how the need to fulfil the requirement in the second subparagraph of Article 7(1) is taken into account.	described in text

4.2 Horizontal Measures - Energy Audit and Management Systems:

4.2.1 Introduction:

The carrying out of energy audits and the adoption of management systems has so far not been mandatory for any category of enterprise or consumer in Malta. Thus there are as yet no official centralised and comprehensive records of energy audits actually carried out, except for those supported by the Government. Nor have standards or criteria to ensure the level of the audit been covered by legislation or official standards.

Because of the absence of centralised recording of energy audits, the situation in Malta can best be summarised by describing (in aggregate) the practices adopted by large enterprises and some typical and special programs and carried out over the years, generally with the involvement of government and its entities, to promote audits in SME's and in households. Audits in buildings of public entities are described in Sections 3.3.1 and 3.3.2.

Energy efficiency has always been pursued by industry in general. The main driver of this was the impact of energy bills on the balance sheet of business enterprises in a competitive environment and at a time of economic stress.

4.2.2 The Current Situation:

The Energy Unit within the Ministry for Energy and the Health (MEH) is in continual dialogue with various market operators. The situation regarding energy efficiency auditing was investigated recently. The general picture that emerges is generally satisfactory, though initiatives in favor of SME's must be expanded and standards upgraded.

- *Large Enterprises*

Various information meetings were recently held with individual enterprises[14] coming from various sectors of the economy and with trade associations (eg. the Chamber of Commerce and Enterprise and the Malta Hotels and Restaurants Association) to discuss energy auditing in Malta. It is planned that this dialogue will continue and be widened and intensified and extended to SME's and other categories of enterprise.

A survey carried out in conjunction with the Malta Chamber of Commerce, Enterprise and Industry among 'large enterprises' has shown a high degree of EE awareness. These enterprises generally carry out regular energy audits and only some enhancement is required to meet the auditing obligations of Directive 2012/27/EU. Some also implement energy environment management systems that exempt them from the direct obligations of Para 4 of Article 8 of the Directive.

Thirty three questionnaires, covering five issues, were sent out to eligible enterprises members of the Malta Chamber of Commerce Enterprise and Industry by the Chamber. Ten responded up to the time of writing. MEH had discussed energy auditing with several large enterprises immediately prior to the survey and this may have effected the response.

The findings of the survey were:

- Implementation of an Energy or Environment Management System

  - 6 enterprises implement one or more of ISO 14000, ISO 50001 plus participation in corporate schemes.

  - 1 participates in regular audits by its Corporate HQ

  - 3 have internal teams monitoring energy consumption.

[14] A major hotel in St Julians, a large hi-end commercial/residential development in Sliema, large banks, a beverage manufacturing company holding a major international franchise, shipyard, aircraft maintenance industry, commercial office space development and others.

The six who implemented an EMAS did not reply to further questions, since prima facie they satisfy the EA requirements of the Directive. The other four reported as follows:

- Description of their current practices:
  - 3 reported internal energy monitoring practices based on sub- metering and analysis.
  - 1 reported that it has a fully fledged EMAS to monitor efficiency and identify opportunities.
- Standards, Benchmarks, Performance Indices.
  - 3 reported benchmarking with industry standards.
  - 1 reported participation in a Corporate International program with a competitive element. The Malta plant won Gold Group Award and other external awards.
- Self-Assessment of compliance with Article VI and Annex I
  - 1 reports fully compliant system
  - 2 report some enhancement needed, but results are likely to be confirmed.
  - 1 report partial compliance
- Any other comment / suggestion:
  - Return on EE investment is lower than investment in core business
  - Balance between Energy Performance of buildings and rent payable has not yet been reached (Rent of high quality buildings eg. BREAM certified is too high)

o SME's .

Micro, small and medium enterprises make up over 99% of business entities in Malta. Typical programmes directed at SME's were:

- *EU funded Energy Grant initiative*

In January 2010, Malta Enterprise launched an EU funded Energy Grant scheme to support specific energy savings measures. The rational presented to businesses was that by implementing energy efficiency measures, businesses will see good returns on investment and increased profitability, whilst in doing so they would also be taking initiatives in favour of the environment. Eligible projects include intelligent lightning systems, thermal insulation, CHP, BMS and RES.

Malta Enterprise has over the past few years been offering Energy Audits. Once an enterprise requests an Energy Audit at its premises, Malta Enterprise will contract an engineer on the enterprise's behalf, who will conduct an audit within a period of four weeks. The audit is essentially a walk through review, but is a starting point to gathering and recording further information. The further information gathering covers operations description and performance together with a evaluation of suggested energy conservation measures. Utility bills are reviewed and additional metering of specific energy-consuming systems may be performed to supplement utility data, while meetings with key personnel are conducted so as to provide a better understanding of major energy consuming patterns.

An overall financial analysis is also provided for each energy saving measure proposed. Options for improvements are costed so that the enterprise can weigh the cost of improvements against future energy savings and prioritise according to those that offer best value for money.

This service was offered at no cost to the businesses.

- *Eco-Gozo project – 'Save and Reduce'*

This project is described in more detail in the paragraph 'Energy Audits in the Household Sector' below.

581 small businesses were provided with a walk-through audit and informed on water and energy conservation, renewable energy and waste management.

4.2.3 Energy Audits Obligation for 'large Enterprises'

With the imminent transposition of Directive 2012/27/EU into Maltese legislation, energy audits will become mandatory for 'large enterprises'

Large enterprises will be required to register with the Energy Agency and submit appropriate reports whenever the statutory audits fall due and have been completed. The audit standard is stipulated in the legislation and the auditors will have to be accredited or otherwise acceptable to the Energy Agency. Local auditors will be registered with the Malta Resources Authority under Government Notice 404 (see section on accreditation schemes).

The legislation will also require those 'large enterprises' which implement energy or environmental management systems according to the relevant ISO standards to apply to the Energy Agency for exemption from the mandatory audit, giving proof that the system they operate fully meets the standards set, including qualification and independence of the auditors.

The details of the legal notice setting the EA obligations of large enterprises are being discussed with stakeholders prior to publication.

4.2.4 Energy Audits in the Household Sector:

Maltese households have traditionally been prudent in energy use, though there is room for more energy efficiency (see Eurostat and Eurobarometer data.). This attitude was driven by:

- The high costs of energy, especially electricity, and the awareness of the negative impact of this on the cost of living of consumers.

- Awareness of the importance of wise use of energy raised by various activities and national support schemes, by Government directly and other entities on its behalf.

- Recently, the high level of public debate put energy costs at the top of the public agenda.

- Mild Climatic conditions.

A substantial amount of work has already been done to promote energy audits as a first step towards wise energy use. Typical projects are described below. Government plans to offer to have a free energy audit to every household and SME in Malta upon request.

'Save and Reduce'

'Save and Reduce', a Government-funded campaign, designed to promote sustainable energy, water and waste management practices in households was offered to all households in the island of Gozo starting as from 2012. This project was under the responsibility of the Ministry for Gozo in cooperation with the Institute of Sustainable Energy of the University of Malta. Some aspects of the project have been described elsewhere under 'consumer information'. This programme was offered to 11,000 households, out of which 8828 (56% of all households in Gozo) accepted to receive the visits and audits.

Among other deliverables, a walk-through energy and water audit was conducted and advice arising out of the observations of the audit was offered to the consumers in the household. An information booklet that contained qualitative and quantitative information about energy efficiency was handed out to the household. The officers visiting the households were subjected to a training course by the Institute of Sustainable Energy prior to the start of the programme.

The Ministry for Energy and Health will now be implementing a similar project offering the audit to all the households in Malta who request such a service. This is a firm commitment of Government in its electoral manifesto and is expected to start in the near future..

Besides the structured programme described above, there were several other small initiatives by various other institutions. The following are some examples.

4.2.5 Energy Efficiency in Low Income Houses in the Mediterranean

In 2013, MIEMA Energy Agency, in collaboration with the Ministry for Energy and Health started a project referred to as ELIHMED (Energy Efficiency in Low Income Houses in the Mediterranean). This project is co-financed by EU funds and should be completed by the end of 2014. Thirty five low income households are benefitting from this project. This project covers visits by a trained energy auditor to the participating households in order to determine which energy efficiency measures and renewable energy sources are recommended to that particular household to reduce its energy consumption. A grant up to a maximum of €7,000 can be awarded to implement the recommendations of the auditor. The benefitting household will only contribute an additional 10% of this amount.

Possible energy efficiency measures include solar water heating, introduction of double glazing apertures and roof insulation, low energy lighting and optimization for natural lighting.

4.2.6 European Citizens Climate Cup (ECCC), Funding instrument: Intelligent Energy Europe, 5/2010-08/2012

The European Citizens Climate Cup (ECCC)[15] was a competition between Maltese households and on European level with the aim to demonstrate that everybody can save energy significantly. The ECCC in Malta issued tips, practical solutions and information in order to help reduce the amount of energy consumed by the households through a personalised online 'Energy Saving Account' (ESA). The households entered at least four energy bills or meter readings into the ESA and it collected all energy consumption and cost data and evaluated it.

Key outputs.

- More than 150 households participated in the energy saving campaign and submitted energy bills and readings for the online tool.

- 63 households received a free energy walk-through audit at their home with a detailed report and suggestions how to save more energy.

- Participating households in Malta lowered their energy consumption by an average of 10% as a result of the competition, ca. 650kWh per participating household during the 12 months competition.

- An estimated 750,000 media impressions locally.

4.2.7 New measures to promote energy audits and systematically maximise the benefits therefrom

The following measures will be implemented:

- Setting up by the Energy Agency at MEH of a centralised recording system of energy audits data designed to support the monitoring of progress and to help chart the way forward

[15] http://mt.theclimatecup.eu/

(including schemes to incentivize the implementation of the most cost-effective measures, where appropriate).). For large enterprises, the database will record, as a minimum,

- compliance with the legislation transporting the relevant parts of Directive 2012/27/EU
- The dates of the audit
- The auditors, their accreditation and the standards
- The recommendations arising out of the audit
- Any energy and environmental management system implemented by the enterprise and the reference to any exemption from the obligation of carrying out an 'ad hoc' audit.
- Progress over previous audit

- Government agencies (Energy Agency, Malta Enterprise etc.) will engage with SME's about energy-related issues, supplementing initiatives by the industry representative associations.

- A Government program to offer and provide free walk-through energy audits to all households and SME's in Malta that will take place in 2015.

More focused 'second- round' audits offered to SME's depending on the findings of the walk-through programme.

4.3 Horizontal Measure - Metering and billing

4.3.1 Introduction

Energy used by households in Malta is generally in the form of electricity supplied through the public grid and through LPG in cylinders.

LPG is purchased in 12kg cylinders and is generally used for cooking and space heating. The question of metering does not arise and consumers measure their consumption by the number of cylinders purchased, and their rate of gas consumption by the number of days after which the cylinder needed to be replaced.

Electricity services have traditionally been metered in Malta. Consumers have been provided with accurate actual metering of their energy consumption. Bills are based on metered consumption, and this, coupled with tariffs that are responsive to electricity cost has been an effective measure to avoid the wasteful end-use of electricity.

Enemalta Corporation is now installing smart meters, conscious of their value as a tool to empower consumers to manage their energy affairs, to help it identify energy demand trends and how best to influence them, and as a tool to help it account for energy flows and consumption. Smart meters are expected to lead to a reduction in energy consumption by changing consumer behaviour through information on energy consumption, and better energy accounting overall.

Enemalta Corporation is the sole electricity supply company in Malta. As such, switching is not possible and metering and tariffs were not designed to support such activities. The tariff scheme for Enemalta's supply is regulated by the Malta Resources Authority. Tariff schemes have traditionally been based on rising block rates, and recently an 'eco-mechanism' rewarding careful electricity use has been introduced. For metering and accounting purposes, autoproduction of electricity through domestic and small P.V. systems is considered as exported, while all electricity consumed is considered as imported.

Other services. There are no national widespread natural gas, heating, cooling and/or domestic hot water services in Malta. Some such services are limited to minor localised networks and major high-end commercial projects or residential schemes, the operators of which are very conscious of the need of energy efficiency and of the measurement of consumption of each individual residence to sensitise users to wise energy use.

Water consumption has also traditionally been metered. This is relevant to energy management because 55% of the water delivered through the national network is produced by the desalination of seawater, which is perceived to be very energy-intensive.

The following addresses some issues raised in the Directive. Malta is already generally compliant with the metering and billing requirements raised therein.

4.3.2 Measures adopted in metering and billing,

i) Advice on monitoring and management of energy consumption to consumers when smart meters are installed – empowering the consumer to use energy wisely.

A public information campaign was launched in 2009 during the period when a pilot SMART meter project was being introduced and implemented. This campaign took the form of

billboards, leaflets and other documentation which explained the benefits of changing to a SMART meter, and gave guidelines on how to use the features of the meter to read and monitor one's consumption.

Enemalta Corporation is currently distributing a SMART METER manual, which is given to each client during the installation of the meter. This manual is kept by the client for reference. It briefly describes how to use the meter and how to access the display functions. The manual also gives information as regards the rating of common appliances with a view to effectively improve on the use of electricity.

Enemalta installers and those of its external contractor working on its behalf were given training on how to install the meters, how the meter works (basically the steps to understand what the display is showing and how to monitor consumption) and how to answer simple questions about the function of the meter. All clients who have a SMART meter should have been given the short explanation by the installer and handed over the booklet. The number of final customers who received such advice up till the 27th January 2014 is around 236,900 clients.

ii) <u>The progress with the roll-out of smart meters, and their capabilities.</u>

SMART meters are being installed for every electricity service in Malta (except for temporary applications where an electronic meter is used). At the start of the project in 2009, it was expected that the 245,000 meters originally included in the programme were to be completed within 3 years. The number of accounts increased throughout the years especially due to a higher than expected increase in the number of new customers and in PV installations (similarly requiring a SMART meter) following the incentive schemes offered by government in favour of RES. Taking into consideration this increase, the number of 'meter accounts' as of 2nd January 2014 is 281,182 of which 236,920 (i.e. 84%) have been changed to Smart. Of these installed meters 187,948 have been commissioned (i.e.79%) and out of these approx 140,000 meters are practically sending readings successfully (i.e.75%).

The SMART meters being deployed are basically identical to those used in Italy with a total of 32 million installed in this country and several million others within electricity networks managed by ENEL. The meters used offer the possibility of multiple tariffs with separate registers segregated by time of day and with the facility to remotely change the tariff structure. Enemalta has ordered a consignment of these meters and is awaiting delivery around May 2014.

The meter has a number of functionalities which include non volatile registers for storage of data and load profile for at least 38 days, two way encrypted communication by PLC (power line communication) to an automatic meter reading system with the ability to exercise remote control of the meter including remote on/off and power curtailment. The meter is manufactured to EN50470-1, EN50470-3, EN62052-11, EN62053-23 MID 2004/22/EC.

iii) Other local market actors supplying energy, and metering.

Enemalta is the only electricity supply company in Malta and, as explained above, ensures that all of its services are metered.

There are no other national networks supplying energy-related services in Malta. Some such services are limited to small isolated localised networks and major commercial projects and large residential schemes. As explained earlier, all heating and cooling services and gas services are individually metered and generally billed in one or two month intervals.

iv) Accounting of individual consumption of heating/cooling in multi-apartment and multi-purpose buildings.

Every residence, whether stand alone or in multi-apartment or multi-purpose building has or will have a SMART meter installed at the first entry into the customer's internal installation to measure electricity consumption[16]. The meter therefore measures the total individual household consumption.
The measurement and billing of consumption of energy for particular services has already been indicated in (iii) above.

v) Frequency of billing and billing information (for electricity consumption).

Billing is a useful tool to promote energy efficiency – the more frequent the billing, the more the consumer is kept EE-aware.

Prior to the roll-out of smart meters, actual meter reading frequency by Enemalta was about every six months. Interim bills estimated on the basis of demand/ consumption patterns were

[16] With one exception where a multi-apartment building was serviced with electricity under the old regulatory regime prior to the legislation and Network Code coming into effect. Each individual's meter was installed at the point of entry point into the building, not the apartment.

issued every two months with a final 'actual' bill based on meter readings issued every six months.

Even before the roll-out of smart meters, electricity consumption was however clearly shown on digital meters installed for every service, the reading of which were easily accessible to the consumer.

Electricity consumption information as follows is provided in the electricity bills:

Meter readings	Reading at time of billing and the previous reading
Consumption	Derived from above if actual. Otherwise it could be estimated if meter is stopped or faulty, or if meter has not been read for any reason not the fault of the Corporation.
Working and make-up of bill	The bill clearly indicates the fixed charge, the units of energy consumed and the cost per unit. Tariff in Malta is traditionally based on a rising block tariff favouring energy conservation.
Information specific to household.	– Consumption in previous year based on intervals as available. – Average kWh/day and cost per day. – Projected annual consumption, average kWh and cost per day based on current consumption pattern. – CO^2 generated by electricity usage. – Advice to access account details and on-line payment facility.

The practices to be adopted when the Smart Meter roll-out is complete and meter- reading stabilised have not yet been decided. It is expected that the two-month billing interval will be maintained.

vi) Complementary information.

Billing records are kept by Enemalta Corp (or lately by the billing agency Arms Ltd on its behalf). The 'metering/billing history' over the last three years including meter reading, the derived consumption and the bill make-up is available on demand to the consumer at no charge. The cost of billing is covered by the tariff as an administrative overhead.

Enemalta Corporation provides a calibration service should a consumer desire to have his meter checked.

vii) Electronic billing.

Electronic billing has not yet been adopted in Malta. It is likely that it will be introduced in the future to provide a complete customer service.

viii) Other measures that go beyond the requirements of EED.

Meter-readers have for several years been equipped with hand-held electronic terminals, which contains stored data on previous consumption readings and into which the latest reading is entered. The terminal (and printer) provide in hard copy the comparative data as well as comment on the level of consumption compared to the average consumption of other households of similar characteristics. This is delivered by the meter reader at the time of meter reading, until such time as the particular consumer is serviced via the Smart Meter..

4.3.3 Further Measures.

No major further measures other than the above are planned in so far as metering and billing are concerned, at least up to 2016.

4.4 Horizontal Measures - Consumer Information Programmes and Training

4.4.1 Introduction

Maltese consumers are very much aware of the importance of energy efficiency and conservation. Figure 4 compares the 2010 energy consumption of households per capita in tonnes of oil equivalent in the EU 27 countries alongside the EU 27 overall average for 2010. This figure indicates that in 2010 Malta had a consumption per capita of 0.15 toe which was the lowest household consumption per capita in 2010 among the EU27 countries and well below the EU27 average of 0.57 toe.

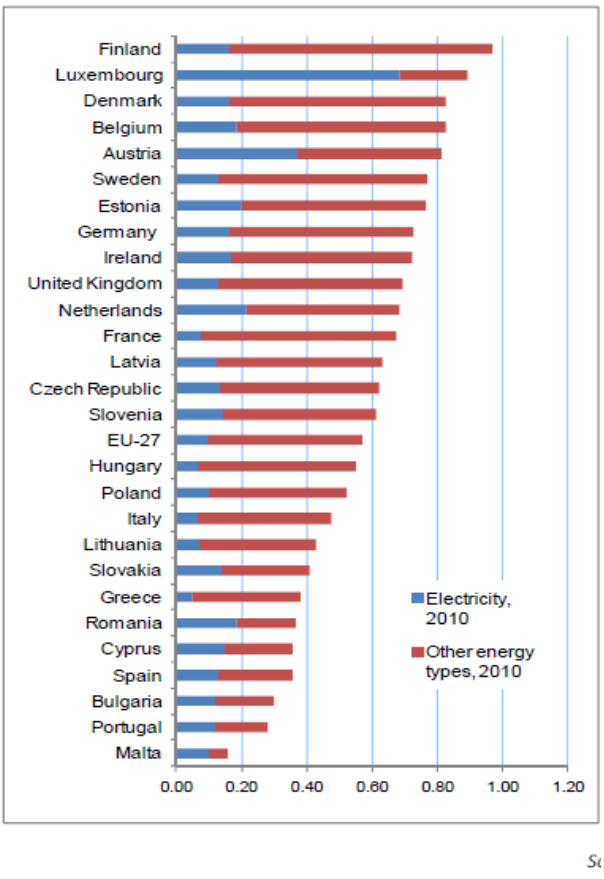

Figure 4 Lowest Household Consumption per Capita amongst the EU-27

Source: Eurostat data

These results are partly a reflection of the effects of climatic conditions on the use of energy by households, and also on the cost of energy.

The cost of energy and the consequent bills in Malta have been very high over the last years. Indeed, they are perceived to have been amongst the highest in Europe and the cost of energy is a major national issue in Malta. High bills ensured that waste of energy by consumers was minimised or eliminated to the best of their abilities, certainly in the majority of the households. Euro-barometer surveys carried out since 2004, furthermore indicate that the Maltese population is, in general, careful about the use of energy resources. The survey, published in April 2011, shows that 87% of the Maltese respondents indicated they have cut down on electricity use for lighting and domestic appliances while 68% said they have reduced the use of heating and/or air-conditioning.

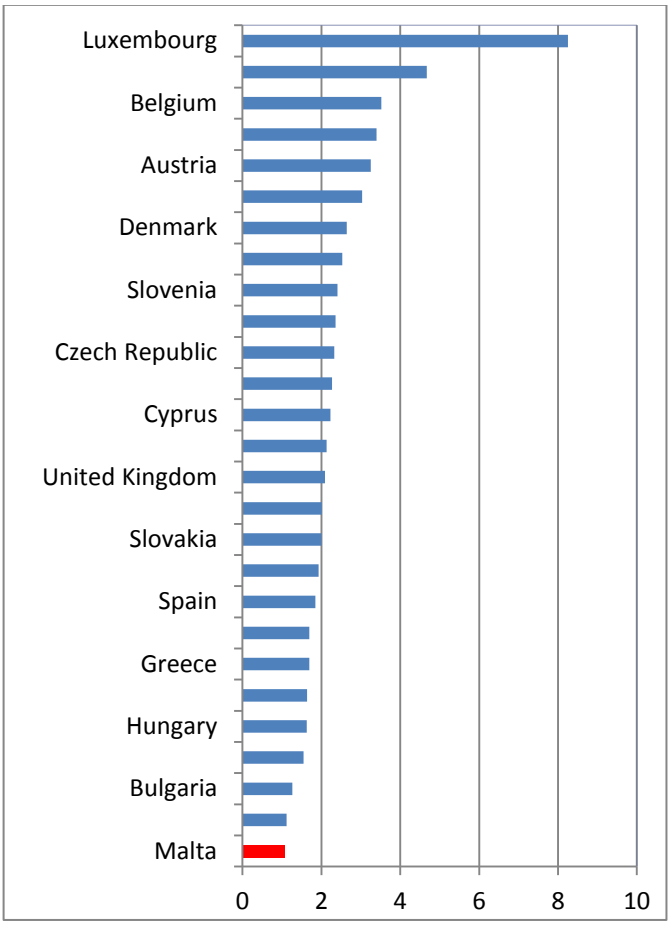

Figure 5 Lowest Final Energy Consumption per capita (2011) amongst the EU-27

A lot of work to promote energy use efficiency has been done over the past years. Information and awareness programmes are practically ongoing, and have been so for a number for years. Several incentive schemes have been offered, some more successful than others.

The following sample projects illustrate the type of information dissemination and awareness-raising on energy efficiency, including incentive schemes that have taken place in Malta. The list is by no means exhaustive.

4.4.2 Behavioural Change in consumers

i) *'White goods' support scheme.*

The scheme for promoting energy efficient domestic appliances provides a good example of how such schemes are effective in changing public behaviour and hence influence the market towards energy efficiency. Government published an incentive scheme for grants on the purchase of household appliances for domestic use certified as being efficient in the use of energy. A grant,

equivalent to 20% of the selling price of particular appliances, subject to specific maxima, was offered.

The scheme was as shown below:

Appliances	**Category**	**grant of 20% of selling price with maximum of:**
Dishwashers	A	€ 58.23
Refrigerators, Freezers or Combinations	A Tropical	€ 116.47
	A+ Subtropical	€ 116.47
	A Subtropical (till 31st March 2007)	€ 58.23
Washing Machines	A	€ 58.23
Tumble Dryers	A	€ 58.23
Air Conditioning Units	A	€ 58.23

Table 16: Energy efficient appliances scheme

The main objectives of the 'energy efficient appliances rebate scheme' were to guide the market towards more efficient appliances and to influence consumer choice in favour of energy efficiency. It was also emphasised that by using a more energy efficient appliance, the consumer would, in the longer term, be facing a lower electricity bill than otherwise would be the case.

The results of the scheme have been a market transformation process as indicated in Table 17 below. The weighted average sales of each category of appliances increased in the A class sector. The poorest performing sector was that of air conditioners, then flooded with cheap equipment imported from outside the EU with poor energy classifications. This data in this table was obtained from replies to a specific questionnaire by importers participating in the scheme.

Category		2006 level of sales	2007 level of sales	2005 level of sales in EU15
Refrigeration	A+, A++	10%	29%	8%
	A, A+, A++	36%	77%	59%
Air conditioners	A	16%	44%	Not available
Washing machines	A	75%	86%	85%
Dish washers	A	85%	96%	80%

Table 17: Transformation in the appliances market

The Scheme was audited by an external auditing firm in order to improve and streamline the various processing and verification procedures, with the aim of making the scheme more participant-friendly. Attention was paid to ensuring customer awareness of the scheme and its objectives.

A customer survey was also carried out to assess how the process could be further improved. One of the items in the survey covered the disposal of the old appliance. The disposal rates are what one might reasonably expect given the rate of penetration of the relevant appliances. What needs to be catered for any later similar schemes, though less significant than expected, is the removal of old refrigerators from use.

Appliance	new %	disposed %	still in use %
washing machine	33%	52%	15%
refrigerator	38%	52%	10%
air-conditioning	87%	13%	0%
dishwasher	75%	25%	0%

Table 18 Disposal / Use of Old Appliances

ii) *Common appliance policy – All for one, One for all – Energy Labels (COMEON LABELS);*

The ComeOn Labels project[17] carried out in 2013 further supported the concept of the market transformation process. It was funded through the *Intelligent Energy Europe Programme* ,(project

[17] **http://www.come-on-labels.eu/**

number 12/2010-05/2013). It aimed at summarising the best European experience related to the energy labelling of household appliances and supported the proper implementation of the EU energy label. Its goal was to enhance the visibility and credibility given to the EU energy label and to improve the market for labelled products.

Key outputs

- More than 60 shop visits in Malta over a period of 30 months to verify energy label compliance: http://www.come-on-labels.eu/displaying-energy-labels/status-of-appliance-labelling
- Retailer training on the new energy label was widely organised in Malta in collaboration with MCCAA: http://www.come-on-labels.eu/download/retailer-training-manual
- Various media activities to inform consumers about energy efficient household appliances: http://www.come-on-labels.eu/download/malta-independent

4.4.3 Targeted EE information and advice, awareness raising and initiatives

The media has been used extensively to deliver information and advice and raise awareness on Energy Efficiency to citizens

Radio and TV. The local TV and radio stations are all accessible over the whole national territory. Taken together, programmes are widely followed.

Many TV and audio programmes intended for general viewing and others aimed at specific audiences (e.g. housewives) contain sessions on EE and RES. These programmes are interactive between the technical advisor invited to the program (supported by the program anchor) and the consumer via telephone from his home. Government agencies provide experts, as do private market operators.

- Mail Shots - A ‘mail shot’ whereby pamphlets on energy tips are delivered to each and every household is a cheap medium to pass on the EE message. This is facilitated by the size of the country (circa 186,000 households) and by a liberalised highly competitive postal service, including private operators who have developed a niche market delivering campaign and P.R. material.

- Billboards - Use of billboards along major roads and bypasses is another relatively cheap and effective medium that is very popular and known to be particularly effective. Its effectiveness lies in the fact that the billboards are placed at strategic points along the few busy road arteries

through which much of the traffic carrying consumers to those zones with a high concentration of work places has to pass.

- Use of the Internet: Several local market operators host websites offering advice on Energy Efficiency. The Maltese people, especially the younger generation are very IT-literate and foreign EE sites are accessible and surfed.

  - Enemalta hosts a website[18] supported by a customer care service that assists the consumer estimate his energy consumption and provides advice and tips on energy use efficiency and RES.

The main features of this website are:

- An Ecocalculator

  This enables the householder to estimate how much energy is being used in the household by appliances in a given list. The calculator allows the householder to judge what appliances are using too much electricity and suggests alternatives/ corrective action.

  The calculator also works out the amount of greenhouse gas emissions generated by the household to reinforce the EE message.

- Energy Tips (See Annex A)

  This is a section containing some 63 FAQ's about energy use efficiency in the home, covering generic issues, appliances, the EU energy label, freezers/refrigerators, cooking, dishwashers, washing machines.

- Heating and Cooling

  Water heaters, solar water heaters, air conditioners, general space heating.

- Other

[18] www.enemalta.org.mt

Lighting and stand-by power.

Besides the website, the Corporation offers further specific personalised assistance through a customer care service. This service covers request for information, queries, complaints, suggestions or for reporting related matters. It is provided through a freephone and an e-mail service offered in the website and on the bill.

The Malta Resources Authority too hosts an informative website, which informs stakeholders on regulatory issues and other matters within the functions and other terms of reference of the Authority.

The site contains information on:

- Authorisations, permits, licenses and notifications covering electricity and RES; registration of training courses for RES systems; authorisations for activities related to the inland fuel market and bunkering.

- Regulated tariffs for electricity and fuels, and feed- in tariffs for RES

- Registers of licensees and authorised service providers

- Information on the workings of support schemes for retailers and consumers; technical information to assist consumers e.g. to maximise the benefit out of their RES investment, and guidelines; registered products

- Information on Climate Change impacts and adaption, emissions and other matters.

- Library publications, legislation and archived documents

House Visits

- Gozo.

  In 2012, the then Ministry of Resources and Rural Affairs, in cooperation with the Institute of Sustainable Energy of the University of Malta organised a program (*Save and Reduce*) offering house visits by trained experts to each and every household in Gozo wherein an EE and RES information session and a walk-through energy and water audit were conducted. The audit aspect is discussed in detail elsewhere (Section 4.2 – Energy Audits).

During the visit, energy efficiency tips and ideas, water conservation, RES technologies and Government assistance schemes in place at the time were discussed and an information booklet that contained qualitative and quantitative information about energy efficiency was left with the household.

- Malta

  All the households and SME's in Malta will shortly be offered on-site energy audits and advice on energy consumption and related matters. Upon request, households will be visited by technical experts and given individual advice according to the specific household circumstances. The project is currently being planned.

Consistent with the policy to handle matters holistically, this study will include a research element to contribute to other work aiming to achieve a quantitative understanding of all energy consumption in Malta. This will in turn allow more knowledge-based decisions, including focussed cost-effective incentive and support schemes. It will also ensure that duplication of work and inefficient use of resources is avoided.

Specific Attention to Vulnerable groups

Vulnerable groups are given particular attention to overcome energy poverty.
A recent example is that of the Department of Nutrition, Family and Consumer Studies within the Faculty of Education of the University of Malta. This Department considers energy efficiency to be a relevant theme in its undergraduate courses. It also features in Health, Family and Consumer Studies post-graduate courses.

Recently, the Department collaborated through 'Homeconomists in Action' (an association of home economics teachers) with Caritas (Malta), an NGO helping vulnerable citizens, in organizing an 8 week evening course in Sustainable Lifestyles. This included energy and water conservation in the home and in one's lifestyle and choices.

4.4.4 Quantitative assessments and projects to allow knowledge-based decisions, targeted information and focussed incentive schemes

The National Statistics Office has conducted a study 'Development of Detailed Statistics on Energy Consumption in Households' whereby a sample 1500 households (flats, maisonettes, terraced houses and villas) were visited, information on the appliances and behaviour of household members from an energy perspective was gathered, and technical information on the actual consumption for various

services was obtained through consumption meters fitted to the various appliances for a short period of time.

The NSO study referred to above was conducted over the winter months and identified refrigeration, water heating and lighting and other as the major consumers of energy in households. Air conditioning for cooling was unnecessary for the period of the survey and there seemed little awareness of the benefits of this appliance when used for heating.

The study provided useful indicators and it is planned to extend its scope in terms of detail and time span. In this way, a better understanding of demand of energy by the household sector is obtained.

The Ministry of Energy and Conservation of Water will be collaborating with the NSO in this exercise. It is planned to start in..... It is not excluded that this project will be combined with the fact-finding element of the 'House Visits' programme described above.

4.4.5 An example of a structured holistic Educational Campaign to Promote Energy Savings in the Domestic Sector

To spread awareness that energy consumption, and hence also electricity consumption bills, is also dependent on consumer's knowledge and behaviour, the Malta Resources Authority has co-ordinated an EU- funded educational campaign to promote efficient use of energy in a number of key areas, notably homes, enterprises, buildings in general and transport. The aim of this campaign is to target specific consumer groups with relevant information covering a wide range of initiatives: information sessions, brochures, billboards, advertising on media etc.. These are used to raise awareness about energy consumption, inform consumers about the available technologies and the energy efficiency potentials.

During the Launch Seminar which was held on the 27th May 2013 (see Figure 6), it was explained the overall objective of this Educational campaign was to reduce energy consumption through the use of energy efficient and renewable energy solutions across the various areas. It was outlined that through this campaign, the consumers are to be better educated on the efficient use of energy, including but not limited to the following topics:

- Labelling awareness
- Equipment replacement

- Standby power use
- Appropriate equipment sizing (water heaters; cars)
- Eco driving
- Building Energy Performance
- Energy Efficient Lighting

Figure 6: Launch Seminar of the Educational Campaign

Information sessions and Brochures

During the month of September and October, four information sessions were held. All information sessions were targeted for the general public addressing different issues related to energy efficiency. The first session was held on the 13th September and it focused on issues related to the Transport Sector. The main topics discussed during this session were the following:

a. The importance of tyres labeling – by MCCAA.

b. Eco Driving – by Transport Malta.

c. What fuel efficiency measures are taken by the Public Transport – by the public transport operator, Arriva.

d. The importance of electric cars in Malta – by Transport Malta.

e. The role of research for Sustainable Mobility – by the Institute for Climate Change and Sustainable Development.

The last 3 sessions were focused on energy efficiency in building. First session was held on the 1st October, 2013 focusing on 'Energy efficiency initiatives at home'. The following topics were discussed:

a. The importance of the Energy Performance Certificate – by the BRO.

b. Information on Energy Labelling in household appliances – by the MCCAA.

c. The significance of the Yearly Appliance Energy Cost Indication – Supporting the uptake of energy efficient products – by the PIM.

d. The meaning of Stand – by Power – by the MRA.

e. How to utilize the refrigeration and air conditioning system at home efficiently – by the MCAST.

Second session was held on the 7th October, 2013 focusing mainly on the following topic: "Energy Efficiency in Building." In this session, a number of issues were discussed, namely:

a. The role of the BICC in promoting energy efficiency in buildings – by the BICC.

b. Vocational training related to energy efficiency in the Built Environment – by the MCAST.

c. Retrofitting by Design – Energy Conservation at its best – by the UOM.

d. Energy efficiency in Urban Conservation Areas – by the KTP.

e. Working towards net zero energy affordable homes – Architecture Project Ltd.

The last information session for the general public was held on the 30th October focusing on 'Renewable energy for Households'. The following participants presented the following topics:

a. Renewable energy at home: how much is too much? – by the ISE.

b. Policy and Design Guidance on Energy Efficiency – by the MEPA.

c. Structural Issues related to PV Panel Installation – by the UOM.

d. The Uptake of the Renewable energy grant scheme– 2013- by the MRA.

Apart from the information sessions, during this campaign, 3 focused brochures are to be distributed door to door to all maltese households. The first brochure entitled 'Energy efficiency at home and at the office' was already launched and distributed (see Figure 7). The other two brochures (transport and building) are to be distributed in the following months.

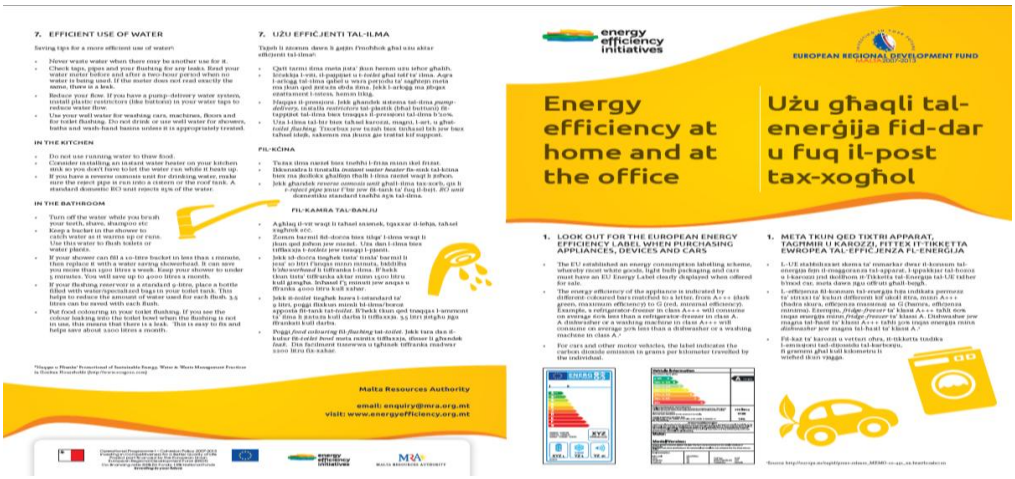

Figure 7: Brochure on Energy Efficiency at Home and at the Office

Billboards, TV and Newspaper Adverts

During the educational campaign, various media, billboards (see Figure 8), tv and newspaper adverts (see Figure 9) were used. Different messages were used each month to target different audience.

Figure 8: Billboard Message for July 2013

Figure 9: Newspaper advert for October 2013

The Malta Resources Authority will be conducting surveys to measure the impact of the programme and see how future similar projects can be improved.

4.4.6 Other Contributors

The (Catholic) Church in Malta too is playing its part in taking efficiency in energy use on board. In 2019, the Church's Commission for the Environment circulated a guideline document 'Guidelines for Wiser Electricity and Water Use in Parishes, Centres and Church Homes' with the intention of initiating a process of energy conservation. Several major building complexes were audited to promote energy and water conservation. Action was taken on the findings, including on the replacement of candescent lamps with LED's for festive street decorations.

Several solar energy projects - installation of PV systems and Solar Heaters on Churches and homes- some with EU part-funding were undertaken.

4.4.7 Further Measures

Given the success of efforts so far, it is planned to continue on the same lines. Of particular importance is the Government programme of offering house visits and walk-through energy audits to all households and SME's in Malta.

It is however noted that certain categories of businesses, such as SME's have not been sufficiently engaged with. The Ministry of Energy will work with stakeholders such as GRTU and the Chamber of

Commerce to fill information gaps in the commercial and industrial sectors with regard to energy efficiency with specific attention to Micro- Enterprises, SMEs, agriculture and rural operators.

4.5 Horizontal Measures: Availability of qualification, accreditation and certification schemes

4.5.1 Introduction

Energy Efficiency is a topic that has been and is being addressed in various technical training institutions and established academic and teaching bodies. The Malta Resources Authority and the Building Regulations Office also keep registers of recognised training courses and of qualified providers of energy services and energy auditors.

4.5.2 The legal framework

Government Notice 404

Government Notice 404, persuant to the Energy End-use Efficiency and Energy Services Regulations sets out the legal framework for a scheme regulating certain training courses and for the registration of the successful candidates with the Malta Resources Authority. Training courses eligible for registration under the scheme in Government 404 are those for :

- Installers of PV systems.
- Solar thermal Systems
- Shallow geothermal systems and heat pumps
- Energy auditors (for industrial and commercial operations or installations, excluding buildings).

The Notice also provides the criteria for eligibility of trainees to join the courses, the course contents and for certification of the successful candidates by the training institution.

Publication of names and contact information of the certified candidates, on the basis of information provided by them, is also provided for in G.N. 404.

Legal Notice 376 of 2012

LN 376/2012, the Energy Performance of Buildings (EPB.) Regulations provides for the energy certification of building units and for the regular inspection of heating and air-conditioning systems in buildings.

It gives legal backing to the certification and accreditation of EPB Assessors. These assessors are listed in a Register kept by the Buildings Regulations Office (BRO). For accreditation, they are required to have a tertiary qualification in a relevant discipline and must have undertaken a training course provided by a recognised EPB Training provider and approved by the BRO. EPB assessors are graded in categories depending on their qualifications and training.

The EPB Assessors register, including contact details and category of registration of assessors is accessible to the public in full respect of Data Protection Legislation.

4.5.3 Education and Training

The Current Situation

Training courses are given at different levels - to professionals, skilled workers, vocationary skills students and university under and post graduate students.

The main providers of academic and vocational courses and training programmes in Malta are the University and the College of Arts, Science and Technology. There is significant collaboration with foreign relevant institutions and universities to ensure a high academic level.

Building Sector Vocational Education and Training

In collaboration with the Building Industry Consultative Council and as part of the '*Build Up Skills'project*, the Malta Chamber Foundation and the Malta Intelligent Energy Management Agency (MIEMA) have published a National Roadmap for Energy Training of Workers in the Building Industry (31/08/2013).

The project had the following objectives:

- Investigating EU policies, legislation and directives focusing on low carbon buildings and associated Vocational Education and Training (VET) Skills;

- Identifying Knowledge, Skills and Competencies required for low carbon buildings;

- Critically evaluating the low carbon skill gaps existing within the local VET scenario;

- Analysing barriers hindering local VET provision towards low carbon buildings;

- Formulating recommendations for VET to achieve low carbon buildings.

The final project[19] report includes a skill gap analysis which reviews current skills vis-à-vis occupational profiles for existing Initial Vocational Education and Training (IVET) courses related to the construction and the building environment. It includes the analysis of cross-cutting skills across the IVET Courses delivered at the Institute of Building and Construction Engineering at MCAST (IBCE), up to and including degree level.

Following the results of the Skill Gap analysis and an analysis of the barriers that might hinder VET to achieve low carbon buildings, a number of recommendations were formulated. Additionally, an action plan was developed for each recommendation was developed. Specifically to VET. part of the project is to develop curricula to address the skill gaps identified. This will allow the development of courses for the existing workforce (CVET programmes). Moreover, the skill gaps identified will also be integrated within the existing curriculum for the full time (IVET) programmes. The latter is envisaged to be undertaken between 2014 and 2017.

Training for providers of RES services at MCAST

The Institute of Electrical and Electronics Engineering (IEEE)at MCAST provides various courses up to degree level in Power Generation and Renewables and in Green Energy Technologies. It also provides part-time courses in Renewable Energy Systems & PV Installation for both large and small systems. These courses are approved by the Maltese energy regulator, the Malta Resources Authority under the provisions of Government Notice 404.

The Institute of Mechanical Engineering and the Institute of Applied Science respectively also provide various courses up to degree level in Operations Engineering and in Mechanical Engineering (Plant)as well as diploma in Environmental Sustainability.

During the three scholastic years 2011 to 2014, over 500 students would have attended the above mentioned courses.

[19]Full detailed reference to the project is available at www.buildupskillsmalta.com with particular reference to the "National Roadmap for Energy Training of Workers in the Building Industry"

Graduate training at the University (at the Institute for Sustainable Energy)

The University of Malta has over the years endevoured to increase the knowledge of the student body covering the whole energy sector, introducing Renewable Technologies and exploring Energy Efficiency. To ccentralise studies on 'sustainable energy', the University of Malta established the Institute for Sustainable Energy[20]. The aims of the Institute are to develop studies in the use of new and renewable energy sources and methods of energy conservation and to organise and participate in teaching programmes and research projects in the field of energy technology. It encourages and promotes research among its students and academics.

The Institute's contribution to the promotion of Energy Efficiency can be detailed as follows:

1. Post-graduate MSc degree in Sustainable Energy. This is an evening part-time course over three years, the first two years consist of a number of study units and the third year is for the dissertation project. In the course programme the following units that are directly related to Energy Efficiency are covered:

    - Electrical Energy Efficiency Technologies
    - Mechanical Energy Efficiency Technologies
    - Energy Processes in Buildings

These units are elective which means that students take only one of these three. Energy efficiency also features in other study units, e.g. in the Energy Regulations, Policy and Economics Unit which is compulsory for all students. In the first three courses, 57 students in total followed this programme of studies.

2. Dissertations for the taught MSc in Sustainable Energy. A number of these dissertations deal with topics which are relevant to energy efficiency.

3. MSc by research. Here again some of these research projects that lead to an MSc by research deal with topics of relevance to Energy Efficiency. On average, 3 to 5 students a year read for an MSc by research.

[20] https://www.um.edu.mt/iet/home

4. Externally funded projects, either through local funds, e.g. the RDTI programme of the MCST, or EU funded projects could be directly related to energy efficiency. Currently, the ISE have an RDTI project, called ThermHCB, which is aiming to develop a Hollow Concrete Block with improved thermal properties for Maltese conditions

5. The Institute's annual conference also normally includes a number of papers that deal with energy efficiency. This conference attracts from 100 to 120 participants per year.

Level of training courses –Co-operation with foreign bodies

MCAST offers BTEC Diploma, Extended and Higher Diplomas in Construction and the Built Environment. Fraunhofer-Gesellshaft collaborates with MCAST in the degree level courses offered by the latter institution.

Training of auditors for industrial or commercial installations and operations, excluding buildings

As part of the general upgrading of the practice and quality of energy audits for wider application and to meet the criteria set out in Directive 2012/27/EC, formal top-up training at university level for warranted engineers is being planned between the MECW and the University of Malta. Successful candidates will qualify for registration under the scheme set up by the Malta Resources Authority under the provisions of Government notice 404.

Training of assessors for buildings

The BRO has been holding courses for Energy Performance in Building (EPB) assessors for the past years and to date around 160 officers and 30 officers, for the residential and non-residential sectors respectively, have qualified. The BRO has also plans to develop courses for assessors of the efficiency of air-conditioning, space cooling and ventilation systems, and for boiler and space heating systems.

4.5.4 Accreditation

Energy Performance in Buildings (EPB) accredited assessors

In line with Legal Notice 376 of 2012 transposing the Energy Performance in Buildings Directive, the Building Regulation Office (BRO) holds a register of Energy Performance in Buildings (EPB) accredited assessors.

Renewable Energy installers , Providers of Energy Services and Auditors

In line with Government Notice 404 of 2012 (pursuant to the Energy End-use Efficiency and Energy Services Regulations), the Malta Resources Authority holds a register of installers of PV systems, solar thermal systems, shallow geothermal systems and heat pumps and for auditors of industrial or commercial installations and operations, excluding buildings.

4.5.5 Measures

The major new measure is the is the running of suitable training schemes for energy auditors, learning from the experience of other countries. The local academic and vocational institutions are in continual contact with industry and well aware of the need to keep up with progress, new technology and legislation as well as the needs of industry in the training and teaching they offer.

4.6 Horizontal Measures: Energy Services

The local market for energy is made up of a number of small companies except for Enemalta Corporation. This Corporation is the only entity that is licensed to distribute and supply electricity.

Malta has repeatedly argued that the expected benefits resulting from the internal market in electricity in terms of efficiency gains and price reductions will not be achieved or passed on to consumers in Malta if, under the present circumstances, access to the distribution network would be granted to other suppliers. In fact, the Commission has granted a derogation to Malta from Chapter IV of Directive 2003/54/EC and from Article 20(1) and Article 21(1) of the same directive in Decision 2006/859/EC, and the Council and the Parliament have established, in Directive 2009/72/EC, that Articles 26, 32 and 33 of that Directive shall not apply to Malta.

The establishment of energy service companies, as understood in Directive 2009/32/EC, to provide "the physical benefit, utility or good derived from a combination of energy with energy-efficient

technology or with action" would run contrary to the derogation and would imply the creation of an energy market. Preamble 30 of the same directive further clarifies that: "The common framework should give energy utilities the option of offering energy services to all final customers, not only to those to whom they sell energy. This increases competition in the energy market because energy utilities can differentiate their product by providing complementary energy services."

The establishment of such markets would mean that the benefits that currently accrue from the derogation acquired under the electricity directive would be eroded. It appears better to come up with a model of 'energy performance contracting' that addresses the specific needs of all stakeholders in the sector.

As described elsewhere in this plan, large enterprises have in-house (or from their parent group) energy experts who maximise energy end-use efficiency in their establishments. These enterprises employ consultants as and where necessary, and contractors who carry out the engineering tasks and projects that are identified.

Small enterprises generally employ consultants to ensure efficient energy use, though sporadic 'energy performance contracts' are not excluded.

It is the intention of Government to explore in more detail 'energy performance contracting' in the coming year in order to come up with the optimum model for such services in Malta, if this activity is shown to be advantageous for industry.

A proposed 'energy management system' for certain public buildings might be the catalyst for this initiative.

The way forward.

The Energy Agency within the Ministry of Energy will spearhead a wide consultation process between stakeholders in the energy sector designed to come up with the model of 'energy performance contracting' best applicable to Malta, if shown to be beneficial. The model will be publicised, stakeholders informed and initially incentivised to adopt it. Awareness-raising among the different categories of stakeholders is very necessary; some of them do not consider it their role to provide an energy service, but rather to sell a product.

The necessary complementary governance and support services to make 'energy performance contracting' successful will be set up.

5 Energy Efficiency measures in Buildings

5.1 Introduction.

Given the mild climate of the Maltese islands, energy performance of buildings historically was never a major parameter in the design of buildings in Malta, with the first regulations directly addressing energy performance being promulgated in 2007.

The present compilation of the cost optimal studies for Energy Performance of Buildings in Malta has provided the theoretical baseline in order to set the level of energy performance of new buildings or renovated buildings. These are now being followed by an exercise to set the minimum energy performance requirements as per Legal Notice 376 of 2012 to cost-optimal levels. The cost-optimal studies have also been used to feed the Nearly Zero-Energy Buildings plan for Malta.

The nearly zero energy buildings plan for Malta is currently in the consultation phase and certain directions have already been identified. Both the cost optimal report(s) and the NZEB plan shall be revised as appropriate in line with Directive 2010/31/EU.

5.2 Overview Of National Building Stock

Categories of Buildings

Based on the 2011 Malta Census carried out by the National Statistics Office, Malta had 223,848 dwellings, of which just 68.2% (152664) were occupied and 71,184 were vacant.

Terraced houses constitute the most common type of dwelling of all occupied units. This is evidenced by the table below. Terraced houses are normally located within development zone which allows the construction of 4-unit blocks. Thus the fate (and remaining life-span) of terraced houses depends on their re-development potential. The increasing number of multi-family units restrict the amount of roof space available for the installation of solar RES. A further study needs to delve into the quantity and depth of renovations taking place. It is generally the case that deep renovations are normally carried out when a new owner buys the unit. Since the majority of households own their main dwelling, the number of multi-family blocks with little possibility for redevelopment due to multi ownership, will bear impact of the number and type of refurbishment to expect in the future.

Of the 71,184 vacant proprieties, almost one-fifth (14237) are holiday dwellings[21], the remainder (56947) unoccupied. With these latter buildings, energy consumption is not an immediate issue of interest or indeed investment priority. Holiday dwellings are generally used for short lets mostly in Summer. The cost-benefit of investment in energy-efficiency is therefore less clear in their case.

Dwelling Type	**Number of Dwellings**	**Percentage of total nr.**
Detached villa	1,030	0.8%
Owner Developed Semi Detached Villa	2,575	1.9%
Speculatively Developed Semi Detached Villa	1,545	1.1%
Post war Terraced House	42,030	30.7%
Pre-war Urban Terraced House	9,380	6.8%
Pre-war Rural Terraced House	9,380	6.8%
Post war top floor Maisonette	14,305	10.4%
Post war ground floor Maisonette	14,305	10.4%
Pre-war top floor Maisonette	3,810	2.8%
Pre-war ground floor Maisonette	3,810	2.8%
Post war top floor Flat	15,675	11.4%
Post war mid floor Flat	15,675	11.4%
Pre-war top floor Flat	1,790	1.3%
Pre-war mid floor Flat	1,790	1.3%

Table 19 Local dwellings built pre-2006 split by type

Information regarding commercial office buildings is limited to recent years only. Until the last two decades, commercial office buildings deployed the same construction methods as the residential sector, with a substantial amount of companies and firms making use of existing converted buildings, originally designed as dwellings. Only recently has this trend changed, with new commercial blocks being built according to modern office space construction methods, and specifically to fulfil this purpose.

[21] National Statistics Office, 2010

Analysis by Building Age

Generally speaking Malta's buildings stock can be considered as a very old stock. In fact around 34.9% of all residential buildings in Malta are over 50 years old, that is, they are beyond the average life span of buildings in Europe. A third of these buildings have actually been built before the First World War (1918), almost a century ago.

Maltese buildings were historically built to last, sometimes not only decades but also centuries. In fact for most Maltese, purchasing or building a property is seen as a life-long investment, which will require little or no modification over a person's lifetime. Such a consideration has in fact led to a low refurbishment (or indeed demolition) rate throughout the private residential sector with only few property owners significantly refurbishing their property over the years. Deep renovation is mainly undertaken when there is a change of ownership and may not happen again for another 30 or 40 years since the size of the islands does not necessitate living close to the workplace. The general trend is that one stays in the same dwelling throughout his adulthood.

On the other hand, the long life span of our dwellings means that existing units, even those with low energy performance, shall continue to be used for a long time, probably without any deep renovation. Similarly to what happened anywhere else, the financial crisis slowed down the building industry in the latter part of the first decade of the 2000s. The number of new constructions has seen a considerable reduction. In 2010, the Malta Environment and Planning Authority (MEPA) approved 4,444 new residential dwellings down from the 9,081 new units which were given the green light in 2005.

5.3 Buildings' Energy Use

Energy Usage in the Residential Sector

Statistically[22], it has been reported that the overall energy consumption of the average Maltese household in 2009 was less than half[23] the EU 27 average. The bulk of the energy used in European homes, approximately 70%, is utilised in central heating, something of an unknown technology in Malta (National Census 2005 reported that less than 1% of the residential building stock have central heating systems installed). In this context, the lack of central heating systems coupled with Malta's

[22] Enerdata. 2012. *Energy Efficiency Trends in Buildings in the EU, Lessons from the ODYSSEE/MURE Project*. D.Bosseboeuf. Paris, France.

[23] 0.63 tons of oil equivalent (toe) for Malta,. 1.48 toe per dwelling for the EU27.

favourable climate conditions and the fact that Maltese enjoy a predominantly outdoor lifestyle compared to their European counterparts, has resulted in Malta's low residential energy consumption compared to other countries in Europe.

In lieu of central heating systems, most Maltese households tend to heat buildings during the very short heating periods either using portable LPG gas heaters or reversible Heat Pumps (in the form of split-unit air conditioner units)[24]. The latter have effectively become very popular as heating devices especially in consideration of the fact that efficient reversible heat pumps split-units have become readily available for the cooling market. A favourable aspect in this regard is that apart from the high EER (Energy Efficiency Rating) which can be obtained when using heat pumps, heating can be provided in a decentralised manner permitting better individual space control, hence heating can be provided specifically where required.

In terms of cooling requirements the share of total energy consumed by air-conditioning system in the residential sector in Malta, is around 10%. In 2005, the average Maltese dwelling consumed 550 kWh per annum for cooling for air conditioning. As demonstrated by the increased sales of heat pumps (45% of the local households in 2005 had air conditioners whilst in 2009 this increased to almost 70%), this energy consumption is on the increase. Notwithstanding this fact, good educational campaigns and a very energy conscious population (vis-a-vis energy consumption in buildings) have prompted most households to use (high efficiency) inverter Heat Pumps having high EER ratings, so already partially offsetting the increase energy consumption due to the increased market penetration of the Heat Pumps.

Domestic hot water heating is still predominately based on electric water storage, with only 10% of existing dwellings[25] making use of solar water heater to heat domestic hot water.
Other renewable sources of energy typically used in Maltese dwelling include mainly electricity produced from photovoltaic panels. Successive grant schemes and the establishment of Feed-in Tariff have greatly facilitated this technology. In 2012 photovoltaics generated 0.6% of the electricity generation.

[24] Enerdata. 2012. *Energy Efficiency Trends in Buildings in the EU, Lessons from the ODYSSEE/MURE Project*. D.Bosseboeuf. Paris, France

[25] National Statistics Office, 2011, National Census of Maltese Households 2011

Energy Usage in the Commercial (Office) Sector

In 2010 the commercial sector consumed 625,554MWh, a share of 29% of the total electricity consumed. Heating and cooling energy consumption for office buildings is harder to establish, given the multitude of existing building typologies in this sector. It is however reasonable to assume that air conditioners, both split-units and centralised systems making use of chillers and air ducted systems, are the predominant technologies used for the purpose of space heating and cooling. Energy and cost conscious commercial building owners have however realised the importance of energy conservation and efficiency and as such tend to go for good energy-efficient technologies such as VRVs, inverter type and heat recovery technologies. Lighting in office buildings, though a substantial load, is already mainly of the energy-efficient type.

The calculation of cost optimal levels of minimum energy performance (EPBD Article 5(2))

The calculations of the cost-optimal energy performance levels in new and existing buildings in Malta have been carried out as per Guidance Document 244/2012. The calculations have been performed as per methodologies established in Malta for energy performance rating/certification of buildings. These are the Energy Performance Rating for Dwellings (in Malta EPRDM) for dwellings and the Simplified Building Energy Model for Malta (SBEMmt) for other buildings. . As per Article 3 of Directive 2010/31/EU, the minimum energy performance requirements shall be reviewed at regular intervals which shall not be longer than five years and, if necessary, shall be updated in order to reflect technical progress in the building sector.

'Cost-optimal level' means the energy performance level which leads to the lowest cost during the estimated economic lifecycle. The cost-optimal level shall lie within the range of performance levels where the cost benefit analysis calculated over the estimated economic lifecycle is positive. As per Annex 1 of the Cost Optimal Regulation, this report assumes a calculation period of 30 years for all of the buildings in this report.

The findings indicate that, although the introduction in 2006 of the present minimum requirements Technical Guidance Document F have resulted in major advances in energy efficiency, there is still space for slight further tightening of the minimum requirements in order to reach cost optimal levels, for both dwellings and non residential buildings. The introduction of renewables, mostly solar, would also greatly improve the performance; however this may not be possible in a large number of cases due to solar shading/orientation problems.

By 2015, when the building minimum requirements are brought to cost optimal levels, new dwellings are expected to produce about 15-25% of energy on site, where solar resources are available. New residences having sufficient access to renewable sources shall reduce the useful energy demand by 40-60%. Buildings having little or no access to renewable sources will not be able to reach this figure.

Existing Dwellings

A number of typical reference buildings were used as the base characterisation of existing buildings in Malta. The study on existing residential buildings focuses on 14 building typologies dating both pre and post war. New (post 2006) dwellings were built according to Technical Guidance Part F– Conservation of Fuel, Energy and Natural Resources which sets the minimum energy requirements on the energy of buildings performance since 2006 and are currently in force.

The table below shows the model-calculated primary energy consumed for the 14 building types used for existing residential buildings, split between those built before 2006 and those built after.

		Primary Energy* (kWh/m^{2}yr)	
Building Type	**Floor Area** (m^2)**	**Reference *** Existing Building (pre-2006)**	**Reference New Building (post 2006)**
Detached villa	176	196	94
Owner Developed Semi Detached Villa	235	177	84
Speculatively Developed Semi Detached Villa	235	189	84
Post war Terraced House	219	163	82
Pre-war Urban Terraced House	219	159	82
Pre-war Rural Terraced House	201	139	82
Post war top floor Maisonette	89	246	97
Post war ground floor Maisonette	89	231	127
Pre-war top floor Maisonette	129	202	97
Pre-war ground floor Maisonette	105	201	127
Post war top floor Flat	74	274	125
Post war mid floor Flat	74	205	117
Pre-war top floor Flat	105	240	125
Pre-war mid floor Flat	105	170	117

Table 20 The model-calculated primary energy consumed for the building types used in the analysis.

Note:

** Cost-optimal studies are based on a factor of 3.45 to translate final electricity savings into primary energy.*

It can be seen that the average primary energy value of the existing building stock built before 2006 is about 199kWh/m^2yr, whilst the value for new buildings built according to Technical Guidance Part F is about 96kWh/m^2yr. Hence it is clear that building in accordance with the Technical Guidance Part F, introduced in 2006, which established energy performance regulations such as maximum U-values of building elements (roofs, walls, glazing) and maximum allowable area of glazing according to the orientation, results in considerable improvement in energy efficiency.

The table below shows the cost-optimal level for each building typology, both with the inclusion of New Dwellings

		Cost-Optimal Level	
Reference building	**Area**	**Primary Energy with RES**	**Primary Energy without RES**
	m^2	**(kWh/m^2yr)**	**(kWh/m^2yr)**
Detached villa	176	22	75.41
Owner Developed Semi Detached Villa	235	20	68.27
Speculatively Developed Semi Detached Villa	235	18	66.27
Post war Terraced House	219	8	57.44
Pre-war Urban Terraced House	219	8	57.34
Pre-war Rural Terraced House	201	8	59.82
Post war top floor Maisonette	89	33	108.38
Post war ground floor Maisonette	89	41	116.38
Pre-war top floor Maisonette	129	40	102.58
Pre-war ground floor Maisonette	105	30	92.58
Post war top floor Flat	74	-42	94.31
Post war mid floor Flat	74	-48	88.31
Pre-war top floor Flat	105	-28	39.83
Pre-war mid floor Flat	105	-31	36.83

Table 21

Seven types of reference buildings were established for new buildings. These are shown in the table below, together with their cost optimal performance level primary energy. By considering a sensitivity range we are allowing for the fact that the cost optimal level for a given dwelling may differ from the more general cost optimal level.

Reference building	**Floor Area**	**Primary Energy**	**Sensitivity Range**	**Mid- Point**
	m^2	**(kWh/m^2yr)**	**(kWh/m^2yr)**	**(kWh/m^2yr)**
Detached villa	176	14	5 to 75	40
Semi-detached villa	235	16	5 to 50	27.5
Terraced house	219	14	5 to 50	27.5
Top floor maisonette	104	35	0 to 70	35
Ground floor maisonette	89	37	-10 to 80	35
Top floor flat	74	-44	-60 to 60	0
Mid floor flat	74	-52	-60 to 40	-10

Table 22

New non-residential buildings

For each reference non residential building considered in the cost optimality study, Table below shows the current national regulations compared to the cost optimal sensitivity range. In all instances the current requirements are well outside the cost optimal range. Whilst the current requirements demonstrate a considerable improvement in building standards, the current technical standards are not cost optimal and are outside the 15% range specified by the recast EPBD. In actual fact the average gap between the midpoint and current requirements is in the region of 40%.

Reference building	Sensitivity Range (kWh/m^2yr)	Mid point (kWh/m^2yr)	Current Requirements (kWh/m^2yr)
Detached Office <250m^2	136.24 - 299.49	217.86	372.98
Detached Office 250m^2 – 1500 m^2	146.76 - 215.76	181.26	279.86
Detached Office >1500m^2	120.68 - 267.31	193.99	338.65
Terraced Office <250m^2	140.21 - 305.70	222.95	419.80
Terraced Office 250m^2 – 1500 m^2	153.31 - 290.97	222.13	378.12
Terraced Office >1500m^2	169.33 - 295.25	232.28	352.14
Mixed Use Office <250m^2	254.16 - 288.66	271.41	382.12
Mixed Use Office 250m2 – 1500 m^2	169.08 - 291.66	230.37	367.43
Mixed Use Office >1500m^2	149.94 - 248.30	199.11	318.06

Table 23 Comparison table for New Buildings

The requirements for new offices are currently well outside the cost optimal range and it is necessary to review the current requirements for new offices to achieve cost optimal levels. The principal areas recommended for review are:

a. The U-values for walls, roofs and ground.

b. The U-values and solar heat transmission of glazed areas.

c. Higher efficiency air conditioning systems.

d. Enforcement on air tightness.

e. Use of efficient lighting fixtures

Analysis of the data demonstrates that the current building regulations have resulted in considerable improvements in the building fabric. The widespread use of high efficiency air conditioning systems for heating and cooling together with the improved efficiency standards brought about by the Energy Efficiency directive have also resulted in lowering the energy requirements for new offices. The cost optimal range shows that the building fabric can be improved further with very few changes to current minimum statutory requirements.

For new offices to meet cost optimal requirements the primary energy requirement should fall between 180 and 257.5 kWh/m2 yr. The introduction of this range as a requirement for new offices together with the tightening of the existing requirements relating to the building envelope should meet the requirements of the recast EPBD insofar as cost optimality is concerned. The various measures

constituting the cost optimal range may be presented as guidelines and not mandatory measures, as specific buildings may have particular requirements that facilitate the selection of one set of measures over another.

It is appropriate to indicate that the range of cost optimal values for new offices could be considered appropriate for Nearly Zero Energy buildings and hence the adoption of the requirements for cost optimality could also meet the NZEB target for new offices.

Existing Non Residential Buildings

The table below shows the current national requirements for new buildings as well as the energy performance of the building stock compared to the cost optimal range.

Reference building	Sensitivity Range (kWh/m^2yr)	Mid Point (kWh/m^2yr)	Current Requirements (kWh/m^2yr)	Building Stock (kWh/m^2yr)
Detached Office <250m^2	119.16 - 307.81	213.48	372.98	539.17
Detached Office 250m^2 – 1500 m^2	88.91 - 245.64	167.27	279.86	559.76
Detached Office >1500m^2	120.34 - 246.19	183.26	338.65	581.70
Terraced Office <250m^2	131.31 - 291.32	211.31	419.80	556.97
Terraced Office 250m^2 – 1500 m^2	153.79 - 250.84	202.31	378.12	804.09
Terraced Office >1500m^2	170.22 - 252.78	211.50	352.14	588.78
Mixed Use Office <250m^2	157.63 - 306.22	231.92	382.12	467.37
Mixed Use Office 250m^2 – 1500 m^2	189.09 - 262.96	226.02	367.43	1286.71
Mixed Use Office >1500m^2	139.86 - 252.78	196.32	318.06	531.85

Table 24 Comparison table for Existing non Residential Buildings

The present requirements for refurbishment of existing offices are well outside the cost optimal range and it is necessary to review these to achieve cost optimal levels. The principal areas recommended for review are:

a. The U-values for walls, roofs and ground

b. The U-values and solar heat transmission of glazed areas.

c. Higher efficiency air conditioning systems.

d. Enforcement on air tightness.

e. Use of efficient lighting fixtures.

f. Integration of renewable energy sources.

g. Solar water heating.

There are no predominant cost-optimal solutions for existing building types. Many different combinations fell within the cost optimal sensitivity range and therefore several different approaches in achieving cost optimal results can be used depending on the particular building being considered. The current building stock lags considerably behind current minimum statutory requirements which in turn falls short of the midpoint of cost optimal primary energy values. An average improvement in the region of 60% is required and hence the spread of measures that could be applied to achieve cost optimal levels.

5.4 Barriers to the introduction of RES in Maltese building

Detailed analysis of RES Potential in Buildings

The studies carried out so far indicate that significant improvements in energy efficiency in buildings in Malta can only be reached by the introduction of renewables, since the improvements brought about by an up-grading of the building fabric has its limitations. Hence an analysis on the potential introduction of RES is in order.

RES potential in the building sector, especially in the residential category, lies in the installation of photovoltaic panels and/or solar water heater installations on the flat roof tops of buildings. This potential is however limited and given the generous grants and feed-in-tariffs offered by Government through various incentive schemes, it is thought that systems have already been installed on a large percentage of those buildings which could host them. A photovoltaic total of 19,757kWp were installed in the residential sector by the end of 2013. The number of SWH in the Residential Sector were 16,276 installations by the end of 2013.

Conflicting roof use

Malta is a country with very limited open spaces, especially in urban areas. Flat roofs apart from providing much needed outdoor spaces also have to accommodate an access room, services such as water tanks and a TV antennas and other building services such as the air conditioners outdoor units. Historically roofs of residential buildings have also been used to air and dry clothes. This is in itself an energy-efficient practice, since it reduces the use of energy intensive tumble dryers.

This trend in multi-family (storey) buildings is however changing since such new buildings either do not have access to the roof or no space is available for additional services. Before 2006, when building policies in Malta were changed to allow an additional liveable space on top of existing buildings (penthouses), the roof space on top of a residential block of apartments was shared equally between the apartments' owners. Permits for penthouses were granted on condition that no washrooms would be permitted on the roof of the penthouse. Access to the roof was to be used for the purpose of maintenance only.

The addition of a penthouse on top of an existing building reduces the roof area available for services since regulations permit that penthouses can take a substantial part of the roof. The airspace on top of the penthouse is either sold with the penthouse or retained by the original owner/developer for further development should permits for an additional floor become possible. The units in the block are granted permission to place a water tank and a shared/individual antennae/aerial and can access it only for maintenance.

Similar situation applies to maisonette developments, with a ground floor and a first floor maisonette. The ground floor unit is usually allocated the back yard while the first floor enjoys the full roof, meaning that the ground floor maisonette is only allowed to install a water tank and antennae/aerial on the roof. This means that half of the existing maisonettes, 18,115 units or 13.2% of all dwellings (14,305 post-war and 3,810 pre-war) do not have the possibility to install photovoltaic panels or solar water heaters.

Other policy regulations on available roof space

The average area of new apartments is 74sqm. Recent residential blocks within development zones, where apartments are normally permitted, is made up of an average of 4 units (including penthouse) on top of each other. This means that in the case where each unit is granted permission to use the roof,

each unit may have a maximum of 18.5sqm (not taking into consideration the required setback of 2m from the front and back edges[26]), including space for water tanks, antennae/aerials and possible solar water heater. In certain areas, MEPA allows up to 9 floors, meaning that 9 units would have to share the roof, leaving only 8.2sqm available for each unit. Therefore the space available for installation of RES is very limited in multi-family building units which constitute a predominant percentage of the existing residential building stock.

Solar Rights

In Malta, there is no legislation protecting solar rights of individuals or buildings and it is difficult to foresee how this may be introduced given the traditional development of buildings and the high percentage of the area already covered by buildings.

Building and land ownership is fragmented and most development occurs in one-off building or plot in existing roads. Orientation would originally have been set without any reference to the sun.
With the increasing standard of living, smaller families and the need of residences nearer the place of work or study, the demand for more and relatively smaller dwellings increased.

Rather than extend the built area horizontally, it was preferred to go higher with development permits being granted for additional living units on top of certain categories of existing buildings. This development, which can be random in time or location depending on the plot owner's needs, brings with it risks of investments in solar equipment being either downgraded or rendered ineffective in part or in whole.

Plot size, shape and orientation

It is a very rare occurrence that local architects are afforded the possibility of designing dwellings of different orientation than that dictated by the size and shape of the building plot. Plots in Malta are characteristically narrow and long, with a front and back façade of just 6m wide. This oblong configuration leaves little scope for manipulation in the orientation to promote certain passive technologies in building design or indeed to maximise RES output. The orientation is thus determined by the plot shape and is aligned with the road. Factoring in planning restrictions, it is sometimes very

[26] All services are placed at least 2 metres from the front and back edge of the roof of the penthouse, stair-hood and washroom. All such services shall not exceed a height of 1.5m above roof of penthouse except for the solar water heater which should not exceed an overall height (including any storage tank) of 1.9m from the roof of the penthouse, stair-hood and washroom.

difficult to allocate the right 'sunny' south-facing space for photovoltaic installations.

5.5 Legislation

Legislation Related To Technical Guidance F Energy Performance of Buildings.

The Technical Guidance Part F – Conservation of Fuel, Energy and Natural Resources which sets the minimum energy requirements on the energy of buildings performance represents the construction industry's current requirements for all new and (major) renovated buildings since January 2007[27].

The Technical Guidance Part F was a significant step in the right direction. In 2013 the Building Regulations Office (BRO) commissioned two studies meant to check whether the current minimum requirements lead to cost optimal energy performance levels for residential and offices buildings in Malta in accordance with Article 4 of Directive 2010/31/EU.

The cost-optimal studies have indicated that there is scope for a further tightening of the minimum requirements and the studies will also serve as the baseline towards revisions of the said Technical Guidance Part F.

Near Zero Energy Buildings plan for Malta

A baseline study has been commissioned by the BRO on behalf of the Building Regulation Board to provide a technical basis for discussion in setting an nZEB definition(s) for Malta. The base line of these studies were the cost optimality reports.

A working group has been formed within the auspices of the Building Regulation Board to manage the process which eventually lead to the formal adoption of the nZEB plan for Malta.
However one must note that many of the actions envisaged are already happening and we can say that Malta already possesses a number of nZEB buildings, even if the most stringent definition is adopted

Main issues being tackled

[27] Originally issued within the scope of LN 1002 of 2006 transposing the first EPBD, Directive 2002/91/EC, now they fall within the scope of LN 376 of 2012 – Energy Performance of Building Regulations which transposes the Recast EPBD Directive, Directive 2010/31/EU

The definition of nZEB for Malta shall be differentiated at least between residential and non residential buildings. Since not all buildings/buildings sites in Malta has solar potential, the overall performance(s) shall be composed of two components:

a) a base component derived essentially from the building envelope being built to cost optimal specifications. This will be site independent and hence will be a mandatory condition.

b) Another component will be essentially achieved by the application of renewables, where feasible.

It has to be realised that in Malta, land/sites for development are limited and it is counter productive to set regulations so stringent that certain sites may not be allowed to be developed. It is important not to impinge negatively on land use, which is a scarce resource.

5.6 Key actions for energy performance improvements

The following actions will be taken to increase the energy efficiency in buildings:

Item	Description
1	The EPC of dwellings and non dwellings will be upgraded to show that the building has reached the nZEB level of performance.
2	Information campaigns shall continue on a national level. These include radio and television broadcasts, street advertisements, information brochure sent door to door etc.
3	The BRO will continue manning a help line giving professional advice regarding energy performance in buildings.
4	Directives through the civil service authorities will be issued to the public authorities to regulate all renovation works and construction of new buildings owned and occupied by the public authorities themselves. The directives will be aimed at having these buildings designed to nZEB levels and will establish the exemplary/leading role of public authorities.
5	Seminars/workshops for key government officials in charge of public buildings, to disseminate information and increase awareness regarding nZEB. Other workshops to upgrade the skills of professionals involved in designing public buildings to nZEB will be carried out simultaneously.
6	The training and educational courses will be organized to have the professionals and local tradesmen more empowered to produce nZEB constructions. These include courses for EPC assessors and inspectors of heating and air-condition systems, training in various skills as ear marked in the Build-Up Skills Roadmap and upgrading the know-how of professionals

	as regards to implementation of nZEB technologies.
7	A number of energy efficient public buildings will be built to serve as a model for the private sector. These will include institutional and housing units, covering more than 5% of the new buildings.
8	The minimum requirements of Document F guidance will be updated to be in line with the minimum cost optimality study.
9	The nZEB plan will be updated and finalised.
10	Review of cost optimality reports as necessary as per Directive 31/2010/EU

5.7 Conclusion

While the first attempt at calculating the optimum level of EPB has been completed, the development of a strategy to secure the achievement in practice of an improved level of energy utilisation has identified several issues that need to be assessed and their impact statistically evaluated. These issues are:-

- Changes in electricity consumption behaviour due to reduced tariffs
- Impact of more efficient electricity generation on COS.
- Rate of deep renovations vs rate of re-development of different type of dwellings
- Detailed analysis of RES potential of buildings taking in consideration:
    - Limited land space and conflicting roof use
    - Other policy regulations on available roof space
    - Solar rights
    - Plot size, shape and orientation

6 Energy efficiency measures in public bodies

6.1 Introduction

Government and public bodies are major players in the economy and the energy consumed by these entities is significant. Implementing energy efficiency in and by public entities could yield significant savings while their leading by example is known to effectively promote energy efficiency in the private sector.

Accordingly, the role of Government and Public bodies in promoting energy efficiency and the objectives is emphasised in Directive 2012/27/EU. Specifically, it is considered under the following headings:-

- *Central Government buildings*, which should be gradually refurbished to meet at least the established minimum energy performance standards of buildings, or otherwise reach equivalent savings. *Buildings of other public bodies* should also be good examples of energy efficiency of buildings.

- *Purchasing by Public Bodies* should incorporate high energy efficiency standards in the specifications for goods and services they purchase.

The following explains the initiatives of the Malta Government in regards to the above

6.2 Central government buildings

Background and Overview.

The national target for enhancing energy efficiency in public buildings (also an obligation under Directive 2012/27/EC) is a reduction in energy consumption equivalent to that which would have been obtained by renovating 3 % of the total floor area of certain buildings owned and occupied by central government each year to meet at least the minimum energy performance requirements as set in Article 4 of Directive 2010/31/EU. The criteria set for buildings to be considered is that these must have a total useful floor area of over 250[28] square meters and are heated and/or cooled when in use.

[28] Present threshold in Directive is 500 m^2 in Directive but will change to 250m^2 in 2015.

This approach (referred to as the 'alternative approach' in Directive 2012/27/EU) is preferred over the 'default approach' (actual refurbishment of 3% per annum of the floor area of heated and cooled buildings) because it is not yet possible to establish a business case for refurbishment since robust data is not yet available. This 'alternative' approach, based on behavioural change and soft measures is flexible, can be started immediately and is useful independently of any refurbishment that might be implemented. Besides several of these buildings have a high historical profile. Deep renovations are difficult.

Preliminary general energy audits were carried out by consultants between 2010 and 2013. Several mostly soft measures which would give the desired results in terms of savings were identified and quantified.
In the meantime, Government is considering a more robust approach, that follows 'best practice' examples elsewhere, based on a centralised building management system, possibly supported by an 'energy performance contract' with a private contractor.

Details and workings of how the target is to be achieved follow.

The inventory of heated and cooled central government buildings and other data

In Malta, buildings belonging to the Central Government are managed by the Government Property Department within the Ministry of Finance. This Department ensures the registration of government immovable property under the Land Registration Act[29].

Annex 6-1 gives the list of buildings that are owned and occupied by central government (i.e whose competence extends over the whole territory of the Maltese Islands and excluding Local Councils).

Many of the buildings listed in this Annex are old buildings dating back to the 16th/18th century and have a high historical profile. During that period buildings were built with significant thick masonry walls and the size and orientation of the windows was given priority. This building geometry has proved to be very energy efficient. In fact, the energy consumption of most of these government buildings is lower than the threshold of good practice energy consumption that has been identified from the energy audits conducted between 2010 and 2013 and used in this exercise.

Annex 6-1 also contains information on the floor area in m^2 of each building the energy consumption within those buildings in 2010 and hence a derived consumption per annumper square meter. The total 'useful' floor area of such government buildings amounts to 158,701m^2, where 'useful' area is defined as the area where energy is used to condition the indoor climate.

[29] http://justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=8778

The occupancy of the buildings has somewhat changed after March 2013 following the taking office of a new Administration, with the attendant restructuring of government portfolios that included another three new ministries. As a result of the restructuring, certain competencies that were under a particular ministry in 2012 were deployed to a different ministry in 2013. This brought about changes in building use and occupancy levels, which would result in different energy consumption values than those reported in Annex 6-1.

Some of these shifts from one ministry to another have resulted in the replacement of old buildings with new buildings and/or the removal of buildings due to more intensive use of existing buildings. Although Annex 6-1 is already reflecting some changes known at the time of writing, it will be reviewed within the next year. Further changes will be included in the next update report and the revision of this NEEAP (NEEAP 2017).

The calculation of the renovation obligation

The list of heated and/or cooled buildings owned and occupied by the central government with a useful floor area of over 250m^2 that do not meet certain minimum energy performance requirements on 1 January 2014 is given in Annex 6-2.
These minimum energy performance requirements have been provisionally established at 107 kWhr/m^2/year by consultants who carried out the preliminary energy audit on these buildings (Energy Audit Report MTS 2010). They will be reviewed/confirmed once the cost optimality report for offices has been finalised.

Annex 6-2 also contains the actual electricity consumption expressed per square meter, the calculation of the required savings for the building to reach 'best practice' standards and the estimated savings after the energy efficiency measures identified in the preliminary Energy Audits are carried out.

The total floor area in question is **33802** square meters.

As shown in Annex 6-2, the target savings[30] and obligation are equivalent to 79,341 kWh per annum equivalent to 555,390kWh in the period 2014 -2020. Buildings belonging to administrative departments

[30] Worked out as the difference between the 'actual' and 'good practice' energy consumption per square meter multiplied by 3% of the total floor area.
The energy savings of each building was achieved by subtracting the standard energy consumption in offices from the actual energy consumption and multiplying this by the area.
i.e: Total Energy Savings= $\sum$ (b-c)*d
where 'b' is the actual energy consumption/m^2
'c' is the standard energy consumption/m^2

below central government (local Councils) or other public bodies have not been accounted for in the calculation of the obligation.

Achieving the target

Description of the measures to achieve the target.

The preliminary energy audits carried out have identified which measures are appropriate for which building. A list of such measures for each building is found in Annex 6-3. They include the following.

- New energy efficient lighting systems;
- Smart meter installations;
- Energy Management systems: control of ACs and lighting, dimmers etc;
- Replacement of ACs to inverter integrated ACs;
- Replacement of fluorescent tubes to LEDs.
- Sustainable procurement of appliances and equipment;
- PVs installation for own consumption;
- SWH installation.;
- Behavioural changes such as the reallocation of employees in offices and changing the habitual behaviour of employees;
- Roof and wall insulation/double glazing or glass tinting;
- Other measures included in 'minimum energy performance requirements'.

'd' is the area of the building

Works on the implementation of these energy efficiency measures are expected to commence in 2016 and are expected to be completed by 2020. They will start concurrently in all buildings – prioritization is not applicable. The energy savings were calculated in accordance to section 2 of the Recommendations On measurement and Verification Methods in the framework of Directive 2006/32/EC on Energy End-Use Efficiency and Energy Services.[31]

Calculations of savings achieved by each of the alternative measures.

The expected savings generated by each measure per building per annum is worked out in Annex 6-2. The equivalence of the savings to the obligation in Directive 2012/27/EC is demonstrated in detail in the calculations in Annex 6-2.

A more robust strategy

Government is working on a strategy that will tackle the subset of the national building stock making up the public buildings and optimise them from an EE perspective. If successful, and with the experience gained, the strategy will be extended to other buildings of public bodies and might prove attractive to the private sector. The strategy incorporates the following steps:

- Identification of the government buildings from the list at Annex 3.3-1 that will be part of the exercise.

- Identification of an experienced contractor prepared to undertake some form of 'energy performance contracting' with a track record to provide the technical know-how and project management, take responsibility for the achievement of the design savings and provide a guarantee of such savings for a number of years, should a significant cost-effective project be contracted for.

- The contractor will conduct a preliminary assessment necessary to compile a preliminary business case for the project based on available data. Data that can be collected with current metering set-up is being collected as of now.

- Gather project - specific data for a period long enough to validate or change the preliminary assessment and identify the interventions that are cost-effective. Interventions could be one of or a combination of the following:

[31] http://www.energy-community.org/pls/portal/docs/906182.PDF

- Institute behavioural changes in the utilisation and operation of the building and existing facilities.

- Undertake changes to equipment and facilities – eg. Air conditioning units, lighting, addition of automatic control devices – that do not require changes to the buildings fabric.

- cost-effective refurbishment including changes to the buildings fabric

A possible spin–off of this strategy could be the example and catalyst for the introduction of performance –contracting to the Maltese energy sector, if these are shown to be beneficial to the market.

New Measures

- Undertake the implementation of the measures identified in the preliminary audit.
- Undertake a 'second round' higher quality audits.
- Pursue the possibility of a centralized Government building management system possibly supported by energy performance contracting.

Annex 6-1 Central Government Buildings Owned and Occupied by Central Government.

(Reference - Energy Audit reports Baran & Camilleri (2013), Energy Audit reports MTS (2010), Energy Audit reports Rizzo (2010), ARMS Ltd. Electricity Bills, Miema surveying (2013))

Ministry		Street address	Location	Area	kwh/annum	kwh/m^2	Remarks
Office of the President		The Palace	Valletta	1521	4904.19	3	
Houses of Representatives		The Palace	Valletta	3141	10127.6	3	
Office of Ombudsman	Ombudsman	St Paul's street	Valletta	749	54823	73	
National Audit Office	Audit	Notradame ravelin	Floriana	841	79156	94	
Office of PM	Auberge de Castille	St Paul's Str	Valletta	4707	527984	112	
Office of PM	Government Printing Press	Factory A29, Industrial Estate	Marsa	7840	167778	21	
Office of PM	Notary to Government	MA Vassalli Street	Valletta	600	27197	45	
Office of PM	Government Property Division	Auberge De Baviere	Valletta	3000	158319	53	
Office of PM	Public Registry	Merchants Street	Valletta	200	34453	172	
Office of PM	Planning and Priorities Co ordination Division	12, St Paul's Street	Valletta	1500	45140	30	
Office of PM	Opertation and	13, St Paul's Street	Valletta	300	17167	57	

Ministry		Street address	Location	Area	kwh/annum	kwh/m^2	Remarks
	programme Implemenation Directorate						
Office of PM	Internal audit and Investigation	Valletta Buildings. South Street	Valletta	250	23937	96	
Office of PM	Transcontinental Houses - Level 2	Zachary Street	Valletta	150	11247	75	
Office of PM	Transcontinental Houses - Level 3	Zachary Street	Valletta	150	8453	56	
Office of PM	Transcontinental Houses - Level 5	Zachary Street	Valletta	150	10404	69	
Office of PM	Transcontinental Houses - Level 4	Zachary Street	Valletta	150	8521	57	
Office of PM	OPM Annexe	3 Castille place	Valletta	1500	215191	143	
Office of PM	Electoral office	St Elmo	Valletta	450	141838	315	
Office of PM	CDRT	San Salvatore Bastion San Maison Road	Floriana	793	69556	88	
Office of PM	Public Service Commission	Palazz tal President	Valletta	497	754.49	2	
Office of PM	Courts of justice	Republic street	Valletta	6000	561490	94	

Ministry		Street address	Location	Area	kwh/annum	kwh/m^2	Remarks
Office of PM	Family Court	Strait street	Valletta	1500	561490	374	
Office of PM	Attorney General	Republic street	Valletta	1152	3714	3	
Office of PM	Permanent commission against corruption	The Palace	Valletta	108	348	3	
Ministry of European Affairs and Implementation of the Electoral Manifesto	Casa Catalugnia		Valletta	960	71000	74	
	Pilar		Valletta	516	33000	64	
Ministry for Foreign Affairs	Palazzo Parisio	Merchants Street	Valletta	3200	420504	131	
Ministry of Tourism	Auberge d'Italie	Merchant's street	Valletta	2365	454130	192	
	Heritage Malta	Tha Palace	Valletta	837	2698	3	
	Dept of Local Government	26/28 Archbishop street	Valletta	650	31669	49	
Ministry of Education and Employment	Educational Directorates	Great Siege Road	Valletta	7500	437242	58	
Ministry of Education and Employment	36	Old Mint	Valletta	900	24981	28	
Ministry of Education and Employment	Block C, belt is sebh	Mikiel Anton vassalli	Floriana	600	3625	6	
Ministry of Education and	Malta Qualification	16/18 Dawret it-	Santa	200	18563	93	

Ministry		Street address	Location	Area	kwh/annum	kwh/m^2	Remarks
Employment	council	torri	Lucia				
Ministry for Sustainable Development, the Environment and Climate Change	Not Government Owned						
Ministry for Transport and Infrastructure	Project House	triq franceso bounamici	Floriana	770	325000	422	
Ministry for Transport and Infrastructure	block A	triq franceso bounamici	Floriana	340	94000	276	
Ministry for Transport and Infrastructure	block B (Ministry)	triq franceso bounamici	Floriana	1500	118500	79	
Ministry for Transport and Infrastructure	Cleansing Dept	Qasam industrijali Kordin	Paola	1500	64658	43	
Ministry for Transport and Infrastructure	Restoration Unit	Ospizio	Floriana	600	50577	84	
Ministry for Transport and Infrastructure	Directorate for Corporate services	331, Allied House, St Paul's street	valletta	500	33297	67	
Ministry for Transport and Infrastructure	Manufacturing and Services Dept	Factory K3, Corradino Industrial Estate	Paola	300	35782	119	

Ministry		Street address	Location	Area	kwh/annum	kwh/m^2	Remarks
Ministry for Transport and Infrastructure	Grand Harbour Regeneration	triq franceso bounamici	Floriana	750	56405	75	
Ministry for Transport and Infrastructure	Block C	Mikie Anton Vassalli	Floriana	600	11764	20	
Ministry for Transport and Infrastructure	triq troubridge		Marsa	600	46034	77	
Ministry for Gozo	Inland Revenue	St Francis SQUARE	Victoria	800			included in administration center
Ministry for Gozo	Administration Center	St Francis SQUARE	Victoria	4500	287478	64	
Ministry for Social Dialogue, Consumer Affairs and Civil Liberties	MEUSEAC	Republic street	valletta	1250	42604	34	
	Dept of ind relations and Employment	121, Melita str	Valletta	800	25994	32	
	Dept of ind relations and Employment	108,109 Melita str	Valletta	500	20296	41	
Ministry for the Economy, Investment and Small Business	Commerce dept	Xatt Lascaris	Valletta	1524	88279	58	

Ministry		Street address	Location	Area	kwh/annum	kwh/m^2	Remarks
Ministry for Family and Social Solidarity	DFM, Supplies and Services Section	106/7/8, Melita street	valletta	529	114031	216	
Ministry for Family and Social Solidarity	Palazzo Ferreria	Republic street	Valletta	2716	372257	137	
Ministry for Family and Social Solidarity	Supplies	Melita street	valletta	529	114031	216	
Ministry for Family and Social Solidarity	19 Administration Block	M.A. Vassalli	Valletta	130	11684	90	
Ministry of Home Affairs and National Security	Ministry for justice and home affairs	168, Strait street	Valletta	1500	74851	50	
Ministry of Home Affairs and National Security	AFM	The Palace	Valletta	144	464	3	
Ministry of Home Affairs and National Security	CCF	Corradino	Paola	30000	1680594	56	
Ministry of Home Affairs and National Security	Police HQ	Floriana	Floriana	8700	1830000	210	
Ministry of Home Affairs and National Security	Police Dogs Section and Mounted Section	Marsa/ Mosta	Marsa/ Mosta	394	24000	61	
Ministry of Home Affairs and National Security	Police Garage	Floriana	Floriana	826	27000	33	
Ministry of Home Affairs and	Civil Protection	ta kandja	ta kandja	500	56600	113	

Ministry		Street address	Location	Area	kwh/annum	kwh/m^2	Remarks
National Security	Department						
Ministry of Home Affairs and National Security	Passport Office	1st Floor, Evans Building, Merchants Street	Valletta	250	105717	423	
Ministry of Home Affairs and National Security	CICE Licensing Office & CICE Store Security	Xatt Lascaris	Valletta	1050	116318	111	
Ministry of Home Affairs and National Security	Central Visa Unit	Pjazza San Kalcidonju	Floriana	250	24173	97	
Ministry of Home Affairs and National Security	Land Registry	West Street	Valletta	800	48018	60	
Ministry of Home Affairs and National Security	Probation Services	217, St. Paul's Street	Valletta	322	38296	119	
Ministry of Home Affairs and National Security	Justice Unit 30	Old treasury Building	Floriana	475	19971	42	
Ministry of Home Affairs and National Security	Probation Services	217, St. Paul's Street	Valletta	322	38296	119	
Ministry of Home Affairs and National Security	Office of the refugee commissioner	St elmo	Valletta	168.6	13784	82	
Ministry of Finance	Ministry of Finance	4 old mint street	Valletta	500	22975	46	

Ministry		Street address	Location	Area	kwh/annum	kwh/m^2	Remarks
Ministry of Finance	Ex baggage Room, Customs House,	Xatt Lascaris	Valletta	500	46644	93	
Ministry of Finance	Lab Customs House	Xatt Lascaris	Valletta	150	12363	82	
Ministry of Finance	Inland Revenue Dept	LEU Block 1	Floriana	500	41711	83	
Ministry of Finance	Inland Revenue Dept	LEU Block 2	Floriana	800	37860	47	
Ministry of Finance	Inland Revenue Dept	LEU Block 3	Floriana	2000	125876	63	
Ministry of Finance	Inland Revenue Dept	LEU Block 4	Floriana	1200	63022	53	
Ministry of Finance	Inland Revenue Dept	LEU Block 5	Floriana	600	31039	52	
Ministry of Finance	Inland Revenue Dept	LEU Block 5A	Floriana	150	5760	38	
Ministry of Finance	VAT	Vat departement	B.kara	3169	260000	82	
Ministry of Finance	Dept of contracts	Notre Dame Ravelin	Floriana	1100	68895	63	
Ministry of Finance	Capital Gains Dept	46, Merchants Street	Valletta	1100	73644	67	
Ministry of Finance	Customs House	Xatt Lascaris	Valletta	650	59420	91	
Ministry of Finance	TV Licenses Unit	217, St Paul's Street	Valletta	400	19001	48	
Ministry of Finance	NSO	Xatt Lascaris	Valletta	3550	202472	57	
Ministry of Finance	Ministry of Finance B	19, Mikiel Anton Vassalli Street	Valletta	77	10201	132	
Ministry of Finance	econmic policy departement	pjazza san Kalcedonju	Floriana	1000	49983	50	

Ministry		Street address	Location	Area	kwh/annum	kwh/m^2	Remarks
Ministry of Finance	maison demandols & Cavalier House	South street	Valletta	2800	125200	45	
Ministry for Energy and Water Conservation	Auberge de Castille	St.Paul's street	Valletta	843	94571	112	
Ministry for Health	Public Health Maintenance	16, Triq it Torri ta San Gwann	Birgu	50	1825	37	
Ministry for Health	Pest Control Unit	Vjal ir rihan	San Gwann	25	1440	58	
Ministry for Health	Public Health Lab	Evans Building, triq il merkanti	Valletta	400	134544	336	
Ministry for Health	Food Safety & Env. Health	34, The Annexe, Triq A. Nani	Ta Xbiex	150	14939	100	
Ministry for Health	Burials Admin Unit	Cimiterju Sta marija Addolorata	Paola	1250	36945	30	
Ministry for Health	City Gate	12, republic Street	Valletta	100	7158	72	
Ministry for Health	Port Health Services	2, Telgha tal	Floriana	150	11718	78	

Ministry		Street address	Location	Area	kwh/annum	kwh/m^2	Remarks
		Kurcifiss					
Ministry for Health	Health Inspector Office	Triq d'Argens	Msida	300	17653	59	
Ministry for Health	Rodent Section	Vjal Avjazzjoni	Luqa	100	1403	14	
Ministry for Health	Blood Transfusion Unit - Buidling 2	St. Lukes Hospital	G'Mangia	750	97375	130	
Ministry for Health	Blood Transfusion Unit - Buidling 1	St. Lukes Hospital	G'Mangia	1350	283662	210	
Ministry for Health	Cospicua Helath Center	Triq Ljun	Cospicua	820	95403	116	
Ministry for European Affairs	Auberge d'Aragon	Independence Square	Valletta	800	64902	81	
Ministry for Sustainability, CC and Environment	Civil Abattoir	triq il biccerija	Marsa	500	1200000	2400	
Ministry for Sustainability, CC and Environment	National Park	ta qali	ta qali	1300	57827	44	
Ministry for Sustainability, CC and Environment	Block A - Paying Agency	Ghammieri	marsa	650	46453	71	
Ministry for Sustainability, CC and Environment	block B	Ghammieri	Marsa	200	17915	90	
Ministry for Sustainability, CC and Environment	block C	Ghammieri	Marsa	200	12709	64	
Ministry for Sustainability, CC and Environment	block D	Ghammieri	Marsa	50	6707	134	

Ministry		Street address	Location	Area	kwh/annum	kwh/m^2	Remarks
Ministry for Sustainability, CC and Environment	Ex EU Affairs Block- Part of paying agency	Ghammieri	Marsa	400	23287	58	
Ministry for Sustainability, CC and Environment	Animal Husbandry Block	Ghammieri	Marsa	100	4832	48	
Ministry for Sustainability, CC and Environment	Applications Block - Part of Paying agency	Ghammieri	valletta	300	21738	72	
Ministry for Sustainability, CC and Environment	Old Farmhouse- Part of PID	Ghammieri	Marsa	300	19719	66	
Ministry for Sustainability, CC and Environment	Old Farmhouse - Tis simma maintenance Block	Ghammieri	Marsa	600	32436	54	
Ministry for Sustainability, CC and Environment	Lab Complex	Ghammieri	Marsa	500	24119	48	
Ministry for Sustainability, CC and Environment	Pitkali Office	Ta qali	Attard	300	36740	122	
Ministry for Sustainability, CC and Environment	Plant Health Dept	Annibale Preca Str	Lija	2500	121084	48	
Ministry for Sustainability, CC and Environment	Casa Leoni	476, St Jospeh High Street	Sta. Venera	1200	58324	49	
Parliamentary Secretary for Competitiveness and Economic Growth	House of Catalunya	Marsamxetto Road	Valletta				included in MEAIM

Ministry		Street address	Location	Area	kwh/annum	kwh/m^2	Remarks
Parliamentary Secretary for Culture and Local Government	Dept of Local Government	Chateau de la ville, Archbishop street	Valletta	100	12337	123	
Parliamentary Secretary for Culture and Local Government	Dept of Local Government	26/28 Archbishop street	Valletta	650	31669	49	
TOTAL				158701			

Annex 6-2 – Buildings over 250m^2 and Energy consumption below threshold

Ministry	**Organisation**	**Street address**	**Location**	**Area M^2**	**kwh/annum**	**kwh/m^2/annum**	**Good practice energy cons (kWh/m^2/ annum)**	**Total Energy Saving (kWh)**	**Energy savings after applying the measures (kWh/annum)**	
Ministry of Home Affairs and National Security	Passport Office	1st Floor, Evans Building, Merchants Street	Valletta	250	105717	423	107	78967	16647	
Ministry for Transport and Infrastructure	Project House	triq franceso bounamici	Floriana	770	325000	422	107	242610	72253	
Office of PM	Family Court	Strait street	Valletta	1500	561490	374	107	400990	28075	
Ministry for Health	Public Health Lab	Evans Building, triq il merkanti	Valletta	400	134544	336	107	91744	3181	

Office of PM	Electoral office	St Elmo	valletta	450	141838	315	107	93688	32409	
Ministry for Family and Social Solidarity	DFM, Supplies and Services Section	106/7/8, Melita street	valletta	529	114031	216	107	57428	23406	
Ministry of Home Affairs and National Security	Police HQ	Floriana	Floriana	8700	1830000	210	107	899100	148871	
Ministry for Health	Blood Transfusion Unit - Buidling 1	St. Lukes Hospital	G'Mangia	1350	283662	210	107	139212	5348	
Ministry of Tourism	Auberge d'Italie	Merchant's street	Valletta	2365	454130	192	107	201075		In 2014 building will not be utilised as offices but as a museum
Ministry for Transport and	block A+Block B	triq franceso	Floriana	1110	212500	191	107	93730	72253	

Infrastructure		bounamici								
Ministry for Sustainability, CC and Environment	Civil Abattoir	triq il biccerija	Marsa	1540	230758	150	107	65978	33792	
Office of PM	OPM Annexe	3 Castille palace	valletta	1500	215191	143	107	54691	514154	
Ministry for Family and Social Solidarity	Palazzo Ferreria	Republic street	Valletta	2716	372257	137	107	81645	18613	
Ministry for Foreign Affairs	Palazzo Parisio	Merchants Street	Valletta	3200	420504	131	107	78104	28169	
Ministry for Health	Blood Transfusion Unit - Buidling 2	St. Lukes Hospital	G'Mangia	750	97375	130	107	17125	8088	
Ministry for Sustainability, CC and Environment	Pitkali Office	Ta qali	Attard	300	36740	122	107	4640		energy audit will be carried out in 2014
Ministry of Home Affairs and	Probation Services	217, St. Paul's	Valletta	322	38296	119	107	3842	18493	

National Security		Street								
Ministry of Home Affairs and National Security	Civil Protection Department	ta kandja	ta kandja	500	56600	113	107	3100		energy audit will be carried out in 2014
Office of PM	Auberge de Castille	St Paul's Str	Valletta	5550	622556	112	107	28706		energy audit will be carried
Ministry for Energy and Water Conservation	Auberge de Castille	St.Paul's street	Valletta	843	94571	112	107	4370		Ministry will be relocated to a different building in 2014
Ministry of Home Affairs and National Security	CICE Licensing Office & CICE Store Security	Xatt Lascaris	Valletta	1050	116318	111	107	3968		energy audit will be carried

										out in 2014
TOTAL				**33802**	**6464078**	**4272**		**2644713**	**1023751**	
3% of Total Energy Savings/annum								**79341**		
Total Savings 2014-2020 required in Article 5								**555390**		

Annex 6-3 – Energy Saving Measures in Public Buildings.

(source: Audit reports Baran & Camilleri (2013); Audit reports MTS (2010)

Passport Office Measures	**Annual Energy Saving (kWh)**
Change of existing Quad 18W ballast to Quad 14W ECG ballast - 85 No.	10712
Installation of micro switch to disable air conditioner on opening windows. It is assumed that with this arrangement at least 5% of the energy would be saved.	650
Reduce the number of refrigerators from 4 to 2	800
window films on windows since they are SE/SW	1400
solar water heater to replace electric heater	1200
movement sensors in kitchen and bathrooms which will disable the light when the rooms are left unoccupied.	1885
TOTAL Savings	**16647**

Project House + block A + Block B Savings	
Repalcement of T12 5 feet flourescent tubes	
Replacement of T8 5 feet with T5 4 feet flourescent tubes	
Replacement of T8 4 feet with T5 4 feet flourescent tubes	15253
Installation of solar water heaters Project house	10000
Installation of solar water heaters Block A + Block B.	11000
Roof Insulation	13000
windows double glazing	23000
Total savings	**72253**

Public Health Lab	
Change of existing single 58/65W MAG ballast to single 49W ECG Ballast - 3 No.	100
Change of existing single 36/40 W MAG ballast to 28W ECG Ballast - 3 No.	81
remove existing water heater and change to SWH	3000
PVs included in electoral office	
TOTAL	**3181**

Electoral Office	
Change of existing Quad 36W MAG ballast to Quad 28W ECG Ballast - 15 No.	1744
Change of existing single 58W MAG ballast to single 49W ECG Ballast - 67 No.	2400
Change of existing single 36/40W MAG ballast to 28 W ECG Ballast -26 No.	756
Change of existing Quad 18W ballast to Quad 14W ECG ballast - 15 No.	1409
Micro switch to disable the air conditioner on opening the windows. This is being suggested since it was observed that some offices had their windows open with the AC operating. This arrangement would give at least 5% energy savings	1350
number of refrigerators to decrease to 4	1600
window films since they are SE/SW facing	2900
Installation of SWH to replace electric water heaters	3750
installation of 10kWp PVs	16500
Total	**32409**
DFM, supplies and services	
Publicise energy performance by using an energy labelling scheme such as 'Display Campaign'	
Replace T8 flourescent lighting + magnetic ballast with T5 + electronic ballast (per 100m2)	4792.74
PVs for own consumption	
smart meter installation	18612.85
Total	**23405.59**

Police Headquarters	
replacement of T12 5 feet with T5 4 feet flourescent tubes	
replacement of T8 feet with T5 4 feet flourescent tubes	
replacement of T8 4 feet flourescent tubes	98871
Electric water heaters to be replaced with twelve solar water heaters	40000
PVs	
windows double glazing	10000
TOTAL	**148871**

Blood Transfusion Unit- Building 1	
Change of existing Quad 18 W ballast to Quad 14W ECG ballast - 17 No.	1551
Change of existing 58W MAG ballast to twin ECG ballast - 19 No.	1439
Change of existing twin 36 W MAG ballast to twin 28 W ECG Ballast -9 No.	764
Change of existing twin 58 W MAG ballast to twin 49 W ECG Ballast -16 No.	446
Change of existing twin 36 W MAG ballast to twin 28 W ECG Ballast -5 No.	222
Change of existing incandescent light bulbs to CFL - 3 No.	26
window films	900
total	**5348**

Palazzo Parisio	
change of existing Quad 36W MAG ballast to quad 28W ECG Ballast - 4 No.	401
change of existing single 58W MAG ballast to single 49W ECG Ballast - 206 No.	6361
change of existing single 36/40 W MAG ballast to single 28W ECG Ballast - 9 No.	226
change of existing twin 58W MAG ballast to twin 49W ECG Ballast - 1 No.	280
change of existing quad 18W ballast to quad 14W ECG Ballast - 26 No.	2108
Change of existing incandescent light bulbs to 8W CFL - 38 No.	1450
Installation of micro switch to disable air conditioner on opening windows. It is assumed that with this arrangement at least 5% of the energy would be saved.	5793
movement sensors in all offices, stores, kitchen, and bathrooms which will disable the light and a/c when the rooms are left unoccupied	8000
Decrease the 18 refrigerators to 7 refrigerators	2800
window films	750
TOTAL	**28169**

Blood Transfusion Unit - Building 2	
change of existing quad 18W ballast to quad 14W ECG ballast - 74 no.	7688
install timer on water heater	400
TOTAL	**8088**

Civil Abbatoir	
68 pieces of T8 five feet florescent tubes	4386.4
61 piece of T8 four feet florescent tubes	1405.6
installation of solar water heaters	10000
PVs	
roof insulation	6000
windows double glazing	12000
TOTAL	**33792**

OPM annex	
Power factor correction	171879
split units to VRFs	206337
Supply and replace light fittings	33333
reduce number of refrigerators	26278
installation of motion sensors (savings incl.above)	
window films	8900
roof insulation	35372
installation of solar-thermal equipment	23949
installation of renewable energy generation - \pvs	8106
TOTAL	**514154**

Family Court	Assumed 5% energy savings on actual consumption
Maintenance: establish periodic schedules maintenance procedures covering heating and cooling systems;ventilation and humidification systems;artificial lighting systems;domestic hot water systems and cleaning of PV panels	
seperate energy meters should be provided for the following systems: boiler installations (>50kW); cooling plant (>20kW), motor control	

centres serving pumps and fans (>10kW)	
Sub-metering of seperate tenancy areas:seperate energy meters shoould be provided for the Family Court	
Appoint an energy team: Allocation of official responsibility for energy consumption ensures that energy related matters should be co-ordinated and structured to the benfit of the building	
Energy monitoring and targeting: Managers and staff need information on energy use that is accurate, timely and appropriate	
Communicating the building's performance through labelling schemes such as 'Display Campaigns' could increase awareness and influence behaviours	
Investigate high humidity levels in ground floor areas and install relative humidity data loggers to monitor this ove extended period. Identify measures to decrease humidity	
TOTAL	**28074.5**

Ministry for Family and Social Solidarity (Palazzo Ferreria)	Assumed 5% energy savings on actual consumption
Maintenance: establish periodic schedules maintenance procedures covering heating and cooling systems;ventilation and humidification systems;artificial lighting systems;domestic hot water systems and cleaning of PV panels	
seperate energy meters should be provided for the following systems: boiler installations (>50kW); cooling plant (>20kW), motor control centres serving pumps and fans (>10kW)	
Maintaining appropriate room temperature	
Centralised Efficient VRF A/C	
Maximise daylight	
Atrium ventilation	
light sensors	
occupancy sensors	
zoning to improve control and efficiency of lighting	
low flow fittings	

solar hot water	
common refrigerators	
power factor correction	
TOTAL	**18612.85**

Probation Services Department	
Install submeters for each floor to allow monitoring consumption	
Avoid heating using electric heaters	
replace ac's with centralised units which are energy efficient	
clean air filter to improve air flow	
establish routine maintenance procedures	
draught proof windows	
apply solar film to window	
replace T5 flourescent lighting	
Apply occupancy sensor control	
replace water heater with solar water heater	
change to compact flourescent lamps	
Total savings from above measures 5% of consumption	**1915**
paint roof surface white to reflect incoming radiation and reduce room temperature	1078
install a pv system	12000
Roof insulation	3500
Total savings	**18493**

6.3 Buildings of other public bodies

6.3.1 Local Councils

Several local councils, signatories of the Covenant of Majors have completed Sustainable Energy Action Plans[32] by late 2011. These plans were prepared with the assistance of the Local Councils Association, the Covenant of Majors support structure in Malta, experts from JRC, Ispra of the European Commission, the local utilities – the Water Services and Enemalta Corporations - and the Association's local consultants. They are based on the JRC Document 'Existing Methodologies and Tools for the development and Implementation of SEAP's.

Each SEAP contains:

- A baseline Emissions Inventory. Year 2005 was chosen since it was the year for which the most comprehensive and reliable data is available. The inventory accounts for energy consumption by type, emissions data for buildings (municipal, residential and tertiary), public lighting, by local industrial establishments, by transport (private and commercial) as well as for the production and distribution of water for the locality.

- A careful analysis of the energy consumed in the locality in buildings (municipal, non-municipal residential), in street lighting, in private, public and commercial transport as well as in water production and distribution.

- Actions towards sustainability. Reflecting the lack of data available at the local level, the action plans emphasized the needs for energy audits, analysis of the results,their dissemination to stakeholders and hence the implementation of cost-effective measures assessing out of audits.

While the SEAP's have considered all energy use (and emissions) in their locality, the legal structure of Local Councils in Malta is such that only a very small fraction is under the legal jurisdictions of each council i.e. energy consumed in municipal buildings, equipment and facilities.

[32] The SEAP's can be accessed at:
http://www.covenantofmayors.eu/actions/sustainable-energy-action-plans_en.html?city=Search+for+a+Sustainable+Energy+Action+Plan...&country_seap=mt&co2=&date_of_approval=&accepted=

6.3.2 Social housing in Malta

Introduction

The Malta Housing Authority is the entity responsible for the procurement, management and assignment of social housing in Malta.
The Malta Housing Authority is cognisant of its environmental responsibility and it has set policies to achieve its environmental objectives, of which EE is an important one. Besides, it has to follow new building regulations which require better energy efficiency in new buildings and in refurbishment projects.
However, the Authority is sometimes faced with circumstances which have to take precedence over environmental issues.

Faced with a demand for housing units for urgent assignment and operating in a market reality where there are vacant dwellings, the Authority has launched a scheme to rent from the private sector dwellings which can be immediately assigned and inhabited, rather than build new housing blocks.
Although the energy efficiency of these buildings is not what it would be if new buildings according to the current regulations were constructed, there are wider environmental benefits.

The works programme of the Housing Authority

The works programme of the Housing Authority in the medium term demonstrates its commitment to environmental sustainability.

- New buildings

Only one block of apartments was constructed by the HA during the last three years. This is currently being finished (common parts, including all external building elements). EE measures were adopted within this project including roof insulation, including in penthouse terraces, double glazing and water reservoirs to store second class water for non-potable uses. (see the authority's RES policy in para 3 below.).

- Renting of buildings for social purposes

In response to the high pressure upon the Authority with respect to allocating suitable social housing for families currently living in substandard accommodation without the basic facilities and at times, even with overlying dangerous ceilings and other structures, the Authority launched a scheme

('Skema Kiri' – 'Renting Scheme') requesting offers for the renting of suitable premises from private owners for subletting to social cases.

Besides the urgency of the need for accommodation, the Authority sought to react to the local situation where there are some ….vacant dwellings. (See section … on Buildings). The course of action adopted has obvious environmental and economic advantages.

One of the criteria for assessment of the offers by the Selection Panel is energy efficiency measures in the building.

- The Housing Authority and RES

i) RES on HA building rooftop:

As far back as 2008, the HA invested in a 3.48kWp photovoltaic system and the installation of an energy efficient lighting system on its own offices. This was funded through the ERDF fund and was completed in 2010. The aim was to introduce EE measures and RES in its public building with the intention to serve as an example to the building sector whilst leading by example.

ii) Policy on PV in social Housing

The HA issued a policy with respect to the installation of PV panels on social housing roof tops on the 8th March 2014. The Policy deals with requests from tenants to install PV systems on the roof of the residence in question and the conditions that must be satisfied for the Authority to give its consent. The conditions deal with legal aspects of roof ownership and related rights and obligations, as well as issues that might arise between neighbours. Joint installations in multi-family buildings are also dealt with.

Applying lessons learnt.

In 2005 the HA constructed its first energy-efficient social housing project in Malta, at Tal-Ftieh, Birkirkara. The residential part of the building incorporated EE and RES measures such as roof insulation, a storm water cistern, double glazing in apertures, windows and door louvers and solar water heaters.

However several lessons were learnt which will be applied once new building projects are being considered.

- Solar paths analysis is a key requirement with respect to energy behaviour of the building fabric.

- Residents need more awareness of good energy practice in everyday life.

- Maintenance is very important. A maintenance program after the building is constructed and handed over to the residents would be necessary in order to ensure good building thermal performance,

- Grants should be given for the installation of RES by the occupants themselves. This will ensure that no portion of the guarantee is lost by the time the building is completed and assigned, and arrangements will have to be made to cover the maintenance and repair costs of tenants who cannot afford such expenses.

Leading by Example

The Housing Authority realizes that, as a public body, it should lead by example when it comes to incorporating EE measures in order to aim for low energy housing with improved thermal performance. Accordingly, the following projects are on the Authority's agenda.

- Near-zero energy HA pilot project. A block of apartments from the HA's list of approved planning permits wherein the block shall be re-designed to guidance note F, including EPC certification, aiming for near-zero energy,

  - Will serve as an example to stimulate individual EE improvements by the private sector,

  - Provide a platform to support research and technological development, and

  - Raise awareness to the general public.

  Funding (ERDF and ESF funds) have been sought for this project.

- The identification of stakeholders within the construction industry who could team up with the HA in a public-private partnership whilst providing energy-efficient social accommodation,

- The setting up of schemes with the aim of overcoming the "split incentive" in rented properties.

- Assess HA owned building stock for the introduction of RES on its roof tops.

- Energy audits of HA owned building stock to identify the most inefficient buildings and possibly tap into ERDF funding for retrofitting these energy-inefficient social dwellings.

6.3.3 Purchasing by public bodies

Introduction

Government purchasing decisions, like any other economic activity, bear consequences on the environment. Moreover, public procurement represents a significant proportion of Malta's GDP.

Through Green Public Procurement (GPP), public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured, thus making GPP a win-win tool, leveraging both economic and environmental objectives. On the one hand, it enables the public sector to obtain the best value for money and procure low-carbon, environmentally-friendly goods, works and services, thus representing an efficient use of public finances, whilst promoting environmental improvement. On the other hand, GPP represents a business opportunity for the suppliers of goods and services, rapidly pushing the boundaries of the growing market for environmentally-positive products and services. GPP would not only result in more efficient public procurement, but will also stimulate innovation and the development of competitive markets in the field of environmentally friendly and low carbon technologies, goods and services.

Green Public procurement is increasingly being mainstreamed in order to ensure the integration of all policies in a coordinated manner, and to achieve the national objectives not only in the environmental field but also in areas that impact upon or are impacted by public procurement, exploiting synergies and addressing potential conflicts across sectors. To this end, the National Action Plan promotes good purchasing practices, reduces their environmental impacts, and maximises on economic opportunities.

Background

In 2011, Malta was among the Member States that were still in the process of establishing the right conditions for GPP to take place. In fact, Malta had extremely low levels of GPP. So, it was crucial to reflect on the experiences of other EU Member States, which has helped Malta to adapt the EU common GPP criteria to Malta’s specific needs.

The principle of GPP has formally been included in Malta's policy framework at a strategic level since 2005. The National Reform Programme 2005-2008 made reference to a GPP Plan. This measure was the responsibility of the then Ministry for Rural Affairs and the Environment (MRAE). Following 2008, the policy responsibility for GPP was transferred to the Tourism and Sustainable Development Unit within the Office of the Prime Minister (OPM). In September 2008, Malta agreed in the Competitiveness Council to a political indicative target to integrate GPP in 50% of public procurement.

The National Action Plan for Green Public Procurement

The National Action Plan for Green Public Procurement was compiled by the Office of the Prime Minister, together with the then Ministry of Finance, the Economy and Investment (MFEI) and other institutional stakeholders forming part of the National GPP Task Force, which was responsible for:

1. finalizing the GPP NAP and ensure its presentation to Cabinet for endorsement;

2. acting as a strategic coordinating body overseeing a framework within which GPP can take place in Malta;

3. integrating green purchasing practices within the national public procurement process;

4. establishing clear and measurable targets and objectives for green procurement in a range of sectors and ensure their achievement;

5. ensuring that the implementation of the GPP is continuously monitored and any corrective actions are taken as may be appropriate;

6. engaging procurers, suppliers and markets in the GPP process, provide guidance and facilitate capacity building in this area.

The National GPP Task Force is composed of the following entities:

- The **Ministry for Tourism, Culture and the Environment / Office of the Prime Minister** has the overall responsibility for coordinating the implementation of GPP in Malta. It Chairs the Task Force and coordinates the necessary follow-up at a strategic level.

- The **Ministry for Resources and Rural Affairs** provides input to the finalization of the draft National Action Plan and its subsequent implementation on matters related to energy and resource efficiency, buildings design, procurement related to agriculture and fisheries and issues related to climate change.

- The **Malta Environment and Planning Authority,** in its capacity as a national land use planning and environmental regulator, advises the Task Force and provide input on matters related to environmental and land use issues of relevance to GPP process.

- The **Malta Council for Science and Technology** advises on matters related to the procurement of innovation, research and pre-commercial procurement.

- The **Department of Contracts** is the competent authority for public procurement. It shall be responsible for the integration of GPP into mainstream procurement procedures of the government, screening tender documents to ensure the uptake of GPP at an operational level, and providing regular updates to the TSDU GPP officer on its uptake.

- The **Malta Enterprise** works with its SME client base to disseminate information on GPP and assist market operators in participating in GPP opportunities.

- The **National Statistics Office** advises on matters related to the monitoring of GPP and the potential incorporation of GPP indicators into the mainstream national statistical processes.
- The **Malta Competition and Consumer Affairs Authority** (formerly known as the Malta Standards Authority) advises on all matters related to environmental performance standards of products and services, environmental management systems certification schemes, as well as on the relevant eco-labels and EMAS.

- The **Department for Local Government** facilitates the application of GPP at the level of local authorities, i.e. integration of GPP into procurement by local councils.

- GPP inter-ministerial task force is due to be re-activated in June 2014 in view of the need to review the National Action Plan by end 2014

This National Action Plan (NAP) is based on a comprehensive understanding of the current situation both locally and across the EU. Guided by the vision to promote sustainable public purchasing practices whilst ensuring that this does not lead to market distortions, the 2011 NAP was aimed to

firmly establish GPP in Malta within a coordinated strategic framework, putting into motion the right culture change.

Moreover, the targets are incremental in order to avoid potential market distortions and to allow sufficient lead time for the market operators to adapt to the new government purchasing policy. The 2011 NAP provides concrete recommendations that extend over a three-year period. It is pertinent to note that the requirements on GPP apply to all public tenders within the scope of the Public Procurement Regulations (LN 296 of 2012) irrespective of tender type (supply, works or service) value (departmental or tenders above EU thresholds) and tendering procedure (open, restricted, negotiated, etc).

The implementation of GPP has been identified amongst the priority actions of the National Environment Policy[33], according to which, by 2015, 50% of public procurement shall adhere to EU GPP criteria.

The Administrative Procedure for Green Procurement

Circular CT 5021/2011 was issued on the 14th December 2011 to all contracting authorities to explain the new procedure. It requires all contracting authorities to refer their tenders together with the Tender Originators Form (TOF), to a process of mandatory screening on a generic email address[34] of the compliance of the terms of reference/conditions of products/services against the national GPP criteria for the relevant product group. In this regard, as from January 2012 all calls for tenders must be supported by the Tender Originators Form[35]. In respect of Departmental tenders, Departmental Contracts Committees of each Ministry are directed not to approve the award of tenders for the mandatory GPP products or services without confirmation that the mandatory technical specifications have been adopted.

The GPP process has been completely centralised at the national level. GPP was implemented in an organized manner with effect from January, 2012. The Office of the Prime Minister, first, and currently the Department for the Environment and Climate Change within the Ministry for Sustainable Development, Environment and Climate Change (MSDEC), which has the overall responsibility for coordinating GPP in Malta monitors GPP and takes the necessary policy decisions. The Department of Contracts implements procedures to ensure that GPP forms part of the mainstream public procurement process and is in compliance with the respective public procurement regulations.

[33] https://secure2.gov.mt/tsdu/environment-nep?l=1
[34] gpp@gov.mt
[35] https://secure2.gov.mt/EPROCUREMENT/tof

GPP criteria must be followed when carrying out the drafting of a tender for either of the 18 product and service groups. In 2012, the product and service groups that should have been fully compliant with the GPP criteria were *copying and graphic paper*, *gardening products and services*, *textiles* and *office IT equipment*. As from 2014, this list includes also *cleaning products and services*, *thermal insulation* and *wall panels*. This can be seen in *Table 1*, below.

Product/Service group	Targets		
	Year 1	Year 2	Year 3
Copying and graphic paper	100%	100%	100%
Gardening products and services	100%	100%	100%
Cleaning products and services	80%	90%	100%
Textiles	100%	100%	100%
Office IT equipment	100%	100%	100%
Transport	10%	20%	30%
Furniture	10%	20%	30%
Food and catering services	10%	20%	30%
Electricity	10%	20%	30%
Construction	10%	20%	30%
Mobile Phones	10%	20%	30%
Combined Heat and Power	10%	20%	30%
Thermal insulation	80%	90%	100%
Wall panels	80%	90%	100%
Hard floor coverings	10%	20%	30%
Windows, glazed doors and skylights	10%	20%	30%
Street lighting and traffic signs	10%	20%	30%
Road construction and traffic signs	10%	20%	30%

Table 25 Targets for products and service groups. (Source: *Green Public Procurement – National Action Plan*)

Procurers of product and service groups that must be fully compliant with GPP criteria should ensure that when the tender specifications are drafted, they should be based on GPP criteria. On the other hand, the application of GPP criteria for the procurement of the remaining product and service groups though voluntary, is strongly encouraged.

Upon completing the screening process, a confirmation of compliance or otherwise is given – the former is required in order for the tender to be published.

To address any difficulties that might be encountered in this process, a GPP helpdesk was set up for contracting authorities to consult with the same at an e-mail address[36].
Thus, all contracting authorities - including Ministries, Departments, Government entities and local councils and also, more specifically, the armed forces - are required to refer their tenders, irrespective of their value, to mandatory screening for compliance with GPP criteria, which are modelled on the EU common criteria for the 18 product and service groups. Tenders are screened by a GPP Officer who determines whether any given tender would fall under the product group for which the NAP sets a GPP target and whether the tender is compliant with the corresponding national GPP criteria. Finally, the evaluation of the offers received remains in accordance with the published tender conditions and the principles of public procurement continue to apply. Moreover, Evaluation Committees ensure that the award of tenders is based on fairness, transparency and non discrimination. However, every bidder competes on the basis of the adopted green technical specifications.

Awareness of the benefits of GPP

Along the GPP implementation process, it was essential to secure acceptance and support for GPP amongst a broad range of stakeholders. This was achieved through improved awareness by reaching out to stakeholders with information on the benefits of GPP. In fact, since January 2012 a total of 16 GPP information sessions were held targeting an audience of around 600 representatives of procurers and suppliers. These sessions, amongst other issues, included dedicated training courses offered to public service personnel involved in procurement processes, as well as sessions for green leaders, local councils, sector-specific contractors and suppliers, directors of corporate services of government ministries and departments as well as representatives of NGOs.

This has been critical for ensuring that contracting authorities do not perceive GPP as an added bureaucratic burden. Above all, cooperative relationships with procurers and with industry representatives have been developed, helping to drive GPP forward in a genuine atmosphere of cooperation.

[36] gpp@gov.mt

Progress Made

Product/Service group	Annual Statistics 2012		
	Target for 2012	% of number	% of value
Copying and graphic paper	100%	86%	81%
Office IT equipment	100%	60%	92%
Textiles	100%	50%	33%
Gardening products and services	100%	34%	44%
Cleaning products and services	80%	44%	24%
Transport	10%	29%	60%
Furniture	10%	13%	3%
Food and catering services	10%	37%	12%
Electricity	10%	89%	99%
Construction	10%	8%	0%
Mobile Phones	10%	no tenders	no tenders
Combined Heat and Power	10%	100%	100%
Thermal insulation	80%	0%	0%
Wall panels	80%	18%	3%
Hard floor coverings	10%	2%	0%
Windows, glazed doors and skylights	10%	3%	0%
Street lighting and traffic signs	10%	12%	5%
Road construction and traffic signs	10%	7%	7%

Table 26 The GPP uptake throughout 2012 for all the 18 product and service groups. (Source: *GPP Database for 2012*)

During 2012 there was a gradual increase in tenders being compliant with the GPP criteria. During 2012, the government of Malta published some 3,277 tenders, of which 2,462 have been screened for compliance with GPP criteria by the GPP Office. Some 723 of these tenders fell within the scope of the 18 product groups for which GPP targets are set, as specified in the NAP. 158 tenders amounting to around 30million€ were fully compliant with GPP criteria. This amounts to 4.8% by number and 6.6% by value of all the tenders published during this period. Table 26 is an extract from the GPP Database for 2012, showing the GPP uptake throughout 2012 for all the 18 product and service groups.

By the end of the first quarter of 2013, the GPP Office had reached a level of GPP uptake of 57% of the tenders falling within the scope of GPP product groups, of which 88% in terms of value were compliant with Malta's national GPP criteria. Table 27 below shows the percentage (by number) of tenders under the scope of GPP that were compliant to GPP criteria throughout 2012 and the first two quarters of 2013. Table 28, in turn, presents only the 6 priority product and service groups that were considered to be most relevant to the energy sector.

Product/Service group	2012				2013	
	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun
% GPP compliant tenders under the scope of GPP	15.7%	29.01%	22.16%	21.13%	56.91%	63.83%

Table 27 The percentage (by number) of tenders under the scope of GPP that were compliant to GPP criteria. (Source: *Department for the Environment and Climate Change* within the *Ministry for Sustainable Development, Environment and Climate Change*)

Product/Service group	Target for 2012 according to NAP	2012				Target for 2013 according to NAP	2013	
		Jan – Mar	Apr – Jun	Jul - Sept	Oct - Dec		Jan - Mar	Apr - Jun
Construction	10%	0%	14%	4%	13%	20%	50%	50%
Transport	10%	11%	29%	36%	38%	20%	83%	54%
Office IT equipment	100%	58%	67%	75%	46%	100%	100%	91%
Thermal insulation	80%	no tenders	0%	0%	no tenders	90%	100%	no tenders
Windows, glazed doors and skylights	10%	0%	10%	0%	0%	20%	75%	25%
Street lighting and traffic signs	10%	14%	0%	0%	14%	20%	57%	43%

Table 28 The percentage (by number) of tenders under the scope of GPP that were compliant to the GPP criteria, showing only the 6 priority product and service groups that were considered to be most relevant to the energy sector. (Source: *Department for the Environment and Climate Change* within the *Ministry for Sustainable Development, Environment and Climate Change*)

It should be considered that the implementation process was initiated relatively recently and that previously both uptake and awareness of GPP were very low (less than 20% uptake as per the survey of 2011 of the European Commission).

Future Plans

Since the recommendations provided by the 2011 NAP extend over a three-year period, this document shall be revised by the end of 2014.

Among the improvements being envisaged in the national GPP procedure are further streamlining of the administration process, with a special focus on centralisation of the procurement process, as well as further enforcement.

Further Information sessions on GPP are also envisaged.

References:

- *Green Public Procurement – National Action Plan, Office of the Prime Minister, August 2011*
- *GPP News-Alert Issue No. 31 May 2013*
- *www.gpp.gov.mt*
- *Contracts Circular No. 5021/2011 on Green Public Procurement and dated 14 December 2011 issued by the Department of Contracts*
- *GPP Database (Jan-Dec 2012)*

7. Energy Efficiency Measures in Industry

7.1 Introduction

The National Office of Statistics reports that the 'business demography' for Malta[37] in 2010 as 61880 entities (96.9%) employing between 1-9 persons, 1544 entities (2.4%) employing between 10-49 persons, 359 entities (0.56%) employing between 50-249 persons and 81 entities (0.13%) employing 250 persons or over.

In general, energy has always been pursued by industry in general[38]. This attitude was driven by:

- The impact of the high costs of energy, especially electricity, on the balance sheet of business enterprises in a competitive environment and at a time of economic stress
- Awareness of the importance of wise use of energy raised by various activities and national support schemes, by Government directly and other entities on its behalf.

- Consultancies readily available and offered to enterprises by engineering companies, the University and others.

As in the case of energy audits, in the absence of centralised reasonably complete recording of information on measures that have been implemented, the situation can best be summarised by describing the practices and measures adopted in several types of industry, including government-owned-owned industry.

7.2 Private industry : Large enterprises in manufacturing and services

The Energy Unit within the Ministry for Energy is in contact with individual enterprises coming from various sectors of the economy and with trade associations (eg. the Chamber of Commerce and Enterprise and the Malta Hotels and Restaurants Association) to discuss energy efficiency and management in general. The criteria of enterprises that were visited were extended slightly beyond those enterprises that are large enough to qualify for mandatory audits under Directive 2012/27/EC.

The general picture that emerges for this category of industry is generally satisfactory.

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[37] http://www.nso.gov.mt/statdoc/document_file.aspx?id=3586

[38] This section should be read in conjunction with Section …' Energy Audits'

The findings were:

- Operating standards and benchmarking of performance:

Many large enterprises in Malta are members of international groups or have close association with important international partners who are reputable and technologically advanced. This association can take the form of joint ventures and partnerships (with the foreign parties holding a significant shareholding), subsidiary status and/or franchising (common in the hospitality, beverage and catering industry).

These international partners generally set their own standards (including energy, water and environmental), broadly applicable to all their operations in the various countries and to which the local operator must comply. These standards do not only meet local legislation in the country where the operation is taking place but also draw on additional 'best practises'. Compliance with standards is audited and benchmarked with operations in other countries by the parent company.

The local operations invariably perform creditably in these benchmarking exercises.
This high levels of competence is also found in other large local enterprises, several of whom themselves operate abroad.

- Compliance with best practice:

Most large enterprises are generally well aware of and adopt the practices encouraged by the Directive.

- The buildings operated by these enterprises are generally designed and built by reputable contractors and engineers to international standards. The building would be holistically designed specifically for the intended operations.

- Most enterprises operate smart Energy Management Systems either stand-alone or as part of their building management system. These systems monitor and record energy consumption and control services and/ or machinery according to set standards of service or of comfort, according to the industry and process. They give early warning of abnormal consumption. Analysis of records for longer term trends is also standard operating practice.

- These large enterprises are very much aware of the technological landscape that is relevant to their business. In meetings, it clearly transpired that they hold technologies such as CHP

under constant review for cost-benefit and are prepared to invest in projects that show a reasonable return on investments.

- Operators to whom heating and cooling is relevant, operate highly efficient systems optimised for their circumstances and for the handling of the climate situations in Malta that necessitates heating and cooling for short periods of the year

- The importance of metering for energy and resource management is appreciated. This applies to sub-metering within plants and processes and also to metering individual consumption where subletting residential, office or commercial space is involved. Most operators have adopted metering for all services in their establishment -gas, heating and cooling (flow and temperature metering), Corporation – on a client by client basis, and billing accordingly. Electricity is metered directly by Enemalta.

7.3 The Tourism and Catering Industry

Tourism is a major economic activity in Malta.
Today, the number of tourist arrivals is about 1.5 million per annum. Malta and Gozo have over 160 licensed accommodation establishments which are classified as follows:

- 5 Star – 14

- 4 Star -52

- 3 Star – 44

- Guest Houses / Self Catering apartments. – 51

Leading international brands operate hotels in Malta. A Maltese group are owners/operators of three hotels in Malta and others in Tunisia, Prague, Lisbon, London and St. Petersburg. Major international catering chains operate in Malta.
The number of registered catering establishments amounts to over 1700 units, in the following categories:

- Restaurants (1st, 2nd, and 3rd. Class) which include Fine Diners, Family/Casual Diners / Ethnic (mainly Indian – Chinese – Japanese – Eastern European),

- Snack Bars, Café Bars, Bars, Night Clubs and Kiosks.

The Energy Unit within the Ministry of Energy and the Conservation of Water has had several meetings with the Malta Hotels and Restaurants Association, which is the officially recognised body representing all the classes and categories of these licensed establishments and also with several individual operators about energy issues that concern the industry.
The situation is generally similar to that found in industry - encouraging where large establishments are concerned but needing more engaging with and support to the smaller establishments is necessary.

Access to technical expertise

Large five-star hotels have access to the best technical expertise and have taken energy efficiency very seriously, both because of its impact on their profits and also because of their affiliation to international chains of enterprises whose standards they must attain. They have advanced much beyond standard efficiency measures. Most have Building management Systems in operation and most have already moved to room management systems with sensors and software automating some aspects of wise energy use. Their heating and cooling requirements are satisfied by high COP heat pumps and chillers with EMS, some with systems that optimise their operation. These operators are aware of the benefits of CHP though they have not found it cost-beneficial in present circumstances.

On the other hand, the scale of operations and revenues in three-star hotels does not allow the employment of in-house expertise and their revenues do not permit investment in large energy efficiency projects. Four-star hotels lie somewhere in between.

Energy Audits and related initiatives

Apart from large establishment which rely on energy Management Systems to achieve energy efficiency, only a small number of high quality energy audits were carried out in the smaller establishments through an ERDF scheme. The Energy Unit at the Ministry of Energy and MHRA have identified the need to increase the number of such audits across the industry while also creating a systematic data collection system for benchmarking purposes. This will enable continuous energy management improvement priorities to be identified and hence where support will be the most productive.

MHRA plans that energy efficiency and waste management for energy generation will be their next focus studies, following the highly successful EU Life + Invest in Water programme. Part of this would be the inclusion of intensive Energy Audits would be included in this programme such that energy saving initiatives would be tailored to the individual energy profile of each each establishment. MHRA will be collaborating with other similar establishments across the EU and the Mediterranean region with a view to establish a best practice framework for the industry. The Association already has the necessary international contacts to initiate this initiative.

One of the most promising technologies in this field involves cogeneration. To promote cogeneration amongst hotels one should consider an incentive based upon energy produced efficiently from the cogeneration system:

The Ministry of Energy will cooperate with MHRA in these endeavours.

Training programmes and information dissemination

The industry recognizes that many of its operators need access to high level professional expertise in order to participate meaningfully in energy efficiency programmes and sustain progress. This lack of access to sufficient and quality technical expertise remains a critical limiting factor. MHRA has already organised some training programmes in collaboration with a leading international facility management consulting firm based in Italy, with the objective to raise more awareness about the potential benefits of energy efficient facility management. Its ultimate ambition is to launch an extensive campaign for training and information at an EU level.

MHRA has organized structured fora for contacts with its members where EE matters– e.g. best practices, advice and information dissemination - are discussed. Through the Environment and Product Sub-Committee MHRA is continually reaching out on various issues with our members.

Energy Performance Contracting (EPC)

Meaningful 'energy performance contracting' has not yet taken off in Malta. MHRA has entered into an agreement with a leading international consulting firm to explore avenues whereby such services can be made available to its members that need them.

7.4 Government-owned industry

7.4.1 The Water Industry - Water Services Corporation

Background

Water is a scarce natural resource in Malta. The country's water stress index is by far the highest in Europe and almost globally. Currently 55% of the island's public network supply is desalinated sea water by the Reverse Osmoses process. Water is distributed by an extensive network of some 2500km in length.

The water supply system of the Maltese Islands has over the years developed to meet the expanding needs of the population. Since it was set up 20 years ago, the Water Services Corporation has set as its main technical objectives rationalising operations, the control of leakages in the distribution system, adoption of new cost-effective technologies and the optimising of water quality to meet specific applications at least cost.

The water supply system is highly dependent on a series of pumping operations which varies from extracting water from groundwater sources to pumping process water through the various stages of the reverse osmosis plants. Even the sewage collection network, which in itself is predominantly a gravity system, still comprises a large number of sewage pumping stations distributed throughout the collection network to compensate for the undulating topography of the Maltese islands. This situation makes the Water Services Corporation one of the major power consumers in Malta. The Water Services Corporation accounts for some 6% of the electricity exported by the Power Station.

Accordingly, the Corporation is very conscious of the need of efficiency in all of its operations as most of these impart its energy footprint. As part of its continual effort to improve on its energy consumption, the WSC is undertaking a project to implement various measures in different sectors of its potable water supply and sewage collection systems.

Reduction of Power Requirements in the Transfer and Distribution of Water through certain Pipelines.

The WSC is seeking to upgrade three old pipelines which are currently operating inefficiently due to their capacity and their internal surface condition. They have to cope with higher flow conveyance requirements dictated by increases in demand resulting from demographic growth and generally improved lifestyle over the years. These replacement will reduce the pumping energy requirements to operate these pipelines.

The pipelines in question are:

- The Bakkja Groundwater Puming Station to Ta' Qali Reservoir conduit (4 km.)

- The Hondoq Booster to Ta' Cenc Reservoir pipeline in Gozo (9 Km.). This pipeline is a key link in the Gozo water supply system channelling water from the Cirkewwa RO plant to reservoirs situated at Ta' Cenc, the hub of the Gozo water supply system.

- The Ta' Qali Reservoir to Naxxar Reservoir pipeline(4 km.) linking these two reservoirs and improving on the existing transfer capacity to Naxxar.

The WSC is also seeking to lay a new pipeline to change the potable water supply system from Ta' Qali Group of Reservoirs (8 km.) to the north east part of Malta from a direct pumping system to a gravity system.

These works are estimated to result in a reduction in energy requirements per year of 1,356,294 KWh.

Variable Speed drives for Groundwater production, Distribution and Transfer Pumps

The WSC is seeking to install variable speed drive systems with closed loop control on groundwater production pumps in Gozo[39] to operate this equipment more efficiently with regards to power consumption. It will eliminate avoidable pressure drop resulting from pumps being purposely throttled to achieve the required abstraction yield. Existing pumps also need to be replaced with ones compatable to variable speed systems. This would also control the amount of water that is drawn from

[39] In Gozo there are around 40 groundwater sources from which water is pumped into a collection system to transfer the water to reservoirs for polishing and belending. The operating conditions of the system vary according to demand requirements and variations in the yield of the sources.

each source – reducing extraction when salinity is increasing - hence avoiding the need of further treatment further downstream in the polishing process. The WSC already has experience with variable speed systems and SCADA systems which are also supported internally.

WSC is expected to start benefiting from savings from the project with the first installation of the equipment in begining of 2015. Project expected to be completed in third quarter of 2015 and save 463,137 KWh of electricity per year when complete.

Upgrading of RO High Pressure Pumps and Energy Recovery Systems

The operation of an RO system is based on water being pumped at high pressures to overcome osmotic pressure of the saline waters and enable the passage of water molecules through a semi permeable membrane. The brine reject from this system would still be substantial in volume and at a sufficiently high pressure to justify the use of energy recovery devices for recuperating this energy. The WSC's RO systems are already equipped with energy recovery systems. However, over the years technology in this area has evolved significantly with more efficient equipment delivering higher energy recovery rates being developed.

WSC is seeking to replace the older less efficient high pressure and energy recovery systems with more technologically advanced systems to improve on the specific energy consumption of its RO plants. This project is expected to deliver 5,185,000 KWh of energy savings per full year operation.

WSC is expected to start benefiting from savings from the project in second quarter of 2015.

Replacement of RO Auxiliary Pumps

The auxiliary pumps are used to pump feed water into the plant, boost water through filters within the plant to the high pressure pumps for the actual RO process, and to pump product water out of the plant.

WSC is seeking to replace aging less efficient auxiliary pumps with new pumps to improve on the specific energy consumption of its RO plants by reflecting the current plant usage scenario.

WSC is expected to start benefiting from savings from the project in second quarter of 2015 at the rate of 522,876 KWh per annum.

Polishing of Groundwater

Groundwater is extracted from the aquifer through a number of boreholes and pumping stations. Three of these pumping stations, - Tal-Hlas Pumping Station, Wied il-Kbir Pumping Station in Malta and Xewkija Pumping Station in Gozo -, are subject to source contamination over prolonged periods throughout the year which renders them unfit for potable water extraction purposes. During this period these pumping stations aret running but the water produced is diverted to drain. In this way, when the water quality improves, the pumping stations would be put back on line. The groundwater diverted to drain has to be replaced by desalinated water, thereby expending energy that would otherwise be avoided.

Through the installation of ultra-filtration units, the WSC is seeking to push the quality of the water produced from these three pumping stations to potable standards throughout the year. Thus the need of substitute RO water would be reduced to make good for polishing reject only.
WSC is expected to achieve energy savings of 317,412 KWh/annum from this project, once completed in second quarter of 2015.

Reduction of Seawater Infiltration into the Sewage Collection Network

The sewage collection network is predominantly a gravity system. Part of the network, namely that in coastal areas, runs below sea level. Given the characteristic local fissured stone, any flaws in the pipework would immediately result in seawater infiltration into the system. Such infiltration has a *domino effect* in the sense that it would result in increased pumping volumes, increased treatment requirements, and increased salinity in the treated effluent with a direct adverse impact on its potential for reuse. In a scenario where WSC is implementing a project for further treatment of sewage effluent for reuse purposes, higher salinity directly and adversely effects the energy consumption in the treatment process.

WSC is therefore seeking to rehabilitate sewage collection pipes which are installed below sea water level mainly by in situ repairs with the aim of reducing seawater infiltration into the sewage collection network.
WSC is expected to start benefiting from savings from the project in third quarter of 2015 at the rate of 4,548,693 KWh/annum.

7.4.2 Waste Management - Wasteserv Malta Ltd

Wasteserv Malta Ltd is the Government entity responsible for waste management, including the treatment and disposal of solid and hazardous waste. It operates engineered landfills, waste treatment plants, a thermal treatment facility and other installations.
The Company is very conscious of its environmental responsibilities and maximises recycling of waste, waste to energy harvesting and implementation of RES projects on its sites. Harvesting of heat energy is handicapped by the lack of demand for this commodity in Malta.

Of major relevance to the NEEAP are the following. Further details can be found at www.wasteservmalta.com.

Sant Antnin Treatment Plant

At this treatment plant, energy is generated from waste gases obtained from the anaerobic digestion process. The amount of electricity generated is such that at times, the plant is self-sufficient in electric energy and also some electricity is delivered to the public grid during the silent hours.
The plant is also capable of delivering heat in CHP mode, which is primarily used in its internal processes. Heat is also delivered to a therapeutic swimming pool nearby run by a private non-profit organisation providing therapeutic services to persons with disability.

Landfills

Wasteserv also generates as much energy as is cost-effective from the landfills, both closed and active.

The heat utilisation estimate in the table below is based on the use of the heat energy from methane forming part of the 'bad gas' recovered the landfills (mainly the former Maghtab dump). This heat is used to sustain the RTO (regenerative thermal oxidizer) which is used to destroy the same gases.

Thermal Treatment Facility

Wasteserv operates a Thermal Treatment Facility to treat a wide range of waste fractions. It treats abattoir waste, clinical waste, RDF and industrial sludges to high environmental standards.
An autoclave is being installed at the Thermal Treatment Facility.

The autoclave is an alternative treatment process for animal by-products as opposed to the current incineration process. The by-products produced following the rendering process can be used as a fuel

for the TTF which will result in less fossil fuel consumption at the Marsa incinerator. Furthermore, eliminating the water from the waste prior to incineration will reduce the damages on the refractory of the rotary kiln due to thermal shocks. This facility will be a back-up facility for Malta apart from the Thermal Treatment Facility. Waste heat energy currently being generated from the incinerator (converted to steam) will be used for the pre-treatment of animal tissue waste.

Wasteserv's RES contribution.

The following Table 1 outlines Wasteserv's RES contribution. More heat could be generated by Wasteserv projects but no commitment for its utilisation can be obtained. Only that heat that can be meaningfully utilised is included in Table 29 below.

Table 29 WASTESERV RES CONTRIBUTION (REVISION JULY 2013)

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Electrical (GWh)											
*Landfill Gas**	0.00	0.00	0.58	1.3	2.80	4.30	5.80	5.80	5.80	5.80	5.80
*SAWTP MBT****	0.00	1.55	2.46	0.27	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Malta North MBT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.16	9.16	9.16	9.16
Gozo MBT	may not be implemented										
*RDF (i.e. proposed incinerator)******	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	66.00	66.00	66.00
PV Panels (CA sites)			0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
*Qortin PV field*****	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.80	0.80	0.80	0.80
Heat (GWh)											
*Landfill Gas***	1.80	2.18	2.47	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
SAWTP MBT	0.00	1.39	2.28	0.35	2.30	2.30	2.30	2.30	2.30	2.30	2.30
Malta North MBT	0.00	0.00	0.00	0.00	0.00	0.00	no commitment on utilisation of heat				
Gozo MBT	may not be implemented										
*Marsa Thermal Treatment Facility******						3.40	3.40	3.40	3.40	3.40	3.40
RDF (i.e. proposed incinerator)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	no commitment on utilisation of heat		
Biofuel											
Algae project							20,000 litres of biofuel annually				

Note: 2010 -2012 is actual data

* increase in CHP capacity by 1.5GWh each year until 2016 (due to increase in gas wells)

** excludes utilisation of heat from CHPs

*** reduced electricity generation in 2013 due to fault in hydrolyser tank; post 2014 generation may improve by 25-40% through the introduction of at source segregation of organics

**** development permit application approved; way forward to implement project is required

***** based on utilisation of steam from Marsa incinerator (incineration of biomass fraction only) for autoclave process

******Refuse Derived Fuel (RDF) - based on a throughput of 100,000 tpa

8 TRANSPORT

8.1 Introduction

In the national energy policy document, it is noted that the transport sector accounts for 74% of the fuel used in the inland market, excluding that used for international aviation and electricity generation.

It is further noted that

- Malta has one of the highest level of private car ownership in Europe, at about 3 cars for every 4 persons.

- The vehicle fleet in Malta has been steadily increasing in recent years.

- Vehicles older than 10 years account for 66.4% of the national vehicle stock

- A trend in recent years is the high percentage of imported 'used cars' which in 2010 amounted to 65% of the newly licensed cars for that year.

- People in general prefer to travel by private cart (75% of all trips)

The national characteristics of Malta do not enable it to take advantage of the efficient modes of internal mass transport (rail and inland navigation) while its insular status necessitates abnormally high recourse to international aviation. This is confirmed by Eurostat data and hence the special consideration for aviation agreed with the Commission (see Preamble to EE Directive2012/27/EU).

Road transport is so far the only mode of everyday internal mass transport generally available, apart from some inter- harbour services and those between the islands of Malta and Gozo by ferry.

The high dependence on road transport is the major driver for the reform of the public transport service which has now been on the national agenda for the last few years. It is clear that further substantial improvement in the public transport service is needed to make it an attractive and viable alternative to private transport for commuters.

The objective of the reform is to attain the optimum, or at least an acceptable balance between the level of service on the one hand and financial sustainability on the other, with due regard to the environmental impact. This has so far not been achieved and so the reform is still to be considered 'work in progress'.

An acceptable level of service means frequent services, an extensive route network that is easily accessible from the commuter's residence and reasonably comfortable buses. The higher the level of service, the higher the fuel consumption in the public transport system but this is necessary to attract commuters to the service. The benefits are saving on fuel used by private transport, reduced congestion in main road arteries and less time wasted in commuting as well as creating productive jobs.

Concurrently with the public transport reform, improvement in the average fuel efficiency of the private vehicle stock is being targeted. Vehicle scrappage schemes are delivering results and more such schemes are proposed.

Road improvements, alternative means of transport for certain locations, promotion eco-driving and some attempts to encourage further modal shift complete the picture.

8.2 Main policy measures addressing energy efficiency in transport

8.2.1 Measures to improve the energy efficiency of the public transport service

i) New Bus Fleet with efficient engines.

Since the 3rd of July 2011, the whole public transport fleet was changed to a mix of new EURO V diesel engine powered buses and hybrid buses. Previously, public transport service in Malta was operated by a mixture of old and less old vehicles, some of which date back as far as the 1970's. They were driven by Diesel powered internal combustion engines The change in the fleet was brought about in the context of the Public Transport reform, whereby a private contractor was awarded a concession and service contract to operate the public transport services.

Overall, the concession to the private contractor was not successful in matters other than the efficiency of the new buses. Government is taking over the public transport services again until a new public transport operator is chosen and has purchased the bus fleet in the process. It is not yet known if the current bus fleet will be retained by the new operator; however the 'Expression of Interest' notice just issued for a new concession requires:

- 'compliance with EU legislation, particularly with Directive 200/46/EC and Regulation 595/2009'.
- 'buses to be at least Euro 5 compliant'.

One of the published award criteria is that more points will be awarded for newer, cleaner and lower emitting (more fuel efficient) vehicles.

It is expected that additional electric buses would be deployed as part of the service.

ii) Rationalisation of transport routes

The aim of Transport Malta is to improve the network to make public transport more accessible for commuters, so as to achieve a significant modal shift away from the use of the private passenger car. The right balance between a large network for easy access and short travel time and efficient use of fuel by busses still needs to be stuck. A holistic interpretation of balance is the more correct, taking into consideration the saving in fuel and the reduction in traffic congestion achieved through a reduction in the use of private vehicles.

iii) Inter-harbour ferry services, complemented by vertical travel arrangements.

These services provide an alternative mode of transport from the Three Cities to and from Valletta. This would avoid a long trip through congested roads along the long perimeter of the Grand harbour. Coupled with the Vertical Connection Project (Lift) carrying passengers from the ferry jetty up to the City entrance, this provides a convenient alternative to land transport for that particular journey.

8.2.2 Measures in place to increase the attractiveness of public transport

i) Further reform to make the public transport service attractive.

The public transport reform of 2011 was not successful at the operational level and did not increase the attractiveness of public transport as expected.

The general perception was one of longer journey times than previous, inability to stick to timetables, erratic time keeping and missed arrivals of busses at bus stages. The IT system designed to provide real time information on bus movements at stages and terminals was at best non-reliable and did not function most of the time.

This state of affairs has been recognized by Government. The previous operator, unhappy with the financial sustainability of the service in terms of his contract gave up. A concession for a new service operator is now up for tender.

The new concession will benefit from the experience of the previous. It envisages revised routes that were determined after extensive consultation with local councils, renegotiation of the financial structure of the service to ensure sustainability and an improved real time information system and better time-keeping through an increased emphasis on IT.

ii) Real Time Journey Planner

It is the intention of Transport Malta that over the next three years, it will put in place an efficient real-time journey planner for all modes of transport services including ferry services to enable commuters to base their transport needs on public services.

iii) Park + Ride Facilities.

Statistics show that the introduction of the first P & R Facility outside Valletta in 2006 proved to be successful, with private transport users making the last mile of their journey to the City Centre through public transport provided at the P & R facility. This was during the initial introductory period when no charges were levied for the service.
This however changed when these facilities were turned over to the private operator to operate them holistically with the bus service. Too high charges were introduced for the P & R service with the result that most of the vehicle spaces remained empty.

It is likely that the operator levied too high charges intending to discourage commuters from using their private transport and move to public transport to avoid the hassle of parking in difficult circumstances. This was a mis-judgement of the commuters' reaction to the higher P & R tariff because private transport was not put aside.

To address the lack of parking spaces in and around Valletta, Transport Malta built a car park in Floriana with more modest charges. This was well patronised.

Lessons have been learnt. The P & R facilities will not be operated by the new Public Transport Operator. It is also proposed that where possible, these P & R sites will be used to host solar PV farms to generate renewable energy and providing shade for cars.

iv) Bus Lanes and Priority Lanes.

Bus Lanes and Bus Priority Lanes have been in place for some time. Transport Malta is now in the process of putting in place more such Priority Lanes where possible. Additional bus lanes in urban cores over those already identified will pose a problem due to the narrowness of certain road sections.

In addition, over the coming few months, Transport Malta will be replacing and installing new synchronized traffic light junctions, a number of which are grouped in the form of clusters to be able to provide a "green wave" to a platoon of vehicles. These traffic light junctions would also have an in-built bus prioritization mechanisms to give public transport, prioritization over vehicular traffic.

v) Bike and Ride Schemes

Wherever possible, new cycle lanes are being introduced on certain road sections, especially new road sections that are being built or existing ones which are being re-built.

It is expected that in the future Government will do a number of pilot project and schemes for the use of electric bikes and bike sharing similar to those in place in other countries.

8.2.3 Measures in place to increase the efficiency of the private transport

i) Scrappage schemes

'Vehicle scrappage' schemes designed to incentivise owners to scrap old excessively fuel-consuming vehicles and replace them by new efficient vehicles is an expensive but effective way to promote energy efficiency in private passenger transport. These schemes promote a high turnover of the vehicle fleet in order to take advantage of the progressively higher efficiency of new vehicle placed on the market.

These schemes are particularly indicated for Malta, where the national vehicle stock is old. In the period 2010 – 2013, a number of scrappage schemes were implemented, preceeded by a reform in the vehicle taxation system that became effective as from 2009.

Table 1 below gives available data on the historical rate of vehicle scrappage over the last eight years, and the measures to which it is attributed.

	Number of Passenger Vehicles scrapped							
Event	2006	2007	2008	2009	2010	2011	2012	2013
BAU.	2545	2148	2348	*2347*	*2347*	*2347*	*2347*	*2347*
Licensing regime				*1098*	*1574*	*1167*	*3265*	*1954*
Scrappage scheme - effective 2011						2653		
Scrappage scheme - effective 2012							2542	
Scrappage scheme - effective 2013								483
Total number of Vehicles scrapped	2545	2148	2348	3445	3921	6167	8154	4784

Table 30 Historical rate of vehicle scrappage

Notes to Table 1:

GREEN indicates actual data supplied by competent authorities.

RED indicates estimated numbers or numbers derived from estimated numbers.

BLUE indicates numbers derived from actual data.

2347 = the average of 2006 to 2008

The conditions attached to the scrappage schemes were:-

Date of Scheme	Effective Year	Conditions
15 November 2010	2011	Fiscal incentive of up to 2000 euro when purchasing a new vehicle and simultaneously scrapping a vehicle older than ten years.
	2012	Fiscal incentive of up to 2000 euro when purchasing a new vehicle and simultaneously scrapping a vehicle older than ten years.
	2013	Fiscal incentive of up to 500 euro when purchasing a new passenger or light commercial vehicle and simultaneously scrapping a vehicle older than ten years.
	2014	Fiscal incentive of between 500 and 900 euros depending on CO2 emission level, for the purchase of a new passenger car and simultaneously scrapping a vehicle older than ten years.

Table 31 Conditions attached to past Vehicle Scrappage Schemes

It is estimated that about 2700 tons of fuel were saved in the period 2011 to 2013 thanks to these scrappage schemes. The significant number of pre – 2000 passenger vehicles still left in the vehicle stock also means that there is still potential for such schemes in the future at current scrappage rates.

ii) Improvement in roads and junctions.

(a) junction upgrade at Kappara

Transport Malta plans several major roadworks in order to ease traffic flow and reduce congestion. These are preceeded by careful studies including CBA and other impact studies such that the best option is identified and the permitting process is successfully concluded.
A major project, due to start in 2014, is the junction upgrade at Kappara. The environmental planning statement for this can be accessed at :-
http://www.mepa.org.mt/EIACMS/documents/PA0491709/B2c_KapparaEPS_App2c%20JASPERS%20Feasibility%20Study_Simplex%20A4.pdf

iii) Programmes promoting eco-driving

a) Eco-driving is included in the theory part of the test which one sits for to acquire a driver's license.

b) The Malta Resources Authority is currently co-ordinating an EU- funded educational campaign to promote efficient use of energy in a number of key areas, notably in homes, enterprises, buildings in general and transport. The aim of this campaign is to target specific consumer groups with relevant information and through a wide range of initiatives: information sessions, brochures, billboards, advertising on media etc.. These are used to raise awareness about energy consumption, inform consumers about the available technologies and the energy efficiency potentials. One of the main topics outlined and emphasized during this campaign is Eco Driving.

There are various month to month adverts on TV, newspapers and billboards. During the month of September and October, four information sessions were held. All information sessions were targeted for the general public addressing different issues related to energy efficiency.

The first session was held on the 13th September and it was targeted to discuss issues related to the Transport Sector. The main topics discussed during this session were the following:

- The importance of tyres labeling - MCCAA
- Eco Driving - Transport Malta
- What fuel efficiency measures are taken by the Public Transport - Arriva
- The importance of electric cars in Malta - Transport Malta
- The role of research for Sustainable Mobility - Institute for Climate Change and Sustainable Development.

Furthermore, during the last months, MRA participated in two particular fairs in order to promote this topic as part of the energy efficiency campaign.

iv) Designated low-traffic or low-emission zones, and congestion charging.

At the moment there are no Low Emission Zones in place.

There is no congestion charging in place, although Malta's vehicle licensing regime takes into account the CO_2 element as well as the length of all vehicles registered and licensed in Malta. This is also reflected in the annual road licenses (circulation tax) of all vehicles as stipulated in the Maltese legislation CAP 368, Motor Vehicles Registration and Licensing Act.

A Controlled Vehicular Access system is in place in Valletta. Charging is time-based and is intended to promote shorter stays within the capital, releasing parking spaces and so reduce the time spent by drivers looking for a parking lot. It is also intended to incentivise the use of public transport for access to Valletta making access by private car more expensive. Upon introduction, a reduction in the number of vehicles accessing Valletta was registered. However this effect soon fizzled out. The system is now being re-evaluated to update the objectives and shall be tweaked as necessary.

v) Car Sharing

As part of the Malta National Electromobility Action Plan, Transport Malta will conduct a number of pilot projects in order to kick start the concept of car sharing in Malta through the use of Electric Vehicles

vi) Financial support for sustainable transport measures

Malta does have financial support mechanisms in place with respect to public transportation.

- The public transport service receives financial support under a PSO arrangement to offer reduced prices for public transportation services, especially on routes that are loss making, in a bid to make the service more popular. It is expected that this support will increase as of 2014, as Government will be extending the public transport network routes and put additional buses on the network to increase accessibility and frequency to make the service more attractive to the public.

- The Government has also recently introduced a high speed vertical connections lift adjacent to the city walls of Valletta to connect the lower Grand Harbour Area up to Central Valletta. This lift is operated at a subsidised fare to entice people living in the port areas to use inter-harbour ferry services instead of their private vehicle.

- Government this year has introduced a grant to encourage people buying Electric Vehicles. Part of this grant is tied with a scrappage scheme for vehicles older than ten years.

- This latter scrappage scheme is tied to the purchase of new vehicles and the level of support depends on the CO_2 emissions levels.

- In addition the Government is re-introducing a grant of €200 for 2014 for those vehicle owners who decide to convert their vehicle into using LPG.

vii) Tax incentives in place to improve the fuel efficiency of passenger vehicles and/or freight vehicles.

Currently there are no tax incentive in place to improve fuel efficiency of passenger and/or freight vehicles. However due to new less polluting, more efficient vehicles available on the market, such

incentives are being contemplated as of January 2015 after discussions with the respective authorities. Directive (2009/33/EC) is fully transposed in public procurement regulations

viii) Promotion of e-Working or Teleworking

Teleworking is an effective way of reducing energy consumption by the transport sector and is part of the Government's policy published in 2008. The latest published figures show that 643 government employees benefited from e-Working during 2012. Teleworking reduces fuel consumption for both user as well as through its effect on the general traffic congestion.

8.3 The Development of a National Transport Model supporting Strategy Development in Malta

It is clear that transport is a major issue for Malta, not least from an energy perspective. The development of a National Transport Model as described below will allow quantitative and holistic investigation of all energy related issues, from a technical, economic and environmental perspective. It is certain that the development will represent a quality jump in transport management in Malta. Future NEEAP's and respective will be more knowledge-based and accurately evaluated. It is expected that this progress will be clearly evident from as early as 2016.

Technical Description of the Project.

Transport Malta has received EU co-financing under Operational Programme 1 (2007-2013) Priority Axis 7 Technical Assistance for the procurement of professional services to assist Transport Malta in the development of a national transport model for Malta using an industry-standard transport modelling software package which would enable the simulation and analysis of the urban and inter-urban transport network / system and its interactions with economic, social, environmental and land-use factors, including energy-related issues.

The model will also be used to assess likely future transport demand for passengers and freight by mode of transport (road, public transport, ferry, air) in the short, medium and long term taking into consideration the impact of both economic (e.g. GDP, GDP per capita, car ownership, income, values of time, fuel cost and energy price) and demographic (e.g. population, age-structure, households, employment) trends over the period for each geographic zone;

Project Objectives

The objective behind the project is to develop a National Transport Model for Malta which would enable the simulation and analysis of the urban and inter-urban transport network / system and its interactions with economic, social, environmental and land-use factors.

The national transport model shall facilitate the quantification of travel demand and travel characteristics (e.g. traffic flow volumes, journey times, freight tonnage, generalised costs (time / monetary), travel distances and revenues). This would form the basis for the testing of different future forecast scenarios to assess the effectiveness of different transport demand and supply-based policies, programmes and plans in the short, medium and long terms in addressing issues and meeting targets relating to traffic congestion, modal shift, emission reduction noise abatement, accessibility and safety. This model shall be used as a planning and analysis tool to refine and develop the National Transport Strategy for Malta and to facilitate the prioritisation of identified transport investments (road transport, public transport, ports and ferries, and air transport) in the Transport Master Plan for period up to 2020.

It will also enable energy-related issues (e.g. fuel consumption in congestion situations, quantitative energy efficiency measures and their prioritization) to be investigated in detail.

8.4 Energy Saving measures in transport

A list of specific measures, the expected savings and other details are reported in Section …. Tables A, B and C., since they are part of the equivalent measures under the 'Obligation Scheme'.
Otherwise the main thrust over the next three years will be in the Public Transport Reform and in large infrastructural works in junctions.

9 Promotion of efficient heating and cooling

9.1 Introduction

It is generally perceived that conventional urban district heating and cooling is not cost- effective in Malta. Central heating (and/or cooling) schemes, especially if undertaken for a first time, require extensive infrastructural work[40]. The very low and seasonal heating loads dictated by Malta's mild climate, typical of most Mediterranean climates, renders such schemes unattractive in terms of obtaining a reasonable payback period[41], despite the dense population of the Maltese Islands[42].

Central heating and cooling is adopted in localised high-density top-end commercial developments where heating and cooling are managed holistically and effectively. In these circumstances, heating and cooling energy is obtained through heat pumps. Sea water boreholes are used as an effective heat sink, where access to seawater is possible. Access to the fresh water aquifers are permitted in certain well-regulated cases.

Co-generation of electricity and heat has also not taken off in Malta. Even in the high-density commercial developments mentioned above, cogeneration has been found difficult to justify economically because of the relatively low thermal loads and low heat/power ratios required.
Malta had used cogeneration meaningfully and extensively for thermal seawater desalination in the late 1960's to late 1980's, when sea-water distilling plant was supplied with steam from power-station passout steam turbines. Thermal desalination is now superseded by high efficiency reverse osmosis technology for the production of potable water and hence is now longer used.
The drive to higher efficiencies in industry and the higher standards demanded in the residential and hospitality sector as well as development of new technology has kindled interest in more competitive heating and cooling. Industry has determined the most cost-effective technology to adopt in different circumstances including in niche segments in industry and commercial establishments.

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[40] Rezaie, B. and Rosen, M.A. "*District heating and cooling: Review of technology and potential enhance*ments" Applied Energy, 2012. 93: pgs. 2-10

[41] Borg, S.P. 2012. Doctoral Thesis -*"Micro-Trigeneration for Energy Efficient Residential Buildings in Southern Europe",* University of Strathclyde, Glasgow, UK

[42] Section 3.2.1 on Energy Efficiency in buildings comments in detail on the heating and cooling characteristics and the energy used in maltese homes for these purposes.

9.2 A Comprehensive assessment of the potential for the application of high-efficiency cogeneration and efficient district heating and cooling, as required by the Directive 2012/27/EU

Carrying out the assessment in 2015

By mid-2015, a comprehensive assessment of the potential for the application of high efficiency cogeneration will be carried out for Malta. Efficient district heating and cooling will be included in the scope to obtain an informed assessment of possible niches that could be cost-effectively exploited, such as a group of neighbouring hotel joining together in one project.

Given Malta geographical size and taking into consideration the set-up of local government structures (local councils) and their legal competences, a national holistic and centralised assessment will be carried out by the Central government. The designated competent authority responsible for carrying out the assessment and the cost benefit analyses is the Energy Agency within the Ministry for Energy. The assessment will be contracted to experienced consultants able to guarantee a high quality product.

The the preparation of the technical specifications for this assignment are advanced. They cover the criteria set in Annex IX of Directive 2012/27/EU.

It is anticipated that the study will have six work packages:

i. The establishment of the heating and cooling demand for Malta,

ii. the preparation of a forecast of how this demand will evolve till 2030,

iii. the preparation of a map of the national territory that identifies at least the main supply and demand points above certain consumption or production thresholds, and the existing and planned district heating and cooling infrastructures,

iv. the identiification of heat demand and a heat demand forecast, identifying those elements of[43] the heat demand that could be satisfied by high-efficiency cogeneration, micro-cogeneration and efficient district-heating and cooling,

v. the identiification of those parts of the technical potential that can economically be met by high-efficiency cogeneration, including residential micro-cogeneration, by the refurbishment of existing and the construction of new generation and industrial installations, by utilising waste heat, and by building district heating and cooling infrastructures meeting the efficient district heating definition of the Directive Article 2(41), and

vi. on the economic potential, proposing strategies, policies and measures that may be adopted up to 2020 and up to 2030.

Any potential that is identified will be examined in further detail to ensure that it is appropriate and cost-effective to develop further. The taking of adequate measures for its development, including the carrying our of any cost benefit analysis that may be required will be an obligation upon large enterprises and will be regulated by the Malta Resources Authority.

9.3 Identifying economic potential

High-efficiency co-generation

In June 2009, a study 'Analysis of the Potential for Co-Generation on the Maltese Islands' was carried out by the Malta Resources Authority[44], with the assistance of the UK Department of Environment, Food and Rural Affairs (DEFRA). The objective was to explore the potential of CHP in locations where enough heat is produced or would be required in quantities that would justify the consideration of a co-generation project. The sectors studied were the hotel industry, the beverage Industry, laundries, health care (hospitals and old people's homes) and the educational Sector.

The June 2009 study referred to above did not identify any economic potential for high-efficiency co-generation, except if certain conditions were met and high subsidies in the form of feed-in tariffs paid for the electricity generated.

The conclusions of the analysis indicated that high-efficiency co-generation would be viable with the then (high) conventional electricity prices, plus a more favourable excise duty regime for CHP fuel and a high bonus price for CHP-generated electricity over the market price. Even so, CHP was not viable in Industry.

[44] http://mra.org.mt/wp-content/uploads/2012/08/8.1.Analysis-of-Cogeneration-Potential.pdf

CHP was not considered feasible in industry because cheap Thin Fuel Oil (a blend of heavy fuel oil and gas oil) was available to industry for heating purposes. If CHP engines could run on Thin Fuel Oil, then CHP would have been deemed feasible. However, this was not the case and CHP engines were deemed to be economically unfeasible for industry. In any case, thin fuel oil is no longer in the market. When Gas Oil was considered as the CHP fuel, the only option showing economic feasibility in industry was where there was a high heat to power ratio, and only if a very high bonus price on the already high price of electricity from the public network were paid. The analysis concluded that in certain applications e.g. hotels and hospitals, co-generation could prove feasible under certain scenarios considered in the analysis.

In recent discussions with various major industry and commercial operators, it transpired that they are very much aware of the possible benefits of CHP but have not been able to justify it financially so far. As the local conventional electricity prices will be moving downwards by march 2015 (because of more modern generation infrastructure and the interconnector to the European grid) it is likely CHP will be even less attractive in the medium term.

Efficient district heating and cooling

As stated above, it is generally accepted that district heating and cooling is not cost- effective in Malta. Even so this will be re-examined in the holistic assessment referred to in paragraph 1 above.

Other efficient heating and cooling systems

- Centralised systems in large establishments.

In the absence of district heating and cooling, large establishments such as five star hotels, have adopted sophisticated smart systems to satisfy their heating and cooling needs. Several cases based on heat pumps are reported in the section on energy efficiency in industry to illustrate the significant efforts being made by industry and developers in favour of EE in this sector.

- Use of ground or sea water as a heat sink medium.

To improve on energy-efficiency of heat pumps for heating and cooling through higher system COPs, large establishments such as hotels, factories and large scale residential complexes have started to adopt the use of sea water through seawells, and in some cases groundwater, as a heat sink medium instead of roof top ambient air cooled condensers. The added cost to the system due to the heat sink arrangement would be offset by lower running costs.

Compared to air as the heat sink medium, the temperatures of ground or sea water are more constant over the year. In certain locations, where seawater is drawn from great depth, the sink temperature obtained is substantially lower. This will provide a more efficient heat sink and process. On the downside, the impact of groundwater heat sinks on the aquifer is critical and must be carefully monitored and regulated.

The freshwater aquifers in Malta are critical for the provision of drinking water. They are fragile and need to be protected. Open loop groundwater cooling systems are not allowed, reflecting the scarsity of groundwater resources. Aquifers in Malta are also small and fractured. Heat recirculation with temperature pollution would occur unless the system is expertly designed and carefully monitored to detect early any adverse impact. Groundwater moves at an extremely low velocity and the heat discharged to the aquifer remains around the discharge point increasing the local temperature significantly and hence reducing the efficiency of the system. From a purely water management perspective, discharges of hot water deep in the aquifer create local convection currents (hot water rises upwards) moving saline water to the top (freshwater) parts of the aquifers therefore severely affecting the quality of the aquifer system. Though less harmful, when sea water cooling is used, reject water from the condenser will be rejected at a higher temperature than the ambient sea temperature, with some impact on marine eco-systems in the immediate vicinity.
Plans are being made to accelerate the use of heat pumps for space and water heating in the hospitality industry and in the domestic sector in preference to other sources of energy (especially over conventional fossil fuel or electricity fed heaters). While the implementation of these plans would provide savings from the energy perspective, aquifer protection issues must be considered so as not to cause collateral damage to the aquifer. There will be adequate and appropriate regulatory monitoring when this facility of groundwater cooling is tapped.

9.4 Developing the economic potential of high-efficiency cogeneration and efficient heating and cooling

In consultations between the Energy unit at the Ministry for Energy and various market operators, it is clear that the latter are closely watching the potential economic benefit of high-efficiency heating and cooling technologies for possible implementation.

The Government will intensify this dialogue with industry and commercial operators on the subject, exploiting the opportunity offered by the Comprehensive Assessment. A more informed and comprehensive position will be taken, possibly including the development of policy and measures to

facilitate the uptake of these technologies within the constraints of State Aid Regulations, once the conclusions of the assessment are available.

9.5 Heating and cooling from RES sources and waste heat.

i. Solar water heating in households, commercial establishments and small industry.

Heating by solar energy has been found to be very useful to assist households and certain commercial establishments reduce their consumption of electricity or LPG while satisfying their need for hot water.

Solar panels raise the incoming temperature of water to be heated such that the energy required to reach the final set temperature is reduced, and in some cases eliminated.
The penetration of solar water heaters in households as at the end of 2012 is estimated at 15,836 installations with a calculated solar heat capture of 31.8 GWh.

Government has promoted this penetration of SWH by offering several incentive schemes for the purchase and use of solar water heaters, as in the table below, and intends to continue doing so.

Year of launch	Rebate/ Maximum	Uptake	Remarks
2005	20% /116.48 euro	Low	
2006 (to Feb 2009)	40%/232.94 euro	1700/year	
2009	66%/460 euro	3500/year	
2010	40% / 560 euro		Restricted eligibility
2011	40% / 400 euro	Still open.	85% ERDF funds
2011	40% / 400 euro	Still open.	100% national funds
By end of 2012	Total penetration	= 15836 units	

Table 32 Incentive schemes for the purchase and use of SWH.

ii. Energy from waste – Wastseserv (Malta) initiatives.

The activities of Wastseserv (Malta) Ltd. are described in detail in Section 7.4.2 (Energy Efficiency in Industry).
Wasteserv reports that in its waste management activities, it exploits all possible generation of heat to use in its internal processes and also for export. However it could do more but no commitment for (low grade) heat utilization can be obtained.

9.6 Further Measures

The Comprehensive Assessment should go a long way to establish holistically the way forward and possibly identify new ways of how heating and cooling needs can be more efficiently obtained.

10 Energy transformation, transmission, distribution and demand response

10.1 Introduction

The most significant progress that occurred during the effective period of the preceding action plan and the major initiatives that will come into effect during the period covered by this NEEAP are in the transformation of fuel into electricity and the purchase of electricity from mainland Europe via the interconnector to Sicily.

These initiatives will transform electricity generation in Malta from a process with an average efficiency of about 30% to one with around 45%, thereby resulting in very significant savings of fuel through a reduction in the transformation losses.

The Directive emphasises the impact of tariffs on energy transformation, transmission, distribution and demand response. Although some of these issues are of less relevance to Malta, they are tackled in the NEEAP.
As described elsewhere in this Action Plan, Malta has a derogation from Articles 9[45], 26[46] 32[47] and 33[48] of Directive 2009/72/EC. Generation of electricity is only licensed for the generator's own use (auto-production) or for sale to Enemalta Corporation. The latter is the only licensed supply company in Malta.

Thus there is only one set of retail supply tariffs - that of Enemalta Corporation - that cover various categories of consumers. There is no case for tariffs for third party access to the distribution network, no possibility of switching suppliers, and no balancing or ancillary services procurement. This is the background to the discussion on the impact of tariffs on energy efficiency.

10.2 Energy Efficiency in the Transformation of fuel into electricity

The changes in infrastructure:

- In December 2012, 8 X 17.1 MW diesel engine-driven generators plus 8MW steam turbine, generating electricity at 47.5% efficiency (referred to as the BWSC plant or Delimara 3 (3rd extension) were commissioned. These replaced the old Marsa Power Station conventional

[45] Unbundling of Transmission Systems and TSOs.
[46] Unbundling of TSO
[47] Third part access
[48] Market Opening

steam plant (at 27.5%.transformation efficiency) and enabled Enemalta to cope better with the cyclic nature of the demand.

- A 215 MW interconnector to Europe via Sicily is being constructed and is expected to come into service in 2015. It is intended that once this interconnector enters service, electricity generated in Sicily from large CCGT turbo-generators having an efficiency of around 50% is sourced as necessary.

- Enemalta has awarded a tender to a private consortium to build and operate a 215 MW CCGT at Delimara Power Station and sell electricity to it. This CCGT will act as base load and will generate electricity also at an efficiency of around 50% efficiency. It will come on line in 2016.

These new facilities will enable Enemalta to shut down the old Marsa Power Station (average efficiency 27%) and Delimara 1 (conventional steam plant, average efficiency of 31%) and make minimal use of Delimara 2 (efficiency 38%).

Year	*Milestone*
2013	8 x 17.1 MW diesel engines + 8MW steam turbine (BWSC Delimara 3) commissioned.
2014	
2015	Interconnector to Europe commissioned. Marsa P.S. shut down.
2016	215MW CCGT (Delimara 4) commissioned.

Calculating the savings in the transformation process

This has been done through a mathematical model of electricity demand and supply.

The model considers:-

- The demand by consumers up till 2020 based on GDP

- The savings by consumers

- The electricity provided by RES

- The technical and non-technical losses in the distribution system to supply consumers.

- The 'units used in station' and to energise the interconnector.

The source of information for the various parameters used in the model is as below.

- Demand by consumer.

  Demand projections for households and the non-household sectors are based on a model which considers the following issues:- Official data published by the National Statistics Office for the variables covered by the model are used for the 2009-2011 period.

  - Data or 2012 is based on the ARMS billing system, and from which a ratio of demand by industry out of total demand of 46% is established, and retained for 2013

  - Data for 2013 is based on extrapolations of past growth figures

  - Data for 2014 to 2020 is established on the bases of two separate studies for the household and industry sectors taking into account:
    (i) demand changes due to volume/economic activity effects;
    (ii) demand changes arising out of the expected changes in electricity rates in 2014 (households) and 2015 (industry).

In particular, the following behavioural relationships are established in the models, and underpin the forecasts:

- a quasi-unitary elasticity of household consumption to household disposable income

- an elasticity to GDP of 0.8 with respect to industry consumption, reflecting historic longer term trends in the decoupling of energy demand growth and economic growth

- no further energy efficiency considerations are included in the baseline
- a price elasticity in the residential sector ranging from -0.07 in the short run to -0.44 in the longer term (3 years)

- a price elasticity in the industry sector ranging from -0.221 in the short run to - 0.49 in the longer term (3 years).

- Electricity savings by consumers - consistent with numbers worked out for the Action Plan
- Technical and non-technical losses. – information provided by Enemalta Corporation.
- Categories of RES and production from each. – information provided by Ministry for Energy
- Losses in interconnector at various loads. - provided by Enemalta Corporation.
- Annual production of electricity from various sources. – Enemalta modelss
- Average units used in stations for production of electricity. - provided by Enemalta Corporation.
- Transformation efficiency of plant and of energy sourced from Sicily. - provided by Enemalta Corporation.

10.3 Energy Efficiency Criteria in Network Tariffs and Regulations

Energy efficiency in the retail tariffs

Enemalta's tariffs are regulated by the Malta Resources Authority[49]. The approved tariffs in fact emphasize energy efficiency.

Enemalta Corporation submitted to the Authority a set of 'principles' that will apply to tariff proposals that Enemalta submits for the Authority's approval. Prior to agreeing, the Authority submitted the 'principles' to public consultation.

The following is an extract from the 'principles' that relate to energy efficiency:

[49] www.mra.org.mt

8. *The tariffs will ensure that as far as possible there is no discrimination internally within each user group provided that:*

a. in the Residential Tariff, positive discrimination measures may be taken in order to:
i. encourage and incentivise the use of energy saving devices;
ii. give preference to efficient energy users;
iii. penalise users who are considered as excessive users of energy;
iv. incentivise the pre-payment and/or immediate settlement of energy bills and disincentives late payments or arrears;

b. in the Non-Residential Tariff there will be no distinction between the various sectors of commercial activity and the sole criterion used shall be the amount of energy used provided that:
i. all the positive discrimination measures applicable to the Residential Tariff shall also apply to the Non-Residential Tariff;
ii. large account holders may be given quantitative discounts;
iii. night and day differential rate schemes may be introduced;
iv. incentives may be introduced for pre-payment agreements.

The tariff package (all consumers) in force from time to time may be accessed at www. mra.org.mt. The example for residential billing illustrates the general characteristics favouring energy efficiency. The tariff is based on a 'rising block' system whereby rates get higher as consumption increase. An 'eco-mechanism' rewards prudent energy use, awarding reductions on a per-person basis when consumption is less than the stipulated minimum.

An assessment of the benefits of the 'rising block' tariff in terms of electricity savings in households using elasticity analysis has been carried out, and it is estimated that the reduction in energy consumption in the Residential sector is 0.85% of which 0.36% is due to the eco-reduction mechanism.

Potential of Smart Grids

Enemalta has as yet no fixed roadmap for the meaningful adoption of Smart Grids. Developments are likely to include the exploitation of the smart meters through remote displays, differentiated tariffs, pre-payment systems etc to encourage energy saving and shifting of load (DSM), and the continued automation of the MV network with the 11kV substations integrated into the HV SCADA system (initially critical nodes, but eventually the majority of substations).

As reported elsewhere in this Action Plan, Enemalta is being restructured and all plans may be reviewed.

Shifting customers' electricity demand to off-peak

Enemalta Corporation never considered that the potential benefits of providing the infrastructure required to implement dual-tariffs for households was justified. This may be reviewed now once the roll-out of Smart Meters is completed and their operation stabilised.

This dual-tariffs facility was offered to industry. It was found, however, that this did not entice new industry to move activities to off-peak hours but in practice benefitted only those industrial consumers who were performing off-peak work in any case.

This is explained by noting that there are few enterprises in the industrial sector in Malta that require uninterrupted working hours over the night due to process requirements. The savings from the 'off-peak' element in the tariff did not justify the change in working timetable to these enterprises.

There are currently only 18 accounts in industry which benefit from day/night tariffs.

In order to qualify for Day/Night rates, the installation must have a consumption of not less than 5500MVAh per annum. These 18 accounts all have kVAh rates which were introduced to ensure that the power factor is corrected at the load end rather than at the supply end. This decreases the losses in the transmission system.

Storing Energy

Water production is an important specific issue for Malta. Fifty five percent of potable water delivered through the public network is made by the desalination of seawater using the Reverse Osmosis process. This is a relatively energy-intensive process. Storing water is therefore equivalent to storing energy. If the desalination plants were to be operated at periods of low electricity demand such that all water is produced during this period instead of uniformly throughout the day, then this would conceptually be electricity demand management. This possibility was investigated by the Water Services Corporation who concluded that the collateral effects of operating this way, coupled with the infrastructure required to blend this product with ground water rendered the exercise cost-inefficient.

The impact of RES

Solar RES is likely to be the most significant for Malta. The impact of this type of RES is favourable to peak-chopping of the daily electricity load, especially in Summer when the demand for climate control (cooling) is high and production from PV is also very high.

Distributed Generation

Given the derogations of Malta in Directive 2009/72/EC, there is no electricity delivered to the grid from distributed conventional generation except for some very small CHP installations.

Passing on savings to the consumer

The tariff approval process adopted in Malta generally requires Enemalta Corp. to submit its proposals to the Regulator, who after dialogue with the Corporation, examines the reasonableness of the Corporation's proposals and approves them if necessary, with amendments.

The financial model used to establish the target revenue has so far been a cost-plus model, comprising the summation of projected fuel costs, wages and overheads plus a return on capital employed less the costs of any inefficiency and any PSO's. Given the volatility of fuel prices over the last years, but not necessarily applicable only to this cost, the impact of any variances between actual and projected costs that are beyond the control of the Corporation will be compensated for in following revisions.

The following is an extract from the MRA Act referring to approval of tariffs:

Art 4(1) (h) 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;

Art 4(4) The Authority may require any authorised provider to provide it with any information, including financial information that the Authority considers necessary for the purpose of ensuring compliance with the provisions of this Act, regulations prescribed thereunder and decisions or directives made in accordance with this Act, regulations prescribed thereunder or any other law which the Authority is entitled to enforce. Any person who fails or refuses to provide such information shall

be in contravention of this Act and shall be liable to the imposition of an administrative fine as may be prescribed by the Authority.

Art 28(2) Without prejudice to the generality of the aforesaid power such regulations may, in particular provide –

(c) for the regulation of price structures for resources and where appropriate for the regulation and determination of tariffs, price mark-ups and charges for the supply, storage and distribution of resources and for the use of any systems used in the distribution and transmission of resources;

Energy efficiency in Network Design and operation

Enemalta Corporation has a Distribution system LV Network Plan that has identified the following programs/projects and operational practices to improve network efficiencies. The intention is also to increase the reliability of the grid so that together with the smart meters, it will evolve to a smart grid. Ongoing programs/projects include:

- A transformer derating programme to reduce copper and iron losses where it is found a lower rated transformer suffices.
  About fifteen transformers are derated per year.

- A load balancing program.
  Every year each Enemalta 'distribution' district takes the top 12 feeders on this list and carries out the required balancing on each section of the feeder by extending overhead lines so that single phase sections are reinforced to three phase and balancing the clients connected amongst the three phases.

- Increase in the number of Low Tension feeders.
  Yearly peak load readings on LT feeders identify overloaded feeders while voltage readings at the end of the feeder together with GIS data help in selecting excessively long feeders. In order to reduce these losses Enemalta increases the number of new feeders for general consumers both from new and existing substations.

- A low voltage feeder load balancing programme.
  At least 100 low voltage feeders per year are checked and balanced for optimum efficiency. This process is being automated.

- Replacement of corrosion prone aluminium lines by copper leads to avoid resistivity losses

Operational practices that are being adopted include:

- Measurement by bulk meters of out-going energy at every low-voltage substation will be compared to the total energy effectively billed through all the (smart) meters fed by that particular station at different intervals. This would uncover anomalies which would be addressed effectively as they arise.

- 'No Objection' for connection of distributed energy sources greater than 16A per phase to the grid has to be backed by sufficient network studies to make sure that the operating parameters according to the Network Code are respected.

10.4 Savings in the generation and supply of electricity

- The Government considers that the investments to increase the efficiency of electricity generation and the purchase of electricity from the Continent that is generated at high efficiency is the greatest contribution that could be made by the country to reduce its avoidable primary energy consumption.

- As to the other major matters considered by the Directive and which are relevant to Malta, the following comments can be made.
  - The retail tariffs are progressive, reward prudent use and are based on actual eligible costs from time to time, and regulated and approved by the Malta Resources Authority.
  - Demand management has so far been applied where cost-effective. The roll-out of smart meters has addressed a major parameter impacting cost-effectiveness and so provides an opportunity to review decisions on this matter.

11. Financing of Energy Efficiency Measures:

11.1 Introduction

As indicated in the introduction, the timing of the drafting of this Action Plan coincides with the negotiation for allocation of ERDF and Cohesion funding (2014 – 2020). Nevertheless, enough funding is secured to show that many initiatives will be implemented and the firm intention of stakeholders to achieve the energy efficiency targets.

11.2 Previous Support Initiatives

Throughout the past years a series of financial support initiatives have been taken by Government and local private banks to support energy efficiency measures.

- Government support schemes

Government, directly and through its agencies, has these past years made use of national funds and European Regional Development Funds (ERDF) to promote a wider use of renewable technologies, most notably photovoltaic panels and solar thermal units, and energy efficient technologies, such as double glazing apertures and roof insulation.

For the schemes promoting photovoltaic panels in residences, ERDF funds were allocated. The first call was published in 2010 and 2011. By the end of 2011, MRA had reimbursed 4,680 households for photovoltaic installations and 569 households for solar water heating installations. The second scheme run by the MRA commenced in 2013. A total of 8,837 households have been awarded a grant.
Energy efficiency support schemes *e.g.* the introduction of double glazing and roof insulation were supported by national funds. The schemes have been running since 2009, and 433 households have made use of such fund.

- Domestic bank products on the market

A number of local banking operators[50] in Malta offered loan facilities and banking products at favourable rates to facilitate the purchase and installation of energy efficiency products.

- *ECO Personal Loan* of Bank of Valletta finances the purchase of environmentally-friendly equipment such as solar water heaters, solar lamps, solar collectors, photovoltaic systems and products/systems/services which save on electricity consumption including Class 'A' white goods, double glazing, energy audits, residential energy management systems and thermal insulation products.

- *APlus* is a product of APS Bank that combines home loan with current, overdraft, deposit accounts and debit cards - all in one single account. These features effectively lower the amount of borrowing on which daily debit interest is charged.

- *Green Loans:* a product of APS Bank supports domestic home owners and businesses in financing their investment in solar water heaters, PV panels.

- *The Banif Green Energy Loan* of Banif Bank is a financial solution aimed at clients who wish to buy environment friendly products such as solar water heaters, roof thermal insulation, double or triple glazing, external shading, photovoltaic systems, and energy efficient appliances.

- *Green loan* of HSBC Bank finances a range of environmentally friendly initiatives and energy saving products: solar water heaters, photovoltaic installations, double glazing, solar film/room darkening, PIR (Passive Infra Red) sensors, solar lights – photo sensors, thermal insulation, external shading, and energy efficient appliances with a minimum rating of A++.

11.3 Funding of Specific Measures identified in the Action Plan

In the various sections addressed in the Action Plan, several specific measures were identified for implementation. The following describes the funding so far secured, or planned, for these measures.

[50] BOV: https://www.bov.com
APS Bank: http://www.apsbank.com.mt/
Banif Bank: http://www.banif.com.mt
HSBC Bankhttps://www.hsbc.com.mt/

Obligation Scheme and Alternative Policy Measures

i. Energy Efficiency Obligation on Enemalta

The only obligation that has been imposed on the Corporation covers the smart meter roll – out and operations, plus the design of the tariff which must include a mechanism that promotes energy efficiency.

Being a commercial venture, the financing of the investment in smart meters will be done by Enemalta from its own funds.

ii. 'Equivalent measures'

The financing of the equivalent measures is discussed under the various 'vertical' issues.

Energy Audit and Management Systems

Energy audits of SME's will be partly financed through Malta Enterprise Schemes funded from national funds similar to past practice.

Metering and Billing

The financing of the relevant measures and initiatives will be covered by Enemalta through its funds.

Consumer Info Programmes and Training

The financing of these programmes will be done through a mix of ERDF and national funds dedicated periodically for training and information programmes.

Qualification, accreditation and certification schemes

Training courses and accreditation schemes are financed by fees payable for the courses and license/registration fees. Some courses or parts of them may fall under the general education fees policy in Malta.

Energy Services

The promotion of energy performance contracting will be financed through the national budget .

Financing of Energy Efficiency Measures in Public Bodies

Measures for increasing energy end-use efficiency in public bodies are reported under Article 7 – equivalent measures and in section 3.3 'Energy Efficiency Measures in Public Bodies'
The implementation of these measures are generally being co-financed by Government and ERDF funds to various degrees.

Specific Projects
ERDF co- funding was awarded to the Ministry of Energy for the project 'Renovating Public Buildings' to increase EE and reduce GHG's (Phase 1). ERDF funding was also confirmed for the following projects:

- University of Malta :
  LED lighting for a reduced carbon footprint, (and for a high efficiency, high density PV systems)

- National Sports Council
  Generation of electricity at the National Swimming Pool and heating of the pool by RES.

- Ministry of Health
  Resources retrofitting at St Vincent de Paule Hospital

- Occupational Health and Safety Authority
  Installation of RES and various EE systems

- Malta Financial Services Authority
  Installation of PV panels and EE chiller solution

Financing of energy efficiency measures in buildings

Main target groups are households, residential buildings and small and medium enterprises.

Plans are being established to set up various financing schemes (which will include financing from EU Structural and Cohesion Funds and schemes from domestic banks leveraging market finance through public funds) for energy efficiency developments in buildings which could include:

- Schemes for photovoltaic installations (Domestic and Industrial). This project will help supporting the shift of the Maltese economy towards a low-carbon economy supported RES production.
- Design and introduce a scheme that will incentivise the use of passive cooling and heating in buildings as an alternative to energy based space conditioning.

- Introduce an interest-free loan for low income households and a low interest loan for higher income households and businesses to invest in RES and/or carrying out energy saving measures in their property.

- To implement recommendations of energy audits in the residential sector carried out with the help of the Government.

Other measures that will be analysed are the financial instruments mentioned in the document Energy Efficiency – the first fuel for the EU Economy[1] published by the Energy Efficiency Financial Institutions Group established by Directorate General for Energy and United Nations Environment Programme Finance Initiative..

Financing energy efficiency measures in Government owned Industry

- Water Services Corporation
  The measures for increasing the energy efficiency of WSC operations are being co-financed by the Corporation and ERDF funding.

Financing Energy Efficiency measures in Transport

The specific measures for transport are described in the text above and some are included in the 'equivalent measures' in Annex 2, Tables A, B and C.

Financing of the main measures will generally be as follows:

- Reform of Public Transport – essentially a commercial transaction between Transport Malta and the operator who is awarded the Concession. Government will subsidise consumers as judged necessary to entice them to the public service.

[1] ec.europa.eu/energy/.../2014_fig_how_drive_finance_for_economy.pdf

- Inter-Harbour services – as above

- Efficiency of private transport through vehicles scrappage schemes, eco-driving promotion will be financed from national budgets and ERDF and Life projects.

- Major road-works e.g junctions shall be financed under ERDF similar to past practice.

- Street lighting projects – awarded co- financing under ERDF

- Development of a national transport model supporting strategy development. The project has received EU co- financing under OPI (2007 – 2013) Priority Annex 7.

- New Grant Scheme on the Purchase of Electric Vehicles[51]- financed through national funds.

Financing Energy Efficiency measures in Heating and Cooling

The 'Comprehensive Assessment' will be financed by national funds.
Various projects by public bodies and others covering some CHP projects and other efficient means of heating and cooling are described under articles 7 and Section 3.6.

Financing Energy Efficiency measures in Energy Transformation and distribution

The initiatives by Enemalta are purely commercial and so will be financed by the Corporation and reflected in its tariffs.

11.4 Latest ERDF awards

The recent decisions on the allocation of ERDF funding have recently been published.

[51] http://www.transport.gov.mt/ The Government has allocated € 300,000 over the next 24 months for this scheme.

Call	Project Reference	Project Title	Applicant Organisation	Total Budget	Public Eligible
18	ERDF334	Carbon Footprint Reduction Project	Water Services Corporation	€ 17,769,314	€ 11,273,690
18	ERDF335	Solar Research Lab	University of Malta	€ 3,979,493	€ 3,979,493
18	ERDF336	High Efficiency High Density Photovoltaic Systems	University of Malta	€ 978,445	€ 293,534
18	ERDF337	LED Lighting for Reduced Carbon Footprint	University of Malta	€ 982,445	€ 491,223
18	ERDF339	Tal-Qroqq National Pool Complex - Energy Efficient Project	Kunsill Malti ghall Isport	€ 976,180	€ 488,090
18	ERDF341	Study for Deep Energy and Resource Retrofitting of St. Vincent De Paule Hosiptal Residence	Ministry for Energy and Health	€ 436,600	€ 370,000
18	ERDF342	Renovating Public Buildings to Increase Energy Efficiency and Reduce GHG (Phase I)	Ministry for Energy and Health	€ 6,886,736	€ 3,449,355
18	ERDF343	Retrofitting Road and Street Lighting by Smart Lighting	Ministry for Energy and Health	€ 7,069,012	€ 5,990,688
18	ERDF344	Renewable Energy Facilities in Public Buildings in Gozo	Ministry for Gozo	€ 1,080,086	€ 274,599

Table 33

18	ERDF346	Assessment of Sub -Surface Ground Water Discharge in the Maltese Islands	Ministry for Energy and Health	€ 270,220	€ 229,000
18	ERDF348	Studies for the Development of a Waste-to- Energy Facility	WasteServ	€ 885,000	€ 225,000
18	ERDF349	An Energy Road Map- towards achieving decarbonisation for the Maltese Islands	Ministry for Energy and Health	€ 716,260	€ 607,000
18	ERDF350	Installation of Renewable Energy and Energy Efficient Systems at OHSA	Occupational Health and Safety Authority	€ 90,140	€ 45,070
18	ERDF354	Installation of Photovoltaic Panels and Energy Efficient Chiller Solution	Malta Financial Services Authority	€ 238,912	€ 119,456

Table 34 *Table 33 - continued*

11.5 Other General funding Sources and Instruments

Besides the funding for specific projects identified above, there are other general funding services and instruments that will be tapped for additional funding or other projects.

Financing horizontal measures

I. Horizon 2020 - Work programme 2014-2015

Involving stakeholder partnerships (agencies, organisations) within EU member states.

With Horizon 2020 support, bankable investment projects that can attract outside financers local banks or other financial institutions, such as the EIB or other funds like European Energy Efficiency Fund (EEEF) can be developed.

II. LIFE 2014-2020 (the Financial Instrument for the Environment)

Programme for the Environment and Climate Action for the period is set up for pilot, demonstration, capacity-building, information, awareness-raising and dissemination projects.

Financing of energy efficiency measures in public bodies

Target areas are central government buildings, buildings of other public bodies,

I. Financing from EU Structural and Cohesion Funds

II. European Energy Efficiency Fund (EEEF)

The EEEF can assist in setting up pilot project – energy efficiency development/refurbishment in central government owned buildings in the preparation of projects, for development/investment and investment in proven technologies that achieve at least 20% primary energy savings for energy efficiency projects.

Due to the fact that Fund can co-invest as part of a consortium and participate through risk sharing with a local bank, it is a part of the planned cooperation with domestic banks.

III. *Energy Performance Contracting will be investigated to determine the best business model for tapping the energy saving potentials in the buildings sector, as indicated in Section 3.1.6*

IV. *Horizon 2020 - Work programme 2014-2015 may be tapped for energy management system, energy audits in public bodies.*

Financing of energy efficiency measures in industry

i. Financing from the EU Structural and Cohesion Funds

ii. *Malta Enterprise Corporation – Microinvest*[52]- offeringTax credit incentive for micro enterprises and self employed. It can finance investment in acquiring machinery, technology, apparatus or instruments which enhance the operations of the enterprises, including systems which save energy or produce alternative energy.

Financing of energy efficiency measures in transport

i. *The EU Structural and Cohesion Funds*

ii. *Domestic banks products on the market*[53], as in (2) above.

iii. *European Energy Efficiency Fund (EEEF)*

Financing of energy supply measures

I. The EU Structural and Cohesion Funds

The Government plans to introduce a scheme to incentivise the private sector to invest in fuel (or equivalent) distribution networks (such as autogas, bio-fuel pumps, electric vehicles charging infrastructure etc) to encourage the use of cleaner/green fuel as a substitute to conventional fuel.

[52] http://www.maltaenterprise.com/en
[53] BOV: https://www.bov.com
APS Bank: http://www.apsbank.com.mt/
Banif Bank: http://www.banif.com.mt
HSBC Bankhttps://www.hsbc.com.mt/

ANNEX 1

The wider policy framework for the NEEAP

Existing national strategies and action plans in climate and energy policy

a) National Strategic Reference Framework: 2007-2013

As cited in the National Strategic Reference Framework 2007-2013 (NSRF, p.29) "Malta's environment is essential for the quality of life and health of its citizens, as well as being part of the country's national identity and competitiveness for important economic sectors such as tourism. Current figures highlight that approximately, public expenditure on the environment amounts to around 1.4 per cent (State of the Environment Report, 2005). Indeed, energy has a significant impact on the quality of life and is a determinant factor in economic competitiveness.

It is also essential as a resource for industry – the cost of energy will have an impact on the competitiveness of the country and on economic growth and job creation. The NSRF has clearly identified that electricity demands has increased from 1603 GWh in 1995 to 2263 GWh in 2005 which is equivalent to an average increase of 3.3 per cent per annum over the last ten years. Currently, the active power maximum has surpassed the winter maximum demand in terms of magnitude. Malta's electricity generation is exclusively reliant on non-renewable energy sources (liquid fossil fuels) and this has been adversely affected by developments in international pricing of petroleum products (NSRF, Energy p.32).

The NSRF underlines that Malta's electricity generation is exclusively reliant on non-renewable energy sources (liquid fossil fuels) and this has been adversely affected by developments in international pricing of petroleum products. The NSRF establishes that the Strategic Objective of improving Malta's attractiveness and the quality of life is underpinned by efforts to promote, improve and expand energy efficiency and the diffusion of RES as well as transport infrastructure, investment related to sustainable environment, invest in accessibility, etc.[54]

The NSRF adds that with regard to the issue of energy efficiency, which is driven also by the need to reduce the use of fossil fuels to mitigate the impact of their rising prices on the national economy and of the resultant emissions on climate change, is increasingly assuming the role of top national priority. Energy efficiency measures aim to[55]:

[54] Pg 62, National Strategic Reference Framework, Malta, 2007-2013, December 2006
[55] Pg 83, Ibid

- Reduce energy consumption while maintaining or increasing the level of output and delivered outcomes and they are likely to be rewarding in reaching the national objective of reducing fossil fuel consumption.

- Address the environmental impact of electricity generation alongside other measures to reduce air pollution to come in line with EU directives.

- Invest in the upgrading of the generation plants and distribution network and implementing demand management measures.

- Attain efficiency in end-use through subsidies and support schemes by Government.

- Position Government to continue to lead by example through the adoption of energy efficient practices in the public sector.

- Adopting legislative and administrative measures to achieve energy efficient and environmentally friendly buildings and services.

The NSRF identifies as examples of energy efficiency improvements the retro-fitting of measures and the financing of beyond compliance measures for, amongst other matters, lighting (e.g. digital control systems, use of motion detectors for lighting systems in commercial buildings) as well as other equipment (e.g. time control for optimised energy use, stand-by loss reduction, installation of capacitors to reduce reactive power, transformers with low losses). Additionally, the NSRF emphasises that Government will continue to lead by example through the adoption of energy efficiency practices in the public sector.[56]

(b) Operational Programme I: 2007-2013

The Operation Programme (OP) I for 2007-2013 underlines that the production of energy from fossil fuels is the most obvious source of environmental pressure because of the combustion processes involved. It adds that energy efficiency can have a significant impact on the demand for energy and so, it can reduce the country's fuel bill and the release of carbon into the environment.[57]

[56] Ibid
[57] Pg 46, Operation Programme I, Cohesion Policy 2007-2013, Investing in Competitiveness for a Better Quality of Life, Malta, May 2012

The OP I notes that energy efficiency measures and RES as alternatives to traditional measures were still in their infancy and needed to be further developed. It underlined the importance of investments in this regard to ensure sufficient capacity in the medium term.[58] The NSRF establishes Priority Axis 4, Climate Change and Resource Efficiency, which establishes as an objective EE measures "at all levels of governance including the public, the domestic and enterprise levels".[59]

The OPI emphasises that interventions under Priority Axis 4 are focused on the reduction of Malta's reliance on imported fuel through the active promotion and increase in use of renewable sources as well as the promotion of EE measures.[60] The NSRF identifies as examples of energy efficiency improvements the retro-fitting of measures and the financing of beyond compliance measures for, amongst other matters, lighting (e.g. digital control systems, use of motion detectors for lighting systems in commercial buildings) as well as other equipment (e.g. time control for optimised energy use, stand-by loss reduction, installation of capacitors to reduce reactive power, transformers with low losses). Additionally, the NSRF emphasises that Government will continue to lead by example through the adoption of energy efficiency practices in the public sector.[61]

(c) National Reform Programme under the Europe 2020 Strategy - 2013

The National Reform Programme (NRF) 2013 presents Country Specific Recommendation (CSR) 5 which states that:

> "In order to reduce Malta's dependence on imported oil, step up efforts to promote energy efficiency and increase the share of energy produced from renewable sources by carefully monitoring the existing incentivising mechanisms and by prioritising the further development of infrastructure, including by completing the electricity link with Sicily."[62]

With regard to energy efficiency measures the primary emphasis placed in the NRF 2013 documents relates to energy efficiency in buildings and transport. It recognises that the application of energy efficiency technologies outside of energy performance in buildings is not widely spread that efforts "are being contemplated".[63]

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[58] Pg 65, Ibid
[59] Pg 124, Ibid
[60] Pg 125, Ibid
[61] Ibid
[62] Pg 16, Malta's National Reform Programme under the Europe 2020 Strategy, Ministry of Finance, 2013
[63] Pg 85, Ibid

It is pertinent to note, however, that with specific regard to buildings the NRP states that building sector requires that improvements in resource and energy use during the whole life-cycle of a building. It emphasises that with respect to energy use there are important synergies that can be exploited between climate change, the energy sectors and the built environment.[64]

The NRP highlights that Malta has suggested targets for the revision of the minimum requirements of energy performance of buildings in the National Energy Efficiency Action Plan; which targets are directed towards affect new and refurbished buildings.[65]

The NRP underlines that in enhancing Malta's growth potent and the achievement of smart, sustainable and inclusive growth, the NRP includes measures aimed at consolidating Malta's progress towards its EU 2020 targets and in this respect Malta set ambitious targets for energy efficiency, renewable energy and GHG.[66]

Furthermore, the NRP states that the generation of energy from Renewable Energy Sources (RES) and Energy Efficiency is a key objective in the Government's energy policy given that it can contribute towards the economy as well as help in achieving social and environmental objectives.[67]

The awareness campaigns envisaged in the project are also in line with the NRP: "In its efforts to increase energy efficiency by consumer, Government will continue to take action in the form of informing the public."[68]

(d) The Energy Policy: 2012

In addressing the Malta's energy challenge the nation's energy policy is significantly influenced by a number of EU energy and environmental policies. The Policy document is based on five fundamental principles:

- Efficiency and Affordability.
- Security of Supply.
- Diversification.

[64] Pg 191, Ibid
[65] Pg 86, Ibid
[66] Pg, 195, Ibid
[67] Pg 196, Ibid
[68] Pg 43, ibid

- Flexibility.

- Sustainability.'[69]

This policy document identifies six key policy areas to attain the stated policy objectives. These are: energy efficiency, reduction in reliance on imported fuels, stability in energy supply, improvement in our carbon footprint, efficient and effective delivery of energy and finally policy support to the energy sector:[70]

The Energy Policy sets the following policy statement with regard to energy efficiency:

"Government will encourage and facilitate the achievement of increased energy efficiency in electricity generation and distribution, and in energy end use, and will lead by example."[71]

The Energy Policy underlines that emphasis on energy efficiency in the production, distribution and end-use of energy is an obvious first step. The cheapest, and cheapest, energy is that which is not consumed, and no type of energy can have the most beneficial impact on the environment than that which is not produced.

Euro-barometer surveys carried out since 2004, furthermore indicate that the Maltese population is, in general, careful about the use of energy resources. The latest survey, published in April 2011, shows that 87% of the Maltese respondents indicated they have cut down on electricity use for lighting and domestic appliances while 68% said they have reduced the use of heating and/or air-conditioning. On the other hand, only 4% of respondents said they took initiatives to save energy at work.[72]

The energy intensity of the economy of Malta, measured as the gross inland consumption of energy divided by Gross Domestic Product (GPD) (kg of oil equivalent per €1,000) for 2010 was higher than the EU MS 27 average. This demonstrates the importance for the undertaking of concerted efforts to address this problem.[73]

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[69] The National Energy Policy for the Maltese Islands, page 5.
[70] Pp40 - 42, Energy Policy for Malta, MRA, 2009
[71] Pg 40, Ibid
[72] Pg 116, Ibid
[73] Pg 118, Ibid

This policy also highlights the importance of awareness campaigns which are also being envisaged in the project being proposed:

'Awareness campaigns with regard to energy efficiency and conservation must be continuous, stepped up, and specifically focused to deliver key priority messages. The effectiveness of such efforts also needs to be continuously monitored.'[74]

Furthermore, this document also mentions the plans of government so that energy efficiency is promoted and implemented across the board in the several government entities:

'In the public sector, Government has appointed green leaders entrusted, among other things, to encourage and champion energy efficiency. More effort is required to reap the energy saving potential of the public sector. Government has also introduced a green travel plan in order to ensure a reduction in the use of public sector cars and integrate travel to and from meetings. This measure started out as a pilot project at OPM and this year has been expanded to other Ministries.'[75]

The Energy Policy also gives importance to the Covenant of Mayors signed by numerous local councils in Malta and Gozo. In fact the below are some of the measures identified in the field of energy efficiency which highlight the need for the project being proposed:

Measured identified in the field of Energy Efficiency in this policy:

- 'Keep under review the cost-benefit assessment of the various options relevant to the NEEAP and the set targets.'[76]

- 'Work with and support Local Council efficiency measures directed to assist them to meet the Covenant of Mayors targets on clean energy.'[77]

- 'Ensure that Malta's standards maximise the potential to achieve energy efficiency and that they make the maximum practical contribution to achieving CO2 emission targets.'[78]

(e) 2nd National Energy Efficiency Action Plan: 2011

[74] Ibid, page 116.
[75] Ibid, page 123.
[76] Ibid. page 129.
[77] Ibid. page 131.
[78] Ibid. page 134.

In 2008, Government published a detailed National Energy Efficiency Action Plan (NEEAP) designed to achieve 9% savings in energy end use by 2016.[79] This first 1st National Efficiency Action Plan (2008) established the following indicative targets for Malta:

- Target adopted for 2010 (GWh): 3% or 126 GWh per year.

- Target adopted for 2016 (GWh): 9% or 378 GWh per year.

The energy efficiency targets are measured in relation to the Average annual energy consumption (October 2001 to September 2006): 4195 GWh. This was established in line with the methodology established in Annex 1 of Directive 2006/32/EC.

The interim target for energy end use efficiency was 3% by 2010 was achieved in 2010 and possibly marginally exceeded. Mainly, results have been achieved from the industrial sector (including early actions in the water sector[80]), 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 national car fleet composition brought about by changes in the vehicle registration system).

This National Energy Efficiency Action Plan (2008) was reviewed and subsequently the second NEEAP was published in 2011. The second NEEAP includes a list of measures to be implemented at the energy generation and distribution side.

The revised NEEAP sets a target of 22% savings in primary energy consumption by 2020 with an intermediate target of 15% in 2014. This target is based on primary energy consumption for Malta. It is based on national productive models of energy consumption and assumes primarily that the energy end use savings envisaged in the NEEAP will be achieved once the 200 MW new gas powered electricity generation plant is commissioned and the newly commissioned 144MWgeneration plant (which is to be converted from fossil oil to gas generation respectively in the Delimara Power Station (DPS), as well as a new interconnector with Sicily. The expected energy savings targets expected from the 200 MW new gas powered electricity generation plant and gas powered 144MW at the DPS are not included in the NEEAP.

Since the publication of the NEEAP, efforts to promote energy efficiency have mainly targeted the

[79] Directive 2006/32/EC[79] on energy end use efficiency and energy services sets an indicative target of 9% savings in energy end used by 2016

[80] WSC incorporating the latest energy-recovery technology in its Reverse Osmosis Desalination Plants.

residential, commercial (mainly tourism) and industrial sectors. The 2nd NEEAP presents a number of measures such as the following:

- Schemes for roof insulation in domestic households.

- Schemes for double gazing in domestic households.

- Re-orientation of public procurement towards more environment friendly and energy efficient supplies, works and services which would have a major impact on both the Government environmental and energy footprint, and the footprint of private industries participating in public procurement process as contractors.

- Energy Certification and Display of Certificates which will ensure that all buildings occupied by public authorities and buildings frequently visited by the public are subject to energy certification and energy audits on a regular basis. The results of these certificates and audits would be displayed in a prominent place of these buildings.

- Upgrade Minimum Performance Requirements of New Buildings constructed for use by the Public Sector ensure that the minimum Requirements set for new buildings are reached by all buildings that are constructed for use by public sector entities.

- Impose Minimum Energy Performance Requirements on all new lease or purchase agreements of buildings that entities in the public sector enter into as from 2015.- Studies have to be carried out before prescribing details of this measure.

- Implement a programme of energy efficiency upgrading of buildings belonging to Entities/Authorities in the Public Sector. This action contemplated the setting up of a special unit were employed public service staff would be identified and trained to introduce energy efficient refurbishment measures in buildings owned and used by the respective entities where they are already deployed in service.

- Residential Buildings (dwellings) - as from 2013 efforts are directed to upgrade existing requirements by 30%. As from 2017 further upgrade minimum requirements would be increased by another 20%.

- Schools (Primary and Secondary level Education) – as from 2013 upgrade existing requirements

by 30% and as from 2017 further upgrade minimum requirements by another 30%.

The Strategy underlined the importance of the public sector as a role model with regard to energy efficiency. The plan refers to the national green public procurement plan where-in 12 out of 18 product groups, for which Green Public Procurement (GPP) targets were set included product groups such as office IT equipment, construction, transport, combined heat and power, plants, electricity, street lighting and traffic signals, windows, glazed doors, thermal insulation, gardening, etc.[81]

(f) The National Strategy for Policy and Abatement Measures Relating to the Reduction of Greenhouse Gas Emissions: 2009

The National Strategy for Policy and Abatement Measures Relating to the Reduction of Greenhouse Gas Emissions (National Strategy for Climate Change Mitigation) presents a multi-pronged approach to the implementation of energy efficiency in Malta as a vehicle directed to enable Malta to meet its GHG reduction target of 20% CO_2e reduction on the 1990 base line.[82]

The Climate Change policy presented a number of recommendations with regard to the energy efficiency which embraced included improved demand management knowledge and education and the introduction of smart meters; energy advisory audits to industry, commerce and citizens, use of ICT; eco design standard; and eco management and audit schemes; and energy performance of buildings. More specifically, the Strategy recommended:

Action 5: The Climate Change Division together with the Building Industry Consultative Council and related professional bodies should embark upon a sustained and embracing information and education campaign directed at underlining the benefits and importance of implementing the Energy Efficiency Performance in Buildings regulations.[83]

Action 24: The Office of Fair Competition will periodically survey prices of technologies relating to energy efficiency in order to ensure that there will be no artificial obstacles that will inhibit the penetration of such technologies.[84]

Action 25: The Government will, with effect from 2011, request each Head of Government entities to draw up and implement an annual Carbon Footprint Reduction Plan that will target,

[81] Pg 36, 2nd National Energy Efficiency Action Plan, Malta, 2011
[82] Pg 119, Ibid

[84] Pg 11, Ibid

amongst others, reduction in general CO2 emissions, reduction in government road vehicles emissions, reduction by means of increased energy efficiency, reduction by means of application of RES technologies and reduction in water consumption.[85]

Action 50: The Government will extend further as appropriate the measure taken in the 2009 budget directed at introducing energy efficiency information on all domestic appliances.[86]

Action 51: The Malta Resources Authority will review the implementation of the Energy Efficiency Performance in Buildings framework to identify lessons learnt and to make the appropriate changes within the parameters of the final decision reached by the Commission on the Recast proposal.[87]

Action 52: The Malta Resources Authority will participate actively in the discussions underway within the EU Commission on the Recast proposal on the Energy Efficiency Performance in Buildings Directive with a view to influence the outcome of such discussions to the extent possible.[88]

Action 53: The Climate Change Division will hold discussions with the University of Malta to (a) determine how undergraduate course content can be strengthened in terms of energy efficiency building design; and (b) introduce post-graduate programmes specialising in the discipline within the Mediterranean generally, and Malta specifically.[89]

Action 54: The Climate Change Division together with appropriate entities will assess how best to implement a policy that would see all new development as well as re-construction works on buildings are constructed with the appropriate plumbing installation works that will allow for the seamless plugging-in of solar related alternative technology equipment.[90]

Action 55: Government will constitute a team of experts to draw up by 2011 a National Policy for Zero Energy Buildings.[91]

The proposed National Energy Policy establishes the importance of reducing the reliance on

[85] Ibid
[86] Pg 14, Ibid
[87] Ibid
[88] Pg 15, Ibid
[89] Ibid
[90] Ibid
[91] Ibid

imported fuels through the use of RES.

The Strategy presented a threefold approach towards the mix of applicable technologies that are to be introduced. It concluded that a single approach on its own would not suffice for Malta to be able to reach the 10% RES target due to Malta's terrain, size and geographical conditions.

The Strategy had determined that Solar based technology generally and PV specifically should be one of the main policy thrusts that Malta should embark upon to meet the 10% RES target. It recommended that the minimum target that Malta should set is that solar related technologies should penetrate to 4% of global energy consumption in Malta by 2020.[92]

(g) The National Climate Change Strategy for Adaptation: 2012

-The Strategy underlines that Sustainable water resources are vital to Malta's long-term prosperity where-in

> "Water is necessary for drinking and it supports everyday life at work, at home, and in the carrying out of leisure activities. Water is essential to agriculture and to the health of the natural environment that supports all human activities. Every sector of the economy depends on secure and sustainable access to water."[93]

The Strategy emphasises that despite the very limited resources of the islands and the importance of water to a healthy future, the prevailing attitude amongst the population in general, and target stakeholders specifically, has not resulted in a culture which perceives water as the valued and precious finite resource that it is. The Strategy adds that perception that access to RO filtered water means that Malta has no water problems is incorrect.

Furthermore, increased dependence on RO water in substitution of natural water, as this diminishes, will result in increased energy generation to power the RO plants. Apart from the cost of increased fossil fuel supply, or gas in the event Malta migrates to such energy source, required to generate the increased usage of RO plants, there will be a corresponding increase – even if gas is used in lieu of fossil fuel – of Greenhouse Gases.

Amongst the recommendations presented in the Strategy the following are of particular note:

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[92] Pg 120, Ibid.
[93] Pg 20, Climate Change Strategy for Adaptation, Ministry for Resources and Rural Affairs, 2012

Action 15 Malta cannot continue to rely exclusively on active cooling to counter the effects of poor building design. Designs should be improved, if necessary by force of law and economic dis/incentives, to maximise passive cooling supported by the education of households / industry on cost effective retro-fitted of energy and water technologies onto existing buildings.[94]

Action 28. The Government will introduce incentive schemes directed at commercial and industrial entities to assist them to build reservoirs and other rainwater catchment measures; to re-use captured water; and to recycle grey water for non-potable purposes as well as to introduce efficient water use technologies.[95]

Action 42. The Government shall carry out a thorough review of the status of existing storm water reservoirs, soak ways, and dams.[96]

(h) Malta's National Renewable Energy Action Plan: 2010

In July 2010, Malta submitted its National Renewable Energy Action Plan (NREAP) to the EC, as required by Directive 2009/28/EC on the promotion of renewable energy. This action plan provides a roadmap on how the country intends to reach the 10% of renewable energy share in the final consumption of energy by 2020 and how the intermediate targets will be met, including the separate 10% renewable energy in transport.

The NREAP envisages that the target share of renewable energy will be achieved through proven technologies, mainly through local RES electricity and heat projects, and consumption of imported and locally produced renewable fuels. The share of renewable energy consumed in Malta in 2010 and 2011 was 0.88% and 1.12% respectively broken down by sources as shown in the Figure below.

As stated earlier the new administration is re-viewing the NREAP in 2013 to reflect the new direction to Malta's energy policy..

The actual renewable energy consumption in 2010 and 2011 includes a percentage of consumption of biodiesel and biomass for heating purposes which was not predicted in the NREAP. Figure 03 also

[94] Page v, Ibid
[95] Pg vi, Ibid
[96] Pg viii, Ibid

shows the bi-annual projections as in the NREAP for the contribution from the different renewable energy sources up to 2020. The bi-annual trajectories from 2012 to 2020 as established by Directive 2009/28/EC are also shown in Figure 03. The NREAP projections show that the bi-annual trajectories will remain above the interim indicative targets established by the RES Directive up to 2020. The trajectories are not binding. However, variations from plans have to be justified.

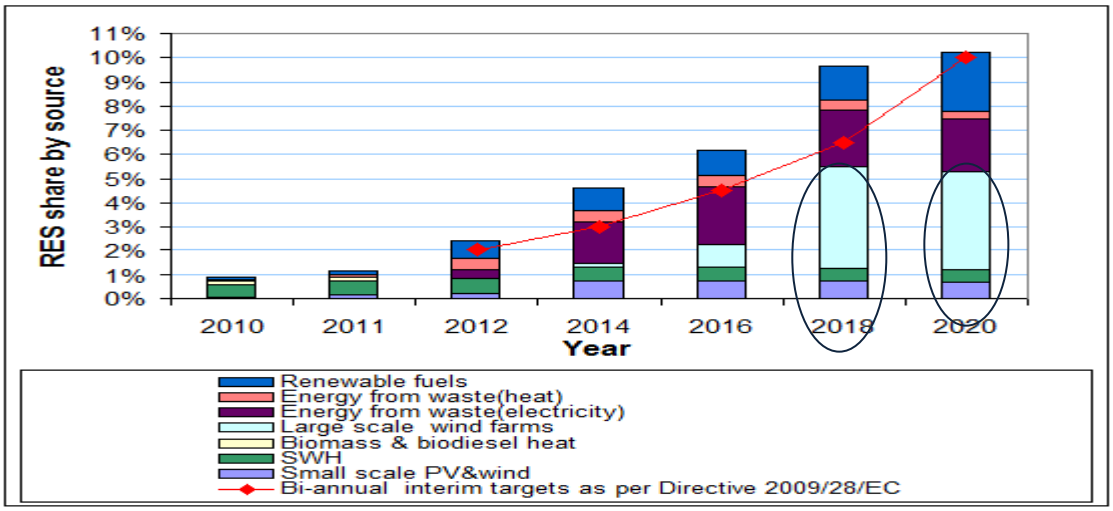

Figure 10 NREAP Projections

(i) A Sustainable Development Strategy for the Maltese Islands: 2007-2016

The main objective set out for the Sustainable Development Strategy for the Maltese Islands (SDSMI) is to "build upon and harmonise the various sectoral, economic, social and environmental policies and plans that are operating in the country and to ensure socially responsible economic development while protecting the resource base and the environment for the benefit of future generations" (Agenda 21, Chapter 8, paragraph 8.7 cited in SDSMI pg. 5).

In addition to this Malta signed the Millennium Declaration and agreed on the Millennium Development Goals for which the project can be seen as complementing the Millennium Development Goal in that of integrating the principles of sustainable development into country policies and programmes and reverse the loss of environment resources (Millennium Development Goal 7). The SDSMI identifies the environment to be one of the 5 main pillars which are considered as warranting foremost attention for the attainment of sustainable goals in Malta. Hence the project will be contributing towards the following three priority areas (SDSMI page15).

The Strategy identifies 20 priority areas of which the first one relates to climate change with the goal to "Take steps 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."[97]

The strategy underlines that energy efficiency and the use of renewable energy sources (RES) can be economically and environmentally advantageous. It adds that further reductions in CO_2 emissions are likely to be attained through the construction of energy efficient buildings and the use of small combined heat and power plants by industry, the introduction of energy-efficient electric motors and drives, the proper dimensioning of air-conditioning units and attendant ducting, and further use of energy-saving lamps.

With regard to Air Quality, the Strategy states that remedial actions will be taken to control emissions of air pollutant (ambient levels of particulate matter, sulphur dioxide, carbon monoxide, benzene, lead, ozone, heavy metals and nitrogen oxides) as well as achieve compliance with European Standards.

Moreover the proposed project will be contributing towards the following main strategic directions with respect to air quality, climate change, energy-efficiency and renewable resources (SDSMI page16-18):

- Improve efficiency in electricity generation.
- Put in place an integrated approach to promote energy efficiency and conservation at the user end.
- Reduce greenhouse gas emissions.
- Promote environmental protection.
- Take action to reduce Malta's vulnerability to Climate Change.
- Promote energy-efficiency through education and awareness campaigns organized by MRRA to target audiences.
- Promote the introduction and use of renewable energy sources through support mechanisms and

[97] Pg 7, A Sustainable Development Strategy for the Maltese Islands: 2007-2016, National Commission for Sustainable Development, 20th December 2006

other appropriate measures.

- Promote energy audits and energy efficiency improvements in commercial and industrial establishments.

(j) National Environment Policy: 2012

The Policy identifies climate change and energy as a long term sustainability issue for Malta. Apart from references made to national strategies already discussed in this document, the Policy underlines that there are important synergies that can be exploited between the climate change and energy sectors and the built environment. With specific regard to energy efficiency the Policy identifies the following as the key measures[98]:

- (2.6.6) Implement National Energy Efficiency Action Plan (MRRA/MRA) with the key indicator being a reduction in energy consumption.

- (2.6.10) Ensure that the energy performance of new buildings meet national standards in line with the EU Directive on energy efficiency in buildings by 2012 (MRRA) with the key indicator being the number of new buildings meeting energy standards by class.

- (2.6.11) Review current spatial planning guidance and regulations with a view to further promoting climate change-related improvements by 2014 (MTCE/ MEPA, MRRA/MRA) with the key indicator being the number of recommended measures implemented.

(k) Green Public Procurement: National Action Plan - 2011

The Government of Malta in 2011 issues a National Action Plan with regard to Green Public Procurement which sets out the following key objectives:

- Establish and maintain a strategic framework and structure within which green public procurement can take place in Malta.

- Integrate the environmental dimension within the national public procurement process.

- Establish clear and measurable targets and objectives for green procurement in a range of sectors and ensure their achievement.

[98] Pg 76, National Environment Policy, Ministry for Tourism, the Environment and Culture, February 2012

- Ensure that the implementation of the GPP is continuously monitored and any corrective actions are taken as may be appropriate.

- Engage procurers, suppliers and markets in the GPP process, provide guidance, and facilitate capacity building in this area.

(l) Eco-Gozo Strategy: 2009

The vision presented in the Eco-Strategy for Gozo places the generation of energy as a central issue. The Strategy proposes the following priority areas[99]:

- Identification of optimal sites for small onshore wind farms and the development of small onshore wind farms with a limited number of turbines.

- Utilisation of rooftops of public buildings and other spaces such as public car parks for renewable energy projects involving solar energy.

- Installation of additional PV panels at the Ministry for Gozo funded from savings in electricity bills arising from replacement of the existing energy supply.

- Carrying out of energy audits on all public buildings including the Gozo Administration Centre.

- Converting all lighting systems in offices and public places to energy saving lighting.

- Providing free consultation to people on how to convert their houses to be energy.

- Awarding companies, households, villages and streets committed to energy-saving with a 'Green Award'.

(m) Water Policy Framework Regulations

The 2004 Water Policy Framework Regulations transpose the Water Framework Directive, which is the most relevant law that applies for this sector's adaptation to climate change. It establishes '*a*

[99] Pg 19, Eco-Gozo: A Better Gozo, Proposed Action 2010-2012, Ministry for Gozo, November 2009

framework of action' for the protection of '*inland surface waters, transitional waters, coastal waters* and *ground water*.' These Regulations attempt to adopt a holistic approach with respect to the whole field of water management.

The Regulations address emissions and discharges that affect water, whether via point or diffuse sources, irrespective of where they originate. The competent authorities involved, which are the MRA and MEPA, are legally bound to prevent the deterioration of the status of all the bodies of water46 and to implement the measures necessary to reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity in order to reduce progressively pollution.

The relevance of these Regulations for adaptation to climate change are particularly related to groundwater management, given the already precarious status of this resource and the impact that climate change is likely to cause on precipitation. This situation renders groundwater resources both more vulnerable and more valuable. Additionally, these regulations also regulate coastal water management, which is also a sector that is closely related to climate change adaptation due both to these areas as a habitat and as a zone of intense economic activity.[100]

The MRA must also ensure that the status of the body of groundwater is not further deteriorated. Lastly, the MRA must list the less stringent environmental objectives in the water catchment management plan5, together with the reasons for adopting these less stringent environmental objectives. These objectives must be reviewed every six years.[101]

(n) Proposal for a Water Policy for the Maltese Islands – Sustainable Management of Water Resources: 2010

The report titled 'A Proposal for a Water Policy for the Maltese Islands – Sustainable Management of Water Resources', looks at a range of policy measures that cover sustainable groundwater use, water demand management, and optimisation and use of non-conventional water resources, rain harvesting, amongst others.

The key objectives of the Water Policy are the:

- Supply of good water quality to meet the needs of the population.

[100] LN 194/2004, Environment Protection Act, 2001 (Act No XX of 2001), Water Policy Framework Regulations, 2004
[101] Ibid

- Sustainable use and management of the nation's water resources.

- Protection of the water resources and the aquatic environment from pollution.

- Fair and transparent regulation of the water industry.

- Mitigating against the effects of floods.

- Adaptation to climate change.

The Water Policy outlines a number of measures and initiatives that will help Malta achieve a better degree of water sustainability. It is also pertinent to note, however, that Malta's aquifers will not achieve 'good status' by 2015 (the target date with respect to the EU Water Framework Directive) and will be seeking an extension in this regard.

(O) Other

Of particular note is that following the change of in administration in March 2013, a ministry that is dedicated to energy and the conservation of water has been established. This demonstrates the importance that the government has assigned to these strategic resources. The mandate of the Ministry is to:

- Design, develop and coordinate energy, alternative energy and water policy at a national, EU and international level (United Nations, International / European Energy Agency, etc.).

- Monitor and review energy, alternative energy and water policy implementation impact and secure governance across and within Ministries, Departments and government entities.

- Work with the Offices of EU Affairs and Programme Implementation within the Ministry to ensure congruency in approach.

- Lead and coordinate across ministries ERDF and Cohesion Policy funded projects under the 2014-2020 Partnership Agreement relating to energy, alternative energy and water.

- Work with the ministry responsible for local government, the Local Councils Association, and

local councils to assist them in meeting obligations as signatories of the Covenant of Mayors.

- Work with the Ministry for European Affairs and Implementation of the Electoral Manifesto to ensure that policy design inputs in the shaping of Malta's policy position within the EU.

- Work with the Malta Council for Science and Technology to identify priorities for national research and innovation in energy and water.

- Design, develop and manage a sustained knowledge, education, information and communications framework directed to influence behaviour with regard to alternative energy use.

Annex II

Tables A, B & C.