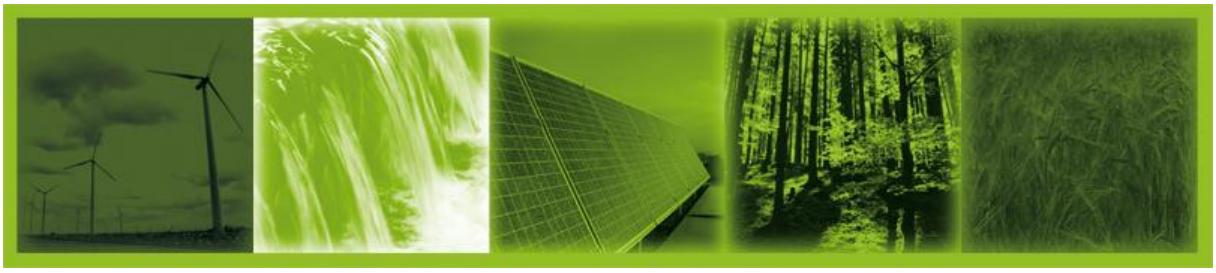
REPAP 2020

Renewable Energy Policy Action Paving the Way towards 2020



Renewable Energy Industry Roadmap for Malta

Final Report

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1 The case of Malta

1.1 Current situation

1.1.1 Background

Malta has no indigenous energy sources and is dependent on imported fuels. Its primary energy supply needs are met by crude oil and oil products. The proportion of oil in the country's balance of total primary energy supply is nearly 100%. The possibility of the presence of oil deposits in Malta's territorial waters has prompted the Maltese Government to offer oil exploration and production-sharing contracts to foreign oil companies and drilling consortia.

Electricity generation in Malta is carried out at two power stations. The total installed electricity generating capacity was 571 MW in 2007 based on a conventional thermal generation systems[1]. The Marsa Power Station is expected to be phased out, in accordance with the European Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants. Plans are underway to build a new 140 MW combined cycle plant near the other power station in Delimara, by 2011. It is also envisaged that a new 200 MW submarine inter-connector will be laid between Malta and Sicily by 2012.[2]

Efforts are being directed towards the identification and utilisation of appropriate alternative energy sources, including solar energy. To promote renewable energy sources (RES) Malta currently is using a combination of capital grants and net metering for PV and micro-wind, provided that the electricity production from the renewable source is lower than the total consumption within an accounting period of one year.

1.1.2 Current status of renewable energies

The penetration of renewable energy in Malta is still very low. However, within the last few years, the number of renewable energy suppliers has grown from a few tens to over eighty.

Electricity:
Photovoltaic grid-connected installations have reached about 240 kWp in 2008, which accounted for 0.015% of total electricity generation of 2008 amounting to 2,313 GWh. In 2009 and early 2010, the Malta Resources Authority has reported a total installed capacity of 3 MWp [3].

[1] Eurostat (2009).

[2] Enemalta News, http://www.enemalta.com.mt/page.asp?n=newsdetailssearch&i=1675

[3] Mifsud, P. (2010), The Status of Photovoltaic Technology in the Maltese Islands – February 2010, A Report for the IEE Project PV-NMS-NET, Malta Resources Authority, Malta.

Heat:

The Official Census of 2005 reported a total of 5,030 domestic solar heating systems in Malta and Gozo. Following Government capital incentives from 2006, the take up has increased. It is now estimated that there are around 15,000 systems installed, saving around 26 GWh_e, which is 1% of the total electricity generated in 2008. However, in 2010 the market for solar water heating system has almost come to a stand-still, since Government's grant for the period 2010-2012 has been restricted to low-income families, first-time home buyers and residents of the island of Gozo, which aims to become an eco-island.

Transport:

There is a small amount of biodiesel use in Malta. Consumption in 2005 was just under 1 ktoe. According to the European Biodiesel Board (EBB), biodiesel production capacity on Malta in 2007 was 8 kt/yr and accounted for 1.08% of the total fuel sales for transport.[4] There is currently no bio-ethanol production or use on Malta. Use of bio-diesel in 2009 has dropped drastically, following some negative experiences with failure of fuel pump rubber gaskets, which lead to a widespread belief that the recommended 20% bio-diesel mix attacks rubber. Another reason for the unpopular use of bio-diesel is that there is no pre-mixed blends available at the service stations. Purchase and mixing of diesel and bio-diesel will have to be carried out by each driver at the fuel pumping station. This seemed to be time consuming and a source of confusion to drivers.

1.1.3 Current renewable energy support policies

Electricity:

Capital Grants for Photovoltaic (PV) and Wind

Once-only investment subsidies are granted by the Maltese Ministry of Finance for small wind and solar PV systems to domestic investors within Malta. These grants aim at promoting an increase in domestic electricity generation from small scale solar and micro-wind energy systems. It is implemented and administered by the Malta Resources Authority (Directorate for Energy Resources Regulation) [5].

The party entitled to subsidies for wind and solar energy systems are home owners who have installed a wind or solar power system for domestic use that is connected to the grid. A development permit is required prior to application for wind turbines only, while solar systems need no application, provided that they follow the design guidance regulations of the Malta

[4] Ministry for Resources and Rural Affairs, Malta's Annual Report for 2007 submitted to fulfill requirements of Article 4 of Directive 2003/30 EC on the promotion of bio-fuels and other renewable fuels for transport, http://ec.europa.eu/energy/res/legislation/doc/biofuels/member_states/2008_rapports/malta_en.pdf

[5] http://www.mra.org.mt/Support%20Schemes.shtml

Environment and Planning Authority[6]. Additionally, systems that produce more electric current than 16 A per phase need a permit from the Malta Resources Authority, while those producing lower current only require to fill up a notification form.

PV

The first scheme had started in 2006 with a capital grant of around Euro 1,165 for the first kWp installed, going down to Euro 700 for the next kWp and further down to Euro 465 for the remaining capacity up to a total maximum capacity of 3.7 kWp. In 2009, this was changed and a 50% grant was given up to a maximum of Euro 3,000. There was a cap on the budget and 200 families benefited from the scheme[7, 8]

For the next 3 years (2010-2012), Government has kept last year's scheme but the number of beneficiaries was increased to 400 families per year.[9] The 2010 call had been fully subscribed on the first day. Government intends to launch an additional call in June 2010, due to the overwhelming interest from the domestic sector and the availability of some European funds for such support. However, following the discovery of a number of fiscal irregularities with regards to the quoted prices, the scheme was suspended and a new grant scheme, with the same maximum subsidy of €3,000, shall be opened towards the end of June 2010[10].

The scheme is regulated through Government notice No. 81 of 2009 "A Grant on the Purchase of Systems for Domestic Use that Reduce the Use of Energy, or Use Renewable Sources of Energy" [11]. The support is conditional to certified equipment registered by the local suppliers with the Malta Resources Authority (MRA), which will be updated accordingly. However, the scheme does not exclude the possibility that an individual imports one's own system from abroad, as long as the products are registered and approved by the MRA.

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[6] Development Control Policy and Design Guidance 2007, Sections 13.3 – 13.5, MEPA 2007, ISBN 978-99932-83-68-3, http://www.mepa.org.mt/planning/planning_policy/policyanddesign2007/DC%202007%20_MEPA%20approved%2022.03.07_%20Printable%20version.pdf

[7] Government of Malta Notice No. GN135/2006 on a Once-Only Grant on the Purchase of Photovoltaic Systems for Domestic Use and on the Purchase of Thermal Roof Insulation Materials for Roofs of Domestic Residences, The Malta Government Gazette No. 17,878 of 9th February 2006, pp. 1190-1207, Department of Information, accessed on 4th March 2009, http://www.doi.gov.mt/EN/gazetteonline/2006/02/gazts/GG%209.2.pdf

[8] Government of Malta Notice No. GN81/2009 on a Grant on the Purchase of Systems for Domestic Use that Reduce the Use of Energy, or Use Renewable Sources of Energy, The Malta Government Gazette No. 18,372 of 27 January 2009, pp. 757-791, Department of Information, accessed on 12th February 2009, http://www.doi.gov.mt/EN/gazetteonline/2009/01/gazts/GG%2027.1extra.pdf

[9] The 2010 Budget, http://www.finance.gov.mt/image.aspx?site=MFIN&ref=2010_budget_Budget Speech_wApp_en

[10] Malta Resources Authority, Press Release, http://www.mra.org.mt/Downloads/Press%20Releases/MRA-pr%204-2010.pdf

[11] Former regulation GN 135 2006: http://www.mra.org.mt/Downloads/Grants/GN2006_135%20pv%20and%20roof%20insulation%20grant.pdf.

Wind

Micro-wind turbines installed on domestic premises may qualify for a grant of 25% on the purchase price of micro wind systems (with a maximum generation capacity of 3.7 kW) and are eligible to a maximum grant of Euro 232.94, only. The once-only grant scheme has been effective since 2006. It is renewed for further periods of one year unless a Notice to the contrary is published in the Gazette. The scheme is regulated through GN 136 2006 "A Once-Only Grant on the Purchase of Wind Energy Systems for Domestic Use". The support is not conditional to certified equipment and installers. However, very few applicants have made use of this grant over the past years, probably due to its low support value and definitely because a full development application for the installation of the wind turbine will have to be filed with MEPA, which costs time and money.

The 3.7 kW benchmark stems from the fact that renewable energy systems shall require only a notification from an electrical point of view, but must not produce more than 16 Amperes per phase. For larger systems, an additional permit will need to be obtained from the MRA for grid-connection.

Feed-in Tariff (net metering)

Since 2004, Malta has promoted the generation of electricity by domestic PV systems through a net-metering system. A metering device records the electricity consumed by the plant operator as well as the amount that is fed into the grid. If the production exceeds the customer's total electricity consumption, the grid operator (Enemalta) pays € 0.06988 for every kWh of solar electricity that is fed back into the grid. This spill-off tariff is credited at a lower feed-in tariff rate than the market value. However, it is to be noted that at the time when this spill-off tariff was introduced, its value was equivalent to the average electricity rate at the time. Today's rates are at least 3 times higher but so far no efforts have been made to upgrade the spill-off tariff.

The instrument is controlled by the Ministry for Resources and Rural Affairs. It is implemented and administered by the Malta Resources Authority (Directorate for Energy Resources Regulation) in cooperation with Enemalta Corporation [12]. The scheme is regulated through the "Subsidiary Legislation 423.19. Promotion of Electricity produced from Renewable Energy Sources Regulations, 30th April, 2004, Legal Notice 186 of 2004".

Soft Loans

At least one of the local banks offers a beneficial loan for residential installations paid over a 10-year period, at discount rate of 2.5%. This loan ranges between € 500 and € 60,000. Loans for non-residential systems amount to between € 25,000 and € 200,000. For industry, the Maltese government also offers a tax credit on the investment.

[12] http://www.enemalta.com.mt

Heat:

Capital Grant for Solar Water Heaters (SWH)

The Maltese Ministry of Finance grants once-only investment subsidies for SWH for domestic use. In 2009, 66% of eligible costs were funded up to a maximum of € 460 per family/installation. There is no more than one grant available per technology, but families are eligible to receive subsidies for more than one technology. There was no cap on the budget but the scheme was limited to 4,000 applications. This scheme terminated on 15th February 2010. The instrument was previously controlled by the Ministry of Finance, but since 1 January 2008, it has been controlled by the Ministry for Resources and Rural Affairs. It is implemented and administered by the Malta Resources Authority (Directorate for Energy Resources Regulation).

The previous scheme that ran from 2006 until 2009 has been terminated with effect from 15 February 2009 in accordance with Government Notice 81 of 2009. From 16 February 2009 until 28 February 2009, new applications for solar water heaters were received.

Applicants who have installed equipment before 15 February 2009 would be eligible to apply under the terms of the 2006 scheme (Government Notice 135 of 2006 for PVs and roof thermal insulation and Government Notice 55 of 2006 and 203 of 2005 for solar water heaters) up to 15 May 2009. No applications under the 2006 schemes will be accepted after 15 May 2009.

The scheme is regulated through Government Notice No. 81/2009 "A Grant on the Purchase of Systems for Domestic Use that Reduce the Use of Energy, or Use Renewable Sources of Energy". The former scheme was regulated through Government Notice 55 of 2006, and Government Notice 203 of 2005. The support is conditional to certified equipment and installers that have to be registered with the MRA.

For the next 3 years (2010-2012), the grant has been upgraded to cover up to 40% of the capital and installation costs, up to a maximum of Euro 560. However, the grant are limited to low income families, new first-time home buyers of value lower than Euro 120,000 and all the residents on the Island of Gozo, to promote the Eco-Gozo programme.[13]. So far, suppliers have reported a serious drop in sales, due to these restrictions.

Transport:

In line with the EU Bio-fuels Directive 2003/30/EC (promotion of the use of bio-fuels or other renewable fuels for transport), the Maltese Government set an indicative target for the use of bio-fuels in 2005 of 0.3% of all fuel sold for road transport. In 2010 the compulsory target is set at 5.75%.[14], but it is highly improbable to reach, due to the fact that there was a sharp

[13] The 2010 Budget, http://www.finance.gov.mt/image.aspx?site=MFIN&ref=2010_budget_Budget Speech_wApp_en

[14] Malta has indicated that given the scarcity of arable land and water resources for the production of energy crops used in bio-fuels production and the existing current conditions the national indicative target for Malta for 2010 is set to 1.25%.

drop in biodiesel sales during 2009, possibly due to a general belief that damage may be caused to rubber seals of vehicle fuel pumps.

In accordance with the new Renewable Energy Directive 2009/28/EC, the Government has set a binding target of 10% renewable energy in road transport by 2020. However, Malta's forecast document on the renewable energy roadmap, showed a sharp discrepancy due to the limited number of diesel-engine cars on the roads. A possible solution could be to co-power electricity generation with bio-fuels as well.

Since 2005, excise taxes no longer apply to the biomass content in biodiesel. Furthermore, there is specific support for bio-fuels produced from wastes, residues, non-food cellulosic material, and ligno-cellulosic material.

Capital Grant for Electric Cars

Since 2005, the Maltese Ministry of Finance grants once-only investment subsidies for electric cars. The instrument was previously controlled by the Ministry of Finance, but since 1 January 2008, it has been controlled by the Ministry for Resources and Rural Affairs. It is implemented and administered by the Malta Resources Authority (Directorate for Energy Resources Regulation).

Electric-powered cars may qualify for a once-only grant of 15.25% on the purchase price of the car, and is eligible to a maximum grant of Euro 1,164.69. This Scheme shall remain in implementation for a period of one year from the effective date, unless terminated beforehand by a Government Notice in the Gazette, and shall be renewed for further periods of one year unless a Government Notice to the contrary is published in the Gazette. The scheme is regulated through Government Notice No. 203 of 2005. There is no cap on the budget. However, the uptake of this grant is very low, probably due to the high price of electric cars, when compared with the relatively cheaper second-hand cars that are being extensively imported into the Island and cover more than 50% of the car sales.

1.2 Targets & trajectories

1.2.1 Overall renewable energy targets and trajectories

In 2005 Malta had no renewable energy share in its gross final energy consumption. This share has to be increased to 10% until the year 2020 according to the Directive 2009/28/EC.

Table 1-1: Overall renewable energy targets and trajectories – Malta

2005	Average 2011 - 2012	Average 2013 - 2014	Average 2015 - 2016	Average 2017 - 2018	2020
0.00%	2.00%	3.00%	4.50%	6.50%	10.00%

Source: Directive 2009/28/EC

1.2.2 Sectoral targets and trajectories

Possible future developments of the renewable energy sector in Malta until 2020 have been assessed based on two scenarios using the Green-X model, the NAT and the ACT scenarios (defined in Appendix 1) and considering a moderate energy demand (based on PRIMES 20% case scenario) [15].

Malta can meet its renewable energy target of 10% in 2020, in both scenarios as **Table 1-2** and **1-3** depict. Total RES shares of 10.2% in the NAT scenario and 12.2% in the ACT scenarios can be reached in 2020, respectively. The RES shares are between 15.2% and 22% in the electricity sector in the NAT and ACT scenario, as well as 14.8% in the heating and 10% in the transport sector in both scenarios.

Table 1-2: Sectoral targets and trajectories – NAT scenario Malta

Malta		NAT (National target fulfillment)					
Indicator	**Unit**	**2005**	**Average 2011 - 2012**	**Average 2013 - 2014**	**Average 2015 - 2016**	**Average 2017 - 2018**	**2020 Targets**
Expected gross final energy consumption	**Ktoe**	498	621	640	659	674	693
Total share of RES in final energy consumption	**%**	0.0%	2.9%	4.1%	5.4%	7.2%	10.2%
Gross final consumption of RES-E	**Ktoe**	0	2	4	10	18	31
Share of RES-E in gross final electricity consumption	**%**	0.0%	1.0%	2.4%	5.5%	9.3%	15.2%
Gross final energy consumption from RES-H	**Ktoe**	0	4	5	7	8	10
Share of RES-H in final heating and cooling consumption	**%**	0.0%	5.9%	7.5%	9.2%	11.6 %	14.8%
Final energy from renewable sources consumed in transport	**Ktoe**	0	12	17	19	22	30
Share of RES in transport	**%**	0.0%	4.4%	6.0%	6.7%	7.7%	10.0%

Source: Green-X Model (2009)

Table 1-3: Sectoral targets and trajectories – ACT scenario Malta

Malta		ACT (proactive support - realisable deployment)					
Indicator	**Unit**	**2005**	**Average 2011 - 2012**	**Average 2013 - 2014**	**Average 2015 - 2016**	**Average 2017 - 2018**	**2020 Targets**
Expected gross final energy consumption	**Ktoe**	498	621	640	659	674	693
Total share of RES in final energy consumption	**%**	0.0%	3.2%	4.8%	6.6%	8.9%	12.2%
Gross final consumption of RES-E	**Ktoe**	0	4	9	17	29	45
Share of RES-E in gross final electricity consumption	**%**	0.0%	2.3%	5.1%	9.5%	15.3 %	22.0%
Gross final energy consumption from RES-H	**Ktoe**	0	4	5	7	8	10
Share of RES-H in final Heating and Cooling consumption	**%**	0.0%	5.9%	7.5%	9.2%	11.6 %	14.8%
Final energy from renewable sources consumed in transport	**Ktoe**	0	12	17	19	22	30
Share of RES in transport	**%**	0.0%	4.4%	6.0%	6.7%	7.7%	10.0%

Source: Green-X Model (2009)

1.2.3 Contribution of renewables to electricity consumption

In 2005 no electricity was consumed from renewable sources in Malta, but it increases in the NAT scenario to 360 GWh in 2020. However, a stronger development due to a proactive

[15] Results and figures for a low energy demand scenario (based on PRIMES high energy efficiency case scenario) are shown in Appendix 2.

policy support in this sector occurs in the ACT scenario, with a total consumption of 522 GWh during the same year.

In both scenarios the technology with the highest development is wind that achieves in 2020 399 GWh in the ACT scenario. The second most important technology is biomass, specifically biogas, which achieves 91 GWh in 2020 in this scenario.

Table 1-4: Contribution of renewables to electricity consumption – NAT scenario Malta

Malta	NAT (National target fulfillment)											
Technology	2005		Average 2011 - 2012		Average 2013 - 2014		Average 2015 - 2016		Average 2017 - 2018		2020 Targets	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Biomass	0	0	0.8	4.9	1.7	10.7	3.5	21.4	5.8	35.4	9.1	55.3
Solid	0	0	0.2	1.2	0.5	3.5	1.2	8.1	1.9	12.7	3.0	19.7
Biogas	0	0	0.6	3.7	1.2	7.2	2.2	13.3	3.8	22.8	6.1	35.6
MSW	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liquid	:	:	:	:	:	:	:	:	:	:	:	:
Concentrated Solar Power	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geothermal	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hydro, total	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
>10MW	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<10MW	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Of which pumping	:	:	:	:	:	:	:	:	:	:	:	:
Photovoltaic	0	0	1.1	1.5	2.7	3.6	5.4	7.1	10.9	14.1	24.9	32.1
Ocean	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind	0	0	5.3	13.9	13.7	36.0	33.5	89.4	59.8	159.2	101.0	273.1
Onshore	0	0	5.3	13.9	11.3	29.1	21.9	54.7	35.9	86.8	49.5	116.2
Offshore	0	0	0.0	0.0	2.3	6.9	11.5	34.7	24.0	72.4	51.5	157.0
Gross Final Consumption of electricity from RES	0	0	7.2	20.3	18.0	50.2	42.3	117.9	76.4	208.7	135.1	360.5

Source: Green-X Model (2009)

Table 1-5: Contribution of renewables to electricity consumption – ACT scenario Malta

Malta	ACT (proactive support - realisable deployment)

Technology	2005		Average 2011 - 2012		Average 2013 - 2014		Average 2015 - 2016		Average 2017 - 2018		2020	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Biomass	0	0	1.6	10.1	3.5	22.5	6.3	39.9	9.9	62.6	14.8	90.6
Solid	0	0	0.5	3.5	1.2	8.1	1.9	12.7	2.8	18.1	3.6	23.4
Biogas	0	0	0.6	3.7	1.2	7.2	2.2	13.3	3.8	22.8	6.6	37.5
MSW	0	0	0.4	2.9	1.1	7.2	2.1	14.0	3.3	21.8	4.6	29.7
Liquid	:	:	:	:	:	:	:	:	:	:	:	:
Concentrated Solar Power	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geothermal	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hydro, total	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
>10MW	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<10MW	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Of which pumping	:	:	:	:	:	:	:	:	:	:	:	:
Photovoltaic	0	0	1.1	1.5	2.7	3.6	5.4	7.1	10.9	14.1	24.9	32.1
Ocean	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind	0	0	12.4	34.7	28.4	79.8	55.7	155.7	95.3	265.1	144.2	399.4
Onshore	0	0	5.3	13.9	11.3	29.1	21.9	54.7	35.9	86.8	49.5	116.2
Offshore	0	0	7.0	20.8	17.1	50.7	33.8	100.9	59.4	178.4	94.7	283.3
Gross Final Consumption of electricity from RES	0	0	15.1	46.3	34.6	105.8	67.4	202.7	116.1	341.8	183.9	522.1

Source: Green-X Model (2009)

1.2.4 Contribution of renewables to heating & cooling consumption

Table 1-6 and **1-7** depict the development of the RES-H sector in Malta in the NAT and ACT scenarios. The development in both scenarios is the same showing an increase in the heat consumption up to around 10 ktoe. Solar thermal technology represents practically the only contributor within this sector.

Table 1-6: Contribution of renewables to heating and cooling consumption – NAT scenario Malta

Malta	NAT (National target fulfillment)

Technology	2005		Average 2011 - 2012		Average 2013 - 2014		Average 2015 - 2016		Average 2017 - 2018		2020	
	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe
Biomass	0	0	0.2	0.0	0.4	0.0	0.7	0.0	1.3	0.1	2.2	0.1
Solid	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biogas	0	0	0.2	0.0	0.4	0.0	0.7	0.0	1.3	0.1	2.2	0.1
Biowaste	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geothermal	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Solar Thermal	0	0	56.3	3.7	76.3	5.0	97.2	6.4	119.8	7.9	147.9	9.8
Heat pumps	0	0	0.6	0.0	1.3	0.1	2.0	0.2	2.8	0.2	3.9	0.3
Gross final energy consumption from RES in heating and cooling	0	0	57.1	3.8	77.9	5.2	100.0	6.6	123.9	8.2	154.1	10.2

Source: Green-X Model (2009)

Table 1-7: Contribution of renewables to heating and cooling consumption – ACT scenario Malta

Malta	ACT (proactive support - realisable deployment)											
Technology	2005		Average 2011 - 2012		Average 2013 - 2014		Average 2015 - 2016		Average 2017 - 2018		2020	
	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe
Biomass	0	0	0.2	0.0	0.4	0.0	0.7	0.0	1.3	0.1	2.4	0.1
Solid	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biogas	0	0	0.2	0.0	0.4	0.0	0.7	0.0	1.3	0.1	2.4	0.1
Biowaste	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geothermal	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Solar Thermal	0	0	56.3	3.7	76.3	5.0	97.2	6.4	119.8	7.9	147.9	9.8
Heat pumps	0	0	0.6	0.0	1.3	0.1	2.0	0.2	2.8	0.2	3.9	0.3
Gross final energy consumption from RES in heating and cooling	0	0	57.1	3.8	77.9	5.2	100.0	6.6	123.9	8.2	154.3	10.2

Source: Green-X Model (2009)

1.2.5 Contribution of renewables to transport fuel consumption

The utilization of bio-fuels in the transport sector from Malta will increase in a relevant way under all the scenarios until 2020 as **Table 1-8** shows. However, the majority of this consumption will be provided by bio-fuel imports. Only a marginal part of the transport fuel demand will be satisfied by biodiesel.

Table 1-8: Contribution of renewables to transport consumption – all scenarios Malta

Malta	NAT	ACT

Technology	Unit	2005	Average 2011 - 2012	Average 2013 - 2014	Average 2015 - 2016	Average 2017 - 2018	2020
Bioethanol	**ktoe**	0	0.0	0.0	0.0	0.0	0.0
Of which imported	**ktoe**	:	:	:	:	:	:
Biodiesel	**ktoe**	0	0.4	0.3	0.0	0.0	0.2
Of which imported	**ktoe**	:	:	:	:	:	:
Biofuels from wastes, residues, non-food cellulosic material, and ligno-cellulosic material	**ktoe**	:	0.0	0.0	0.0	0.0	0.0
Of which imported	**ktoe**	:	:	:	:	:	:
Hydrogen from RES	**ktoe**	:	:	:	:	:	:
Renewable electricity	**ktoe**	:	:	:	:	:	:
Biofuel import	**ktoe**	:	11.8	16.4	19.1	22.4	29.6
Final energy from renewable sources consumed in transport	**ktoe**	0	12.2	16.8	19.1	22.4	29.7

Source: Green-X Model (2009)

1.3 Measures for achieving the target

1.3.1 Policy measures

Measures on administrative procedures, regulations and codes:

- **Should authorization procedure take into account the specificities of different renewable energy technologies? If yes, how?**

Certainly the specifics of different RES sources should be considered for the design of authorisation procedures. Renewable energy technologies may broadly be divided into two main categories. The first may include large centralised systems such as wind farms utilising wind turbines greater than 500 kW each, large photovoltaic centralized systems of capacity higher than 500 kWp or other large systems as in the case of waste to energy facilities. The second category includes small and medium-sized renewable energy systems. For those two categories, specific authorization procedures need to be put into place.

So far, only solar photovoltaic and solar water heating systems have specific guidelines to be followed for authorization. Authorisation procedures should also be published beforehand and be transparent at all stages, rather than treating each system on a case-by-case basis, which could jeopardize the large-scale implementation of renewable energy technologies and bias one technology over another.

- **Should the renewable energy potential be taken into account in spatial planning?**

Generally RES, and their respective potential, are insufficiently taken into account in spatial planning. In many countries and regions future development of RES projects is not taken into account at the moment of drawing up spatial planning programs. This means that spatial planning programs have to be

adopted in order to allow for the implementation of a RES project in a specific area (e.g. RES-E), especially when there is a high RES potential involved in that particular area. This process can take a very long time. Often the acquirement of permits related to spatial planning is the longest trajectory of the overall period needed for development of the project. This is especially the case for projects in the field of wind and biomass. Responsible authorities should be stimulated to anticipate the development of future RES projects in their region, by allocating suitable areas.

Spatial planning, construction permits and EIA (environmental impact assessment) procedures are key problems for regulators. In the RES-E sector, one may need to wait for years, especially in countries where the authorities take into account the opinion of many stakeholders that are hard to harmonize. Since RES-E development is not taken into consideration in the spatial planning, every project and project variants have to be evaluated on an individual basis. The number of the often long lasting appeal procedures could be effectively decreased by including RES-E development plans in local and regional spatial planning. In Germany, for example, these problems have been solved to a large extent. In the case of onshore wind projects the administrative barriers regarding spatial planning are low thanks to the Building Code (1996), which made states designate areas for onshore wind parks, with the result that a wind farm can be established within 1 year. A similar approach is being followed for offshore wind parks. The federal states and the Bundesamt für Seeschifffahrt und Hydrographie (Federal Maritime and Hydrographic Agency) are responsible for designating areas and issuing permits for offshore wind installations.

At the moment, the Malta Environment and Planning Authority is revising the Gozo Local Plan with the aim of the upgrading and extension of the Ministry for Gozo and Centralized Government Departmental Offices, Rabat, the upgrading and extension of the Gozo General Hospital Area in Rabat, the extension of facilities and consideration of extensions within Government Schools, re-zoning of the Rabat Open Centre – previously referred to in the Gozo and Comino Local Plan (GCLP) as the Gozo Communal Centre Development Brief Area – and the introduction of new government/civic and community facilities, primarily focusing on the retention and enhancement of open vibrant public spaces [16]. It is clear that this exercise does not give any importance to the inclusion of renewable energy applications in spatial planning.

- **Should timetables for processing applications be communicated in advance?**

Usually long lead times are needed to obtain necessary permits. Time needed to obtain all necessary permits for the construction of a RES plant can take many years (e.g. RES-E). For example, planning permits to build a bio-digester at Marsascala Waste Facility plant took over 3 years. Experience showed that in Malta timetables for specific granting of permits (e.g. building permits) do exist. However, this is not binding and many times deadlines are missed. Also it can be unclear what the exact length of a procedure will be.

[16] http://www.mepa.org.mt/public-consultation

Clear guidelines for authorization procedures are highly recommended together with obligatory response periods for authorities involved in such procedures. These guidelines must be publicly available and permanently posted on the web.

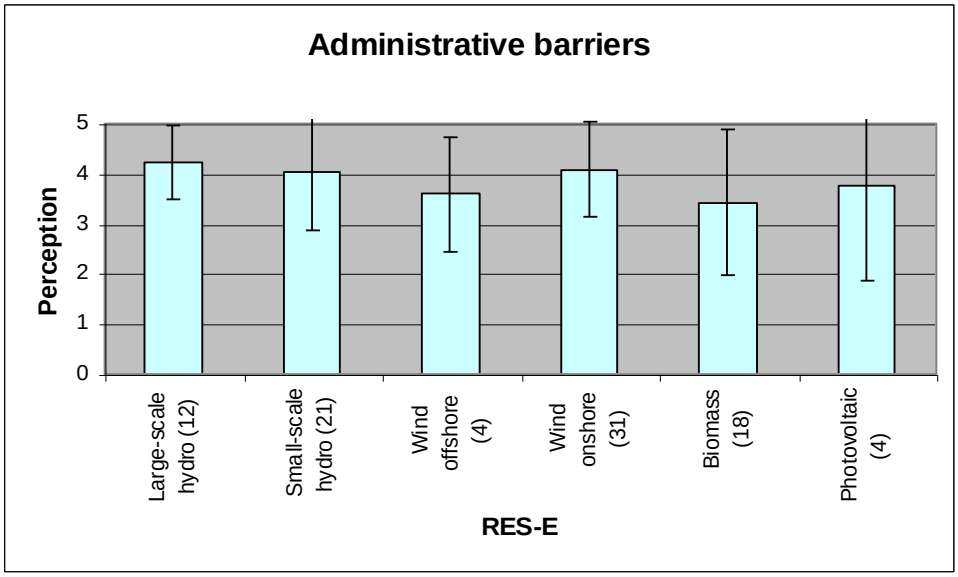
- **How many steps should be needed to obtain the final authorization? Should there be a one-stop shop for coordinating all the steps?**

Generally, a high number of authorities are involved to obtain the final authorization. Often many authorities are involved in both permitting as well as support-related procedures for renewable energy projects. Responsible authorities usually comprise several administrative bodies at national, regional and local level. An important improvement would be to reduce the number of local, regional and national administrations involved in the authorization processes for permits and financial support. Project developers are much more positive in situations where a single administrative body has been made responsible for co-ordination of several administrative procedures, such as the Bundesamt for off-shore wind in Germany.

Furthermore, there is a lack of co-ordination between different authorities. In many cases project developers need to submit similar information multiple times to different authorities. A suggestion to reduce the administrative burden for RES development would be to standardize procedures, such as standardized administrative requirements and application forms between different authorities.

In **Figure 1-2** the perception of administrative barriers per renewable energy source is shown, as identified by the stakeholder consultation[17].

Figure 1-2: Perception of administrative barriers



Source: OPTRES (2007)

[17] OPTRES (2007).

Perception from 0 (no perceived barrier) to 5 (high perceived barrier) is shown. Number of received answers per source is provided in brackets, while standard deviation is marked by bars. Only those RES-E types with at least 4 answers have been depicted.

Figure 1-2 shows that the respondents of the stakeholder consultation perceived the administrative problems to be highest for hydropower projects and on-shore wind. However, also for the other renewable energy sources, the administrative barriers were perceived as an important obstacle in the development of renewable energy projects.

For Malta, the procedure should be simplified given the compactness of the Island and the relative technological ease of communication between entities, especially after the introduction of the e-Government portal. One stop-shop systems already exist, such as in the case of building permits at MEPA and experience showed that it makes sense to have similar procedures for renewable energy. Another strategy that may need to be applied is to group the main authorities that have to deal with renewable energy systems under one Ministry, as this would reduce the complications stemming from such defragmentation.

Measures concerning Buildings:

- **What measures should be introduced into the building codes to ensure the share of renewable energy used in the building sector will increase?**

Policy instruments should be introduced that provide incentives for integrating a RES-H/C device into the heating/cooling system. But since RES-H/C applications operate only effectively if they are fitted to the overall system design, the chosen policy instrument should create incentives for a good overall system performance. Hence, it should also support the reduction of a building's energy consumption (e.g. by improving its insulation) and motivate for an efficient use of the RES-H/C equipment.

As far as possible the policy instrument should motivate the utilization of high efficiency equipment, e.g. through linking the financial incentives to quality standards of a determined minimum rate of efficiency.

It is evident that for the case of Malta, energy performance in buildings is still at its infancy and is moving very slowly. While it may be justified that training of assessors and the actual logistic preparation for the issuing of energy performance certificates may take time, other measures such as planning and implementing minimum renewable energy share in new and renovated buildings should and could have been addressed much earlier. At the moment, it is not considered and is not being debated.

- **How should an obligation for minimum levels of renewable energy in new and newly refurbished buildings be drafted to best ensure renewable energy integration in buildings? At what levels should it be set?**

The obligation should take the different target groups and their different needs into account and might be different for each of these groups. The target groups are private homeowners living in their own home, homeowners renting to others as well as private, municipal and

social housing organizations. As such companies often own and manage a large number of buildings they can become a key driver (but also key barrier) for switching buildings to RES-H/C.

Whereas housing companies often have sufficient technical skills to handle even innovative RES-H/C technologies they generally base their economic calculation on shorter pay back times e.g. private building owners in the domestic sector. In addition, the level of willingness to pay might generally be lower than with small scale investors. These circumstances should be considered in the setting of minimum levels for RES and in the corresponding support schemes.

From the perspective of the building owner (investor) apart from the level of support one of the main indicators is the share of the investment costs he or she can and/or legally is allowed to allocate to the tenants (by increasing the rent). From the perspective of tenants the crucial question concerns the relationship between the financial burden that might derive from an allocation of the investment costs on the rent and potentially reduced costs for heating/cooling due to the reduced use of conventional fuel.

The chosen obligation should ensure that investment is still effectively motivated. Costs for building owners and tenants shall not be too high to discourage investments (e.g. by postponing the reconstruction of heating systems as long as possible).

The buildings sector in Malta is one of the leading activities that drive the economy. A flourishing part of this sector is buildings that are erected in what is called “special designated areas”, which aims at marketing foreign ownership of homes in Malta. In general, these buildings form part of a large condominium that is equipped with a number of communal and entertainment services. Given the nature and size of this up-market sector, only energy efficient buildings that incorporate considerable share of renewable energy systems should be allowed. This could be the starting point for a national programme for the gradual implementation of minimum renewable energy share in all new and renovated buildings in Malta.

- **What is the projected increase of renewable energy use in the building sector until 2020?**

To date, there are no planned programmes for the introduction of mandatory renewable energy systems in Maltese buildings. However, it is clear that renewable energy systems are penetrating existing buildings, in the form of solar heating and solar photovoltaic systems. It is imperative that mandatory measures should be introduced together with systems for monitoring the output of renewable energy in the building sector.

The projected increase in renewable energy use in the building sector will therefore play an important role in the renewable energy mix to attain the 10% target of renewable energy in the final energy consumption in Malta. It is strongly believed that the introduction of feed-in tariffs could greatly enhance the take-up of renewable electricity systems, especially photovoltaics, by households.

Measures on information:

- **How should specific information be targeted at different groups, as end consumers, builders, property managers, property agents, installers, architects, farmers, suppliers of equipment using renewable energy sources, public administration?**

The question is basically about information sharing to all stakeholders. General information for example about subsidies for renewable technologies needs to be broadcasted to all stakeholders. As the internet offers 24 hours access to information and can be updated easily, a base for general information would be a web-based service. A best practice example is given in Luxembourg, where Subsidies for heat in households are communicated with the information paper "Förderprogramm zur Energieeinsparung und Nutzung erneuerbarer Energien im Wohnbereich" of the Ministère de l'Environnement of Luxembourg in an easy manner. Thereby, the paper targets not only public administration, but also end consumers, property managers and agents, installers and architects and is kept in an understandable and clear style.

End users can be informed by customer information brochures about the possibility to make use of support for renewables. The information brochures can be shared among installers, property managers and suppliers of equipment to hand them over to the end consumers.

Furthermore, there could be a subsidy for consultancy on renewable energy and energy efficiency related topics for end consumers. This would give the advantage, that consumers would choose the most appropriate efficiency and renewable energy option according to an energy expert.

Renewable energy and energy efficiency exhibitions are a great possibility to get to know information physically and are therefore adequate for energy experts as well as for technology end consumers adequate. With expositions, it is possible to share specific information as well. For instance, the SOLTEC exhibition in Germany is mainly focusing on solar technologies and through this focus, information can be shared in more detail.[18]

Workshops and speeches provide the possibility to share specific information that is only of major interest for a small target group. Workshops and speeches can be integrated in exhibitions as well.

Experts and public administration members need the most up to date information having a higher degree of detail than the ones for example for end users. Regularly reports published by the responsible administrative bodies keep the legal framework up-to-date. A best practice example is the German "Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit", which published a brochure of the environment policy from 2005 to 2009

[18] Information about the exhibition is given on the web page: http://www.soltec.de/s

in July 2009 being detailed and giving an overview of the topic as well.[19] With published articles in RES journals, the dynamics of the market can be analyzed in detail.

Specific information for a smaller target group can be shared via internet as well. It would be possible to establish a work group in a small field of work being responsible for specific field publishing news on their own internet platform.

The current situation in Malta showed a genuine hunger for more information on renewable energy, with a number of workshops on the topic consistently being reported as over-booked. However, such venues attract a specific type of audience, normally concentrated in the tertiary education level and professionals on the subject.

A more citizen-oriented approach is greatly needed. The Building Regulation Unit has a small programme for energy saving and energy efficiency in buildings. This mainly consists of presenting talks and models for the use of energy efficient measures at homes, usually held at schools, local councils or similar public venues, and manned by one engineer. Up to a few months ago, the Institute for Sustainable Energy of the University of Malta also had a very valid half-day programme specifically targeting schools and educational visits. However, this was stopped this year.

It is believed that the use of multimedia, especially TV broadcasting is one of the most effective media channels in Malta. Unfortunately, very few programmes target the energy topic. This means of communication should be enhanced and sustained over a number of years to ensure effective outcome.

- **How should guidance for planners and architects be provided to help them consider the optimal combination of renewable energy sources, high efficiency technologies and district heating and cooling when planning, designing, building and renovating industrial or residential areas?**

Planners and architects should be provided with an internet platform that holds information on possible options of including renewable energy, high efficiency technologies and district heating and cooling in new or existing buildings. It should not only contain up-to-date information on technology, such as installations options and financial feasibility, but should also include detailed information on successfully completed exemplary projects, new legislation and events related to the topic. Local information on the applicability of solar technology and the availability of district heating and cooling is desirable. Furthermore it should be possible to order printed copies of the contained information as well as publications explaining the various concerns in greater detail. Contact information to all relevant professional associations and their local members would complete the web page's content.

The information should be gathered in consultation with experts in energy, technology, construction and installation and be updated continuously to secure a high level of relevance

[19] Document available on http://www.bmu.de/ministerium/aufgaben/aufgaben/doc/44214.php

and actuality. The web page should be supervised with the help of chambers of professional bodies, planners associations and consumer rights centres, to secure that the target groups are addressed properly. These organizations could also contact their members and customers to raise awareness levels by means of web-based communication tools.

It is clear that there is a lack in the basic educational system at the University of Malta, to provide the engineers and architects of the future, with the necessary tools to seriously consider renewable energy options in their building designs and feel comfortable in dealing with these new building features. It is only very recently that the University curricula are being upgraded to reflect the new realities of energy use in buildings. This is one important development on the local scene.

It is also regarded of utmost importance to organize and provide training opportunities for existing engineers and architects, so that they will also be roped in and become advocates of renewable energy integration in buildings. So far this is not the case. Existing Chambers of Engineers and Architects should play an active role in this endeavour.

Measures on electricity infrastructure development:

- **Should there be priority connection rights or reserved connection capacities provided for new installations producing electricity from renewable energy sources?**

In general and according to stakeholder consultation, the legally guaranteed access to the grid for RES-E sources and priority transmission and distribution is not considered as a key barrier in countries where this guarantee is currently not applied.

However, introduction of positive discrimination of RES-E as regards the guarantee of grid access or transmission and distribution of RES-E, may become an additional motivating factor for reasons of investment security, low transaction costs and the acknowledgement of RES-E system benefits.

Malta will be connected to the European electricity grid via a sub-marine cable through Italy by 2012. Once this cable is in place, it would be relatively easy to allow more renewable electricity systems to be installed and be given priority, without causing difficulties for the management of electricity distribution. Therefore, as in other countries this issue should not become a major issue in Malta.

Priority/Guaranteed Access to the grid:

In Malta, plants generating electricity from renewable energy sources are entitled to preferential connection to the grid (Reg. 7 (2) PRESR). The plant operator is contractually entitled to the conclusion of an agreement of connection with the grid operator Enemalta. The contractual terms shall comply with the network code. Furthermore, RES-E sources are also granted priority in dispatch.

The costs of a connection to the grid are borne by the plant operator, but some authorities

may require the grid operator to bear the full or partial costs for grid extensions and upstream grid reinforcements. There is a relatively shallow level of connection sharing. Due to the low penetration of RES-E, the legal framework does not currently provide for special regulations on the distribution of the costs arising from the promotion system. The plant operator is entitled to the expansion of the upstream grid as specified by the agreement of connection. All other costs arising from the preferential treatment of RES-E (e.g. forecast of production and balancing) are borne by the grid operator.

- **Should priority or guaranteed access be ensured?**

Priority grid access is an essential condition for the rapid expansion of renewable energies. In Member States in which it is applied it has enabled new entrants to the market in particular to supply and sell the power they have generated under clear-cut conditions and at foreseeable costs. One of the popular best-practice options is to have mutualisation of grid upgrade costs. This means that financing of grid upgrades by the transmission system operator comes from a standardised grid charge that every plant operator would pay rather than considering each grid connection on a case-by-case basis. Priority grid connection prevents the existing oligopolies from squeezing out renewable energy producers, especially in markets, where networks and generation capacity are largely in the hands of similarly-sized companies. The inter-connection to the electricity grid will allow and facilitate the granting of priority or guaranteed access to a large degree.

- **How should it be ensured that transmission system operators, when dispatching electricity generating installations give priority to those using renewable energy sources?**

Clear statutory regulations and consistent enforcement are required. It is also important for the case of Malta to decouple the duties of Malta's only utility power company, Enemalta Corporation, into two separate parts, namely the generation of electricity and the transmission and distribution of electricity, thus ensuring fair treatment to all sources of generated electricity on the island, and to avoid any conflict of interest.

- **How should the transmission and distribution of electricity from renewable energy sources be guaranteed by the transmission and distribution system operators?**

The share of renewables in the electricity mix is still low and will remain quite low in 2020. Hence, any technical difficulties associated with the feed and transmission of renewable electricity seems remote at this stage. The main hurdle to guaranteeing the transmission and distribution of renewable electricity will predominantly be administrative. At the moment, the sole fossil-fuel generated electricity company also has the monopoly of transmission and distribution. A conflict of interest may occur here especially when the renewable electricity output is high during times of low load demand (e.g. high wind generation levels at night). Decoupling of the Enemalta Corporation's role as a generator and a distributor is a pre-requisite in this regard.

1.3.2 Financial support

Table 1-9 gives an indication on the necessary financial support by illustrating the weighted average (2011 to 2020) levelised (to a period of 15 years) total remuneration per MWh of RES generation for new installations in the investigated cases (NAT and ACT). This shows the gross support requirements as besides the financial premium offered by a RES support scheme also default revenues from the selling of the produced energy on the related energy market are included[20]. Gross figures were selected here as net expenditures largely depend on the future development of energy and carbon prices at European as well as at global scale[21].

A comparison of the technology or sector-specific figures by scenario shows significant differences between both cases. This illustrates the need to increase support levels if an ambitious and accelerated RES deployment is targeted. However, the figures of the ACT case represent the upper limit of such support requirements, where a fine tuning of the EU-wide equally conditioned technology-specific support levels to the Maltese circumstances offers a significant potential for cost reduction[22].

Consequently, if Malta follows the NAT policy track the support requirements would decrease significantly. An important precondition for that is however that the implemented RES policy needs to be classified as stable and the investor's risk is reduced to a low level (e.g. by offering a guaranteed duration of support (incl. support levels).

[20] For the case of small-scale RES heating systems this shall mean the price of heat supply based on a typical conventional reference technology.

[21] Obviously, also gross figures are not independent from the future development of energy prices. As the price development for energy related equipment in the years before the financial crisis (2008) has shown, prices (and largely also cost) for most types of power plants coincided to a large extent with rising energy and raw material prices.

The overall impact of energy prices on support cost is however seen larger on net compared to gross figures.

[22] Compare e.g. total remuneration for RES in the heat sector: Although support is significantly higher in the ACT case differences in terms of resulting RES deployment are comparatively small.

Table 1-9: Weighted average (2011 to 2020) total remuneration for yearly new RES installation in Malta – NAT and ACT scenario

RES policy indicator (i.e. required total remuneration)	Weighted average (2011 to 2020) total remuneration for yearly new RES installations [€/MWh$_{RES}$]	
	NAT (National target fulfillment)	ACT (proactive support - realisable deployment)
Biogas	94.4	126.1
(Solid) Biomass	97.7	139.8
Biowaste	0.0	113.0
Geothermal electricity	0.0	0.0
Hydro large-scale	0.0	0.0
Hydro small-scale	0.0	0.0
Photovoltaics	199.2	296.0
Solar thermal electricity	0.0	0.0
Tide & Wave	0.0	0.0
Wind onshore	90.7	113.1
Wind offshore	106.9	137.6
RES-E (average)	108.6	140.2
RES heat (district heat)	0.0	0.0
RES heat (decentral)	121.2	168.2
Biofuel (average)	104.3	104.3

Source: Green-X Model (2009)

It has to be stressed that the energy mix in Malta must include as many renewable energy sources as possible, based on the available and realisable potential of each technology. The actual share of the different technologies may be factored by their respective investment requirements.

1.3.3 Increasing biomass availability

The availability of biomass is 34 ktoe in the NAT and 49 ktoe in the ACT scenario in 2020.

The main domestic sources for biomass are forestry residues and bio-waste with 6 and 7 ktoe in the NAT scenario. In the ACT scenario, bio-waste is the dominating biomass source with an availability of 20 ktoe. However, a high share of the biomass demand is satisfied with imports of 17 ktoe in both scenarios.

Table 1-10: Availability of biomass in Malta – NAT scenario

Malta		NAT (National target fulfillment)			
Feedstock category	Unit	Total 2015	Imports 2015	Total 2020	Imports 2020
Agricultural products	[ktoe]	0	10	0	17
Agricultural residues	[ktoe]	1	:	3	:
Forestry products	[ktoe]	0	:	0	:
Forestry residues	[ktoe]	2	0	6	0
Biowaste	[ktoe]	3	:	7	:
Total biomass availibility	[ktoe]	16		34	

Source: Green-X Model (2009)

Table 1-11: Availability of biomass in Malta – ACT scenario

Malta		ACT (proactive support - realisable deployment)			
Feedstock category	Unit	Total 2015	Imports 2015	Total 2020	Imports 2020
Agricultural products	[ktoe]	0	10	1	17
Agricultural residues	[ktoe]	1	:	4	:
Forestry products	[ktoe]	0	:	0	:
Forestry residues	[ktoe]	4	0	7	0
Biowaste	[ktoe]	8	:	20	:
Total biomass availibility	[ktoe]	22		49	

Source: Green-X Model (2009)

1.3.4 Flexibility/Joint projects/European perspective

Excess and deficit production of renewable energy compared to an EU scenario

Malta exceeds in a European perspective scenario the indicative trajectory set in the Directive in every year. Therefore, between 7 ktoe to 14 ktoe are available for the usage of flexibility mechanisms (i.e. statistical transfers, joint project between Member States, joint projects between Member States and third countries, joint support schemes) in form of exports to other countries.

Table 8-12: Excess and deficit production of renewables compared to the indicative trajectory in Malta – EU scenario (defined in Annex 1)

Malta		EU (European perspercitve) vs.Indicative trajectory				
Sector	Unit	Average 2011 - 2012	Average 2013 - 2014	Average 2015 - 2016	Average 2017 - 2018	2020
Excess	[ktoe]	7	11	12	14	13
Deficit	[ktoe]	:	:	:	:	:

Source: Green-X Model (2009)

1.4 Estimated costs & benefits of RES policy support measures

Expected renewable energy use

In Malta the total consumption of renewable energy in 2020 is 71 ktoe in the NAT scenario and 85 ktoe in the ACT scenario. In the NAT scenario, the majority of renewables are consumed in the electricity and transport sector, while more than half of the renewables in the ACT scenario are consumed in the electricity sector.

Expected GHG reduction

The cumulative savings of CO_2 emissions between 2006 and 2020 from new plants are 1.6 $MtCO_2$ in the NAT and 2.2 $MtCO_2$ in the ACT scenario. While in the NAT scenario half of the savings can be reached in the electricity sector, in the ACT scenario this sector is responsible for about two-thirds of the savings.

Expected job creation

The effects on the job market are based on the study EmployRES published by Fraunhofer ISI, EEG, Rütter + Partner, LEI and SEURECO. In this study, the total gross employees due to the renewable energy field are analyzed in different scenarios. The first scenario is a business as usual scenario (BAU scenario) assuming the current renewable energy policy will be retained. The second scenario assumes a stronger RES policy (advanced policy scenario) and is comparable to the EU scenario of Green-X.

The efforts to achieve the target to produce 10% of Malta's energy from renewable sources will add in the BAU and advanced policy scenario the following total gross jobs figures:

Table 1-13: Additional employees in the renewable energy sector of Malta

Indicator	Unit	2010	2015	2020
BAU scenario	[1000 employees]	0.0	0.0	0.0
Advanced policy scenario	[1000 employees]	0.0	0.4	0.6

Source: Fraunhofer ISI; EEG; Rütter + Partner; LEI; SEURECO (2009)

Avoided fossil fuel imports

Avoided fossil fuel imports in energy terms:

The avoided fossil fuel imports in energy terms are 570 ktoe in the NAT and 765 ktoe in the ACT scenario cumulatively seen from 2006 to 2020. The development is similar in both scenarios where the majority of fuel imports are avoided in the electricity sector.

Avoided fossil fuel imports in monetary terms:

In monetary terms, M€ 290 is avoided in the NAT and M€ 385 in the ACT scenario. In both

scenarios, most of the money is saved in the electricity sector.

Avoided external costs

The avoided external costs are M€ 47.3 in the NAT and M€ 64 in the ACT scenario. In both scenarios, the highest avoided external costs are reached in the electricity sector.

Expected capital expenditures

Capital expenditures will cumulate to M€ 336 until 2020 in the NAT scenario. However, they will sum up to M€ 447 in the ACT scenario until 2020. Investments in the electricity sector will be the highest in both scenarios with values up to M€ 366 in the ACT scenario.

Expected costs of achieving the 2020 target

Policy cost:

Policy costs i.e. consumer expenditures due to RES support, will cumulate to M€ 90 in the NAT and to M€ 229 in the ACT scenario. Policy costs generated in the electricity sector will make the major contribution.

Additional generation costs:

Additional generation costs i.e. the difference between the RES generation costs and the reference energy prices will cumulate to M€ 27 and M€ 38 in the NAT and ACT scenario, respectively.

1.5 Outline of RES industry

Although Malta is not expected to become a manufacturing centre for renewable energy systems, there is good potential for the island to become a centre of excellence in terms of technical support and services and component assembly of renewable energy systems for Southern Mediterranean countries, who are envisaged to contribute towards the European electricity market in the future.

1.6 References

A proposal for an energy policy for Malta. Ministry of Resources and Rural Affairs. April 2009.

http://www.mra.gov.mt

Directorate for Energy Resources Regulation (2009).
http://www.mra.org.mt/Support%20Schemes.shtml

EEG (2005). The Green-X Model.

Enemalta (2009). http://www.enemalta.com.mt

Eurostat (2009). http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home

Fraunhofer ISI; EEG; Rütter + Partner; LEI; SEURECO (2009). EmployRES - "The impact of renewable energy policy on economic growth and employment in the European Union".
http://ec.europa.eu/energy/renewables/studies/renewables_en.htm

Government notice No. 81 (GN 81 2009). Ministry for Resources and Rural Affairs.
http://www.mra.org.mt/Downloads/Grants/2009%20Schemes/GN_81-2009.pdf

Ragwitz, M., Resch, G., Morthorst, P.E., Coenraads, R., Konstantinaviciute, I., Heyder, B. (2007). OPTRES – "Assessment and optimization of renewable energy support schemes in the European electricity market".
http://ec.europa.eu/energy/renewables/studies/doc/renewables/2007_02_optres.pdf

Promotion Directive of the Ministry of Finance. Government notice No. 136.
http://www.mra.org.mt/Downloads/Grants/GN2006_136%20wind%20grant.pdf

Reg. 7. Promotion of Electricity produced from Renewable Energy Sources (PRESR).
http://docs.justice.gov.mt/lom/Legislation/English/SubLeg/423/19.pdf

Dörte Fouquet (Editor), EU Energy Law : Volume III - Book Two
Renewable Energy in the Member States of the European Union, Chapter 19: Malta, First Edition, Feb 2010, ISBN: 978 90 776 441 26

1.7 Appendix 1 - Overview on investigated cases

Within this project we have calculated three different scenarios of the future renewable energy development up to 2020. These scenarios are meant to form a basis for establishing the 27 national energy roadmaps. The following gives an overview of the three aims of the scenarios. Generally, in all scenarios it is preconditioned to pursue the overall 20% RES by 2020 on EU scale. All results of the scenario calculations are depicted in terms of RES deployment as well as the associated costs and benefits.

NAT – National target fulfilment:

Within the NAT scenario each Member States tries to fulfil its national RES target by its own. The use of cooperation mechanisms as agreed in the RES Directive is reduced to necessary minimum: For the exceptional case that a member state would not possess sufficient RES potentials, cooperation mechanisms would serve as a complementary option. Additionally, if a member state possesses barely sufficient RES potentials, but their exploitation would cause significantly higher consumer expenditures compared to the EU average, cooperation would serve as complementary tool to assure target achievement. As a consequence of above, the required RES support will differ comparatively large among the countries.

EU – European perspective:

In contrast to the NAT case, within the EU scenario the use of cooperation mechanisms does not represent the exceptional case: If a member state would not possess sufficient potentials that can be economically23 exploited, cooperation mechanisms as defined in the RES directive would serve as a complementary option. Consequently, the prior aim of the EU scenario is to fulfil the 20% RES target on EU level, rather than fulfilling each national RES target purely domestically. Generally, it reflects a 'least cost' strategy in terms of consumer expenditures (due to RES support). In contrast to simple short-term least cost policy approaches, the applied technology-specification of RES support does however still allow an EU-wide well balanced RES portfolio.

ACT – proactive support – realizable deployment:

Finally, the ACT scenario depicts an optimistic future with respect to RES exploitation. The assumption is taken that all EU member states apply proactive RES support whereby EU-wide equal incentives are preconditioned for individual RES technologies (e.g. by applying a harmonised but technology-specific premium feed-in system to support RES-E). With EU-

[23] In the EU case economic restrictions are applied to limit differences in applied financial RES support among countries to an adequately low level. Consequently, if support in a country with low RES potentials and / or an ambitious RES target exceeds the upper boundary, the remaining gap to its RES target would be covered in line with the flexibility regime as defined in the RES Directive via (virtual) imports from other countries.

wide effective and efficient RES support this scenario ends up with a higher RES exploitation as foreseen in the RES directive.

1.8 Appendix 2 - Results and figures for a low energy demand

Based on PRIMES high energy efficiency case scenario

Sectoral targets and trajectories – NAT scenario Malta

Malta		NAT (National target fulfillment)					
Indicator	Unit	2005	Average 2011 - 2012	Average 2013 - 2014	Average 2015 - 2016	Average 2017 - 2018	2020 Targets
Gross final energy consumption	Ktoe	498	619	618	617	615	612
Total share of RES in final energy	%	0.0%	2.8%	4.0%	5.3%	7.0%	10.1%
Gross final energy consumption of	Ktoe	0	2	3	8	15	26
Share of RES in gross final electricity	%	0.0%	0.9%	1.8%	4.4%	7.9%	13.6%
Gross final energy consumption of heating	Ktoe	0	4	5	6	8	10
Share of RES in gross final heating and	%	0.0%	7.3%	10.3%	13.0%	17.1%	22.8%
Gross final energy consumption of transport	Ktoe	0	12	16	18	20	26
Share of RES in gross final transport energy	%	0.0%	4.4%	6.0%	6.7%	7.7%	10.0%

Source: Green-X Model (2009)

Sectoral targets and trajectories – ACT scenario Malta

Malta		ACT (proactive support - realisable deployment)					
Indicator	Unit	2005	Average 2011 - 2012	Average 2013 - 2014	Average 2015 - 2016	Average 2017 - 2018	2020 Targets
Gross final energy consumption	Ktoe	498	619	618	617	615	612
Total share of RES in final energy	%	0.0%	3.2%	4.9%	6.8%	9.4%	13.3%
Gross final energy consumption of	Ktoe	0	4	9	17	29	45
Share of RES in gross final electricity	%	0.0%	2.1%	4.9%	9.4%	15.6%	23.4%
Gross final energy consumption of heating	Ktoe	0	4	5	7	8	10
Share of RES in gross final heating and	%	0.0%	7.4%	10.6%	14.2%	18.4%	24.2%
Gross final energy consumption of transport	Ktoe	0	12	16	18	20	26
Share of RES in gross final transport energy	%	0.0%	4.4%	6.0%	6.7%	7.7%	10.0%

Source: Green-X Model (2009)

Contribution of renewables to electricity consumption – NAT scenario Malta

Malta	NAT (National target fulfillment)											
Technology	2005		Average 2011 - 2012		Average 2013 - 2014		Average 2015 - 2016		Average 2017 - 2018		2020 Targets	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Biomass	0.0	0	0.6	4	1.2	7	2.2	13	3.6	22	6.4	38
Solid	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.7	5
Biogas	0.0	0	0.6	4	1.2	7	2.2	13	3.6	22	5.7	34
MSW	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Liquid	:	:	:	:	:	:	:	:	:	:	:	:
Concentrated Solar	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Geothermal	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Hydro, total	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
>10MW	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
<10MW	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Of which pumping	:	:	:	:	:	:	:	:	:	:	:	:
Photovoltaic	0.0	0	1.1	1	2.7	4	5.4	7	10.9	14	24.9	32
Ocean	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Wind	0.0	0	5.3	14	11.3	29	28.8	76	52.6	138	88.0	234
Onshore	0.0	0	5.3	14	11.3	29	21.9	55	35.9	87	49.5	116
Offshore	0.0	0	0.0	0	0.0	0	6.9	21	16.8	51	38.5	117
Gross Final Consumption of electricity from RES	0.0	0	7.0	19	15.2	40	36.5	96	67.1	173	119.3	304

Source: Green-X Model (2009)

Contribution of renewables to electricity consumption – ACT scenario Malta

Malta	ACT (proactive support - realisable deployment)											
Technology	2005		Average 2011 - 2012		Average 2013 - 2014		Average 2015 - 2016		Average 2017 - 2018		2020	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Biomass	0.0	0	1.6	10	3.5	22	6.3	40	9.9	63	14.8	91
Solid	0.0	0	0.5	3	1.2	8	1.9	13	2.8	18	3.6	23
Biogas	0.0	0	0.6	4	1.2	7	2.2	13	3.8	23	6.6	38
MSW	0.0	0	0.4	3	1.1	7	2.1	14	3.3	22	4.6	30
Liquid	:	:	:	:	:	:	:	:	:	:	:	:
Concentrated Solar	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Geothermal	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Hydro, total	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
>10MW	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
<10MW	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Of which pumping	:	:	:	:	:	:	:	:	:	:	:	:
Photovoltaic	0.0	0	1.1	1	2.7	4	5.4	7	10.9	14	24.9	32
Ocean	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Wind	0.0	0	12.4	35	28.4	80	55.7	156	95.3	265	144.2	399
Onshore	0.0	0	5.3	14	11.3	29	21.9	55	35.9	87	49.5	116
Offshore	0.0	0	7.0	21	17.1	51	33.8	101	59.4	178	94.7	283
Gross Final Consumption of electricity from RES	0.0	0	15.1	46	34.6	106	67.4	203	116.1	342	183.9	522

Source: Green-X Model (2009)

Contribution of renewables to heating and cooling consumption – NAT scenario Malta

Malta	NAT (National target fulfillment)											
Technology	2005		Average 2011 - 2012		Average 2013 - 2014		Average 2015 - 2016		Average 2017 - 2018		2020	
	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe
Biomass	0.0	0.0	0.2	0.0	0.4	0.0	0.7	0.0	1.3	0.1	1.8	0.1
Solid	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biogas	0.0	0.0	0.2	0.0	0.4	0.0	0.7	0.0	1.3	0.1	1.8	0.1
Biowaste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Solar Thermal	0.0	0.0	56.3	3.7	75.9	5.0	90.5	6.0	112.7	7.4	141.2	9.3
Heat pumps	0.0	0.0	0.0	0.0	0.2	0.0	0.9	0.1	1.6	0.1	2.3	0.2
Gross final energy consumption from RES in heating and cooling	0.0	0.0	56.5	3.7	76.5	5.0	92.2	6.1	115.7	7.7	145.3	9.6

Source: Green-X Model (2009)

Contribution of renewables to heating and cooling consumption – ACT scenario Malta

Malta	ACT (proactive support - realisable deployment)											
Technology	2005		Average 2011 - 2012		Average 2013 - 2014		Average 2015 - 2016		Average 2017 - 2018		2020	
	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe	MWth	Ktoe
Biomass	0.0	0.0	0.2	0.0	0.4	0.0	0.7	0.0	1.3	0.1	2.4	0.1
Solid	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biogas	0.0	0.0	0.2	0.0	0.4	0.0	0.7	0.0	1.3	0.1	2.4	0.1
Biowaste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Solar Thermal	0.0	0.0	56.3	3.7	76.3	5.0	97.2	6.4	119.8	7.9	147.9	9.8
Heat pumps	0.0	0.0	0.6	0.0	1.3	0.1	2.0	0.2	2.8	0.2	3.9	0.3
Gross final energy consumption from RES in heating and cooling	0.0	0.0	57.1	3.8	77.9	5.2	100.0	6.6	123.9	8.2	154.3	10.2

Source: Green-X Model (2009)

Contribution of renewables to transport consumption – all scenarios Malta

Malta		NAT			ACT		
Technology	Unit	2005	Average 2011 - 2012	Average 2013 - 2014	Average 2015 - 2016	Average 2017 - 2018	2020
Bioethanol	ktoe	0.0	0.0	0.0	0.0	0.0	0.0
Of which imported	ktoe	:	:	:	:	:	:
Biodiesel	ktoe	0.0	0.4	0.3	0.0	0.0	0.0
Of which imported	ktoe	:	:	:	:	:	:
Biofuels from wastes, residues, non-food cellulosic material, and ligno-cellulosic material	ktoe	:	0.0	0.0	0.0	0.0	0.0
Of which imported	ktoe	:	:	:	:	:	:
Hydrogen from RES	ktoe	:	:	:	:	:	:
Renewable electricity	ktoe	:	:	:	:	:	:
Biofuel import	ktoe	:	11.7	15.9	18.0	20.4	26.1
Final energy from renewable sources consumed in transport	ktoe	0.0	12.0	16.2	18.0	20.4	26.1

Source: Green-X Model (2009)

1.9 Appendix 3 - Short characterization of the Green-X model

As in previous projects such as FORRES 2020, OPTRES or PROGRESS the ***Green-X*** model was applied to again perform a detailed quantitative assessment of the future deployment of renewable energies on country, sectoral as well as technology level. The core strength of this tool lies on the detailed RES resource and technology representation accompanied by a thorough energy policy description, which allows assessing various policy options with respect to resulting costs and benefits. A short characterisation of the model is given below, whilst for a detailed description we refer to www.green-x.at.

*Short characterisation of the **Green-X** model*

*The model **Green-X** has been developed by the Energy Economics Group (EEG) at Vienna University of Technology in the research project "Green-X – Deriving optimal promotion strategies for increasing the share of RES-E in a dynamic European electricity market", a joint European research project funded within the 5th framework program of the European Commission, DG Research (Contract No. ENG2-CT-2002-00607). Initially focussed on the electricity sector, this tool and its database on RES potentials and costs have been extended within follow-up activities to incorporate renewable energy technologies within all energy sectors.*

***Green-X** covers geographically the EU-27, and can easily be extended to other countries such as Turkey, Croatia or Norway. It allows to investigate the future deployment of RES as well as accompanying cost – comprising capital expenditures, additional generation cost (of RES compared to conventional options), consumer expenditures due to applied supporting policies, etc. – and benefits – i.e. contribution to supply security (avoidance of fossil fuels) and corresponding carbon emission avoidance. Thereby, results are derived at country- and technology-level on a yearly basis. The time-horizon allows for in-depth assessments up to 2020, accompanied by concise out-looks for the period beyond 2020 (up to 2030).*

Within the model, the most important RES-Electricity (i.e. biogas, biomass, bio-waste, wind on- & offshore, hydropower large- & small-scale, solar thermal electricity, photovoltaics, tidal stream & wave power, geothermal electricity), RES-Heat technologies (i.e. biomass – subdivided into log wood, wood chips, pellets, grid-connected heat -, geothermal (grid-connected) heat, heat pumps and solar thermal heat) and RES-Transport options (e.g. first generation bio-fuels (biodiesel and bio-ethanol), second generation bio-fuels (lignocellulotic bio-ethanol, BtL) as well as the impact of bio-fuel imports) are described for each investigated country by means of dynamic cost-resource curves. This allows besides the formal description of potentials and costs a detailed representation of dynamic aspects such as technological learning and technology diffusion.

Besides the detailed RES technology representation the core strength of the model is the in-depth energy policy representation. Green-X is fully suitable to investigate the impact of applying (combinations of) different energy policy instruments (e.g. quota obligations based on tradable green certificates / guarantees of origin, (premium) feed-in tariffs, tax incentives, investment incentives, impact of emission trading on reference energy prices) at country- or at European level in a dynamic framework. Sensitivity investigations on key input parameters such as non-economic barriers (influencing the technology diffusion), conventional energy prices, energy demand developments or technological progress (technological learning) typically complement a policy assessment.