Strategy for Renewable Electricity Exploitation in Malta

Volume 2: Policy Options Review

Draft Final

August 2005

Malta Resources Authority
Millennia 2nd Floor
Aldo Moro Road
Marsa LQA 06
Malta

Strategy for Renewable Electricity Exploitation in Malta

Draft Final Volume 2: Policy Options Review

August 2005

Mott MacDonald
Victory House
Trafalgar Place
Brighton BN1 4FY
United Kingdom

Tel 01273 365000
Fax 01273 365100

Strategy for Renewable Electricity Exploitation in Malta
Volume 2

Issue and Revision Record

Rev	Date	Originator (Print) (Signature)	Checker (Print) (Signature)	Approver (Print) (Signature)	Description
A	May 2005	Philip Napier-Moore	Isabel Boira-Segarra	John Porter	First Issue
B	June 2005	Philip Napier-Moore	Isabel Boira-Segarra	John Porter	Second Issue
C	August 2005	Philip Napier-Moore	Isabel Boira-Segarra	John Porter	Third Issue

List of Contents

Tables

Figures

Glossary

EDRF	European Regional Development Fund
EIB	European Investment Bank
ETS	Emissions Trading Scheme
EWEA	European Wind Energy Association
kW	Kilowatt
KWh	Kilowatt hours
FIT	Feed-in tariff
FEMIP	Facility for Euro-Mediterranean Investment and Partnership
FO	Financing Option
IEA	International Energy Agency
LPG	Liquid Petroleum Gas
MM	Mott MacDonald
MRA	Malta Resources Authority
MW	Megawatt
MWh	Megawatt hours
NFFO	Non fossil fuel obligation
PO	Policy Option
PPA	Power Purchase Agreement
PV	Photovoltaic
RE	Renewable Energy
RES	Renewables Electricity Sources
TA	Technical Assistance fund, of FEMIP
TEN-E	EU Trans-European Energy Networks
VAT	Value Added Tax
WTP	Willingness to Pay

1 Introduction

1.1 Objectives

Mott MacDonald has been commissioned by the Malta Resources Authority (MRA) to assist in developing a policy framework for the support of renewable electricity in Malta. The specific project objectives are:

- to recommend and develop a national indicative target for generation of electricity from Renewable Energy Sources (RES) in accordance with the requirements of the EU Directive 2001/77/EC
- to support, with related information and documentation, the submission to the EU on how Malta can comply with the provisions of the Directive
- to provide a roadmap for implementation of support for RES for electricity generation.

To achieve the objectives the study adopts a three phased approach as follows:

- Phase 1 – characterise the resource, consider the barriers to renewable electricity developments and make suggestions for a renewable target, expressed as a percentage of demand, to be achieved by 2010.
- Phase 2 – develop and present a policy options analysis of measures to support renewable electricity sources in Malta.
- Phase 3 – complete an implementation roadmap guiding the MRA through the process of implementing the selected option.

This report forms the results from Phase 2 of the assessment and should be read in conjunction with the Phase 1 report and its technical annexes. The policy options identified for Malta are drawn from a review of existing measures. These are assessed on a range of criteria, examining how successful they have been in different countries and whether they are appropriate to Malta. The study focuses on how the technology scenarios used to reach Malta's indicative renewable energy target as developed on Phase 1 of the study can be supported and financed. The scenarios outlined below are the basic cases developed in Volume 1, from the more plausible scenario groups, B and C:

- Scenario B1: One Large Onshore Windfarm
  - develop one 15 MW large onshore windfarm on mainland Malta before 2010
  - install PV units on 120 rooftops by 2010
  - install 5 x 60kW wind turbines a year by 2010.
- Scenario B2: No Large Onshore Wind
  - install PV units on 240 rooftops by 2010
  - install 5 x 60kW wind turbines a year by 2010.
- Scenario C3: One Offshore Windfarm
  - install PV units on 240 rooftops by 2010
  - install 5 x 60kW wind turbines a year by 2010
  - develop one 27MW offshore windfarm in 2015.

The study also comments on how renewable projects that do not fall under the technology scenarios described above, and therefore would not be considered in the support schemes put forward in this report, may be supported on a case by case basis.

1.2 Context

Policy packages to support and finance Malta's final indicative renewables generation target, for compliance with EU Directive 2001/77/EC, should be chosen that fit with EU plans for energy policy convergence across its member countries. Although no official EC plans are available at the date of this report, it is useful to note that the electricity industry union EURELECTRIC is in favour of market based mechanisms, such as either feed-in tariffs (see section 2.2.3(i)) or green certificate trading (see section 2.2.4). The European Commission (EC) is due to publish a review of support measures during 2005. Any further developments in the EC's stance on renewable support policy, which might indicate the choice for harmonisation, should be taken into account by Malta.

Some of the issues and challenges of integrating renewables into islands are documented by the "Euro-Caribbean RES Forum" (ECRES), drawing on the experiences of its members. The barriers identified include discriminatory taxation, lack of project developers, insufficient public acceptance, and insufficient relevant training for technicians of ministries, utilities and local industry. General challenges are a lack of previous experience, pilot projects or knowledge transfer. Nonetheless, La Desirade (France), Fiji, Samsoe, Pellworm and Reunion (France) each produce more than 50% of their electricity from renewable energy sources (FED, 2001). Another dozen small islands belonging to ECRES have plans to significantly increase the role of renewables in the generation mix, typically using a combination of onshore wind and solar PV, as well as small hydro and waste-to-energy to meet base load. Although Malta does not have the base load resources that would allow significant renewables penetration, the experience of these islands is encouraging and contains useful lessons.

A specific case study is the island of Gotland (Sweden), which currently generates 15% of its power through renewables, as part of a package of sustainable energy developments. Although interconnected with the mainland, Gotland sets a precedent relevant to Malta because penetration has been facilitated through techniques to connect wind into weak, remote grids, and the RE policy promotion measures applied were developed by the island-specific administration. Gotland's findings since beginning their conversion process in 1996 are given below (Boxer, K., 2001), most of which would apply equally well to large-scale systems on mainland Europe:

- political frameworks and plans need to be put in place
- organisations should be established that can promote sustainable energy
- local companies that can implement and manage RES projects should be encouraged
- utilities need to be involved when grid networks need adapting
- the available financing mechanisms need to be identified and understood; public acceptance issues need to be addressed
- the benefits to the island in terms of jobs and regional economic benefits need promoting; and local participation and ownership should be encouraged.

This holistic package of measures complements International Energy Agency (IEA) guidelines, which highlight the fact that: "*Significant market growth has always resulted from combinations of policies, rather than single policies... In no case is there evidence of strong market growth with only one policy in place. Those countries that have experienced strong market growth in "new renewables", such as*

wind and solar, including Germany, Spain, the United States and Denmark, have done so through a combination of financial incentives and guaranteed prices" (IEA, 2004). The evident transferability of core policy guidelines between island examples and the EU member states referred to in the above quote encourages the use of EU precedents to guide Malta's policy choices.

This report therefore explores policy measures to support electricity generation from RES implemented around the world focussing on the European Union and other island states, to show the range of measures available to Malta, and to select the most promising for inclusion in recommended policy packages.

1.3 Key Conclusions and Recommendations

1.3.1 Conclusions

For small-scale generation, namely Solar PV, 60kW medium wind turbines and micro-wind, the report's main conclusions regarding support measures are as follows:

- A combination of net metering and capital grants would be most effective to support small-scale generation in Malta, according to the criteria defined by this study.
- Assuming a net metering arrangement using the average commercial or domestic tariffs, Table 1-1 summarises the level of capital grant required to obtain a 5 or 10 year payback period on small-scale RES equipment.

Table 1-1 Capital Subsidy Required

		5 year payback	10 year payback
*Subsidy level required to give stated payback period on **3kWp PV system***	Proportion of cost subsidised	90.3-91.7%	80.6-83.5%
*Subsidy level required to give stated payback period on **60kW Medium Wind** system*	Proportion of cost subsidised	66.2-72.0%	32.5-44.0%
*Subsidy level required to give stated payback period on **1kW Micro-Wind** system*	Proportion of cost subsidised	76.1-80.4%	52.1-60.8%

The ranges in the table correspond to the support measures based on either domestic or commercial electricity tariffs

- Incentives for individuals to invest in autogenerating RE equipment improve with rising electricity tariffs.
- For a fifteen year support period assumed for the life-span of the equipment, and a spill tariff set to equal the buy tariff, the total subsidy value with net metering rises with the electricity price. An electricity price rise could cross-subsidise autogenerators supported by this arrangement at the expense of other electricity consumers. To minimise this effect, the net metering arrangement may be set at spill levels below the buy tariff.
- Grants and net metering will require monitoring (consistent with EU Guarantees of Origin) as long as the support measures are in place to combat scope for abuse.

For large-scale generation, namely onshore and offshore wind turbines, the main conclusions regarding support measures are as follows:

- Either a feed-in tariff (FIT) or tendered power-purchase agreement (PPA) would be most applicable measure to support large-scale generation in Malta, according to the criteria defined by this study.
- The level of the guaranteed tariff (either a FIT or a tendered-PPA) is very sensitive to the costs assumed for the large-scale development. In this context, a tendered-PPA has the advantage over a FIT that it can result in more competitive power prices since the bids submitted by project developers may reveal the commercial costs of construction more fully than the public review used to set a FIT rate.

The costs of supporting the key scenarios developed in Phase 1 of this study are summarised in Table 1-2.

Table 1-2: Summary of Level for Support Measures

Scenarios	Costs - annual average over period 2008 to 2020 (€/annum)
Scenario B1	448,100-1,356,300
Scenario B2	1550,200-1,866,900
Scenario C3	1,749,600-3,459,000

Scenario B1: one 15 MW large onshore windfarm, 120 PV units & 15 x 60kW by 2010, Scenario B2: 240 PV units & 15 x 60kW wind turbines by 2010, Scenario C3: 240 PV units, 15 x 60kW wind turbines by 2010 & one 27MW offshore windfarm in 2015.

The ranges in table represent the different policy options suggested in this study and covering user payback period set to 5 or 10 years, the level of net metering based on commercial or domestic electricity tariffs and low or high costs assumed for large scale development.

For other large scale developments outside the scenarios considered in this study (i.e. a large PV farm), applications should be considered on a case by case basis using criteria developed by MRA with support provided if deemed appropriate via a Feed-In Tariff set at a level suitable to the specific development.

The Maltese Government will need to create a fund to support renewables. This study examines ways in which such a fund may be created to support the technology scenarios developed in Phase 1. On the basis of the information available, where stakeholder consultation is so far limited to an 'RE survey' of Maltese households, the most promising financing options considered in this study applicable for Malta are:

- increased tax on automotive fuel
- increased income tax on businesses – passed on to all consumers (Maltese and tourists)
- electricity tariff rises – appropriately branded.

Assuming that the scenarios developed in Phase 1 are financed solely by each of the preferred options in turn, Table 1-3 provides a summary of the rises in the level of tax or tariff that would be necessary. The ranges in the table represent the different policy options explored in this study.

Table 1-3: Percentage Increase in Tariff/Tax in Selected Financing Options

Financing Option	Percentage Rise*		
	B1	B2	C3
Corporate Income Tax**	0.02-0.08	0.09-010	0.10-0.19
Tax on Petrol, Unleaded and Diesel	0.25-0.77	0.88-1.06	0.99-1.97
Tariff rise for all Power Consumers	0.35-1.05	1.20-1.45	1.35-2.68

* Percentage difference in the value of tax or tariff as a result of supporting RES

** Based on data for 2003 given in NSO News Release 231/2004 and the Economic Review (Ministry of Finance, 2004). Figure presented is total revenue from corporate income tax divided by 'Gross Operating Surplus and Mixed Income' component of Gross National Income. Operating surplus is the surplus (or deficit) on production activities before account has been taken of the interest, rents or charges paid or received for the use of assets. Mixed income is the remuneration for the work carried out by the owner (or by members of his family) of an unincorporated enterprise. This is referred to as 'mixed income' since it cannot be distinguished from the entrepreneurial profit of the owner.

Table 1-3 indicates that the maximum percentage rise in tax/tariff level within the three promising financing options is 2.7%, which applies to the most expensive scenario and policy option (Scenario C3, with a 5 year payback period based on consumer tariffs for small-scale RES systems and taking the high cost assumptions for large scale offshore wind). This means that financing the scenarios developed in Phase 1 and particularly if more than one financing option was chosen, would not have a significant burden on tax payers or consumers.

Among the range of measures considered for financing RES support policies, an increase in consumer electricity tariffs is a particularly strong candidate option. Points in favour of this financing option include:

- the fact that this measure directly implements the polluter pays principle, which enjoys public support on the basis of the RE survey
- the average cost of increased electricity tariffs, taken across all policy options and scenarios, is € 6.5 per consumer annually. This is within the amount of € 14 annually that 73% of the RE survey sample expressed willingness to pay
- improved incentives to use RE auto-generating equipment at a household or business level.

1.3.2 Recommendations

The recommendations as a result of the present analysis are as follows:

- To use of a combination of capital grants and net metering to support medium-small scale RES in Malta.
- To employ a tendered-PPA system to support the introduction of large scale wind developments, both onshore and offshore.
- To finance RES through the electricity tariff branded as an eco-tax, to reflect the purpose of the funds raised and to foster awareness of sustainability issues among the Maltese public.
- To carry out a broader consultation than that undertaken in the RE Survey, including discussions with businesses, lobby groups and consumer associations, to assess the possibility of using the income tax system as a means to fund RES.

- To assess as part of the above consultation procedure the extent to which ongoing incentives would be required to successfully promote optimal generation from small-scale autogenerators.
- To carry out a broader consultation on the suitability of a tourist eco-tax to decide the appropriate course of action if this financing option is to be further considered.
- To undertake a programme of public awareness to ensure that RES support is welcomed within Malta.
- To cater for any developments not explicitly covered by the set of support measures chosen, to develop a reserve fund and to consider providing support via Feed-in Tariffs for large-scale schemes and net metering and capital grants for small-scale schemes on a case-by-case basis.

1.4 Report Structure

The report is structured as follows:

- Section 2 reviews a 'long list' of policies currently in operation internationally, it defines criteria for evaluation of these polices and screens out those that are clearly inappropriate for Malta, reducing the options to a 'short list'.
- Section 3 discusses the short list of promising support mechanisms for the renewable electricity generation scenarios analysed in Volume I of the study.
- Section 4 discusses the short list of possible measures to raise the financing necessary for each of the policy support options identified.
- Section 5 provides the conclusions.

2 Policy Review

The discussion of policy measures given in this study is divided between mechanisms to provide support to RES and mechanisms to raise financing for the chosen package of support options. Sections 2.2 and 2.3 outline the possible mechanisms for support and financing respectively, and provide an opportunity to screen these according to the criteria set out in section 2.1 below.

2.1 Criteria for Assessment and Selection

This section presents the criteria for assessing the policy measures considered in the review in order to select those most appropriate for Malta and with a successful track record. These are based on key issues, as identified in consultation with Maltese stakeholders, and on pragmatic social, economic and technical considerations, as outlined below:

- *Public acceptability*, referring here mainly to the need for policymakers to take into account public preferences in how support is provided to renewable generators and how financing for such support is raised. A central source of data in evaluating the public acceptability of different measures is the 'Renewable Energy (RE) Survey' designed by Mott MacDonald and carried out by MRA, which interviewed a sample of 500 Maltese residents by telephone. The sample was drawn at random and it covered all the different Local Plan areas in Malta. The survey covers opinion on climate change and renewable energy use, a consideration of resident's 'willingness to pay' (WTP) for power generated by renewables, and opinion on the best mechanisms to raise the necessary financing. The RE survey in Malta does not point definitively to a financing mechanism and level, but does provide a gauge as to the relative acceptability of different options.
- *Fit with market structure in Malta*, applicable in the case of market-based policy interventions, which would require a liberalised electricity market to function effectively.
- *Administrative burden* to the Maltese authorities, which reflects the cost of implementing the measure, in addition to any direct subsidies that the relevant policy involves. The administrative burden therefore affects the cost-effectiveness of a policy measure, as well as indicating whether the measure is practical considering existing administrative constraints.
- *Flexibility*, so that the policy applied can be adapted to advances in renewable generation technology (e.g. offshore wind), changes in the economic climate, or shifts in public opinion. This may be particularly useful if world fuel price changes affect the competitiveness of a renewable generator versus conventional generation plant.
- *General applicability to Malta*, refers to other technical, economic and social grounds why a given policy measure would or would not be suitable for Malta, besides the areas covered in the criteria above.
- *Success of precedents*, including presentation of similar policies previously implemented in other countries, particularly in the EU. The salient features of selected precedent policies are examined and their relative success discussed using the available evidence and industry commentary.

These criteria are considered in screening the measures outlined in section 2.2 and 2.3 below. Each policy measure reviewed is ranked as *low*, *moderate*, or *high* for its suitability in each assessment criteria. This allows for ready comparison of the measures, as summarised in Table 2-1.

2.2 Support Mechanisms

This section reviews a long list of different measures commonly used to support renewable electricity generation, focussing particularly on past experience within the EU. Those measures that are inappropriate for Malta are screened out at this stage. The range of reviewed support mechanisms considered is as follows:

- Tax Incentives
- Investment Grants
- Guaranteed generation tariffs
- Quotas and Green certificates

Apart from these four categories of support measures, many countries also sponsor focussed renewables R&D through different mechanisms. Such R&D measures have not been considered in this review, which takes a project focus and is concerned with Malta's ability to meet capacity targets, rather than develop a domestic RE industry.

By contrast, public awareness of climate change, and the use of renewable energy resources to mitigate GHG emissions, is a complementary feature of governmental renewable energy strategies that is essential for acceptance of new generation technologies. As such, this measure should be a part of any policy package for RE promotion, with only the approach varying to complement the generation strategy chosen. Awareness creation is generally coordinated by a government-designated agency, which channels funds into advertising, industry forums and promotional events. Other previously successful measures are labelling of electricity bills to give the renewables breakdown of power bought, and using renewables on prominent buildings for demonstration projects.

In other EU countries a dedicated agency or governmental department is generally set up to deal with the significant logistical demands of effective awareness creation. Where an independent agency, at arms-length from government, is used to promote renewables this carries the potential benefit of greater credibility with the public. In the case of Malta, a single individual with access to adequate resources might be sufficient to implement the public awareness program across the archipelago. This individual could operate from an existing professional body to take advantage of institutional expertise and public brand recognition. Government-affiliated examples within Malta include the Malta Resources Authority (MRA) and the Institute for Energy Technology (IET). Even in this case, however, this support measure implies a significant administrative burden compared with the others outlined below. We consider that the administrative burden of awareness creation is an unavoidable cost, however, since public understanding of RES is likely to be essential for broad-based support of the national renewable generation strategy finally chosen. Public awareness may be particularly important in Malta, where potential developments would have an island-wide visual impact.

Each of the support measures discussed also needs to be accompanied by action to ensure other potential barriers do not conflict with incentive creation. These potential barriers include the legal and land availability issues identified in the Phase 1 legislative review, as well as priority connection of new projects to the transmission system, streamlining of planning barriers to RES installations and possible limitations on the electricity distribution charges that Enemalta, as the grid operator, can levy. A further potential barrier is fraudulent misuse of a RES support measure. This should be mitigated through monitoring of incentivised renewable generation. Monitoring of RES in Malta would need to be consistent with the system of 'Guarantees of Origin' for RES, mandated in EU Directive 2001/77/EC. The Directive states that renewable energy generators need to obtain a certificate that demonstrates that the electricity is produced from renewable energy sources. In Malta, LN 186 of

2004 establishes MRA as the competent body, to provide objective, transparent and non-discriminatory criteria for issuing the guarantees of origin. Pursuant to this clause, the only renewable generators that will receive financial support (if appropriate) and contribute to achieving the Maltese renewable target will be those that are adequately certified. In some European countries, including the UK, the Guarantees of Origin are issued by the electricity regulator and once a renewable project is registered, the regulating authority undertakes periodic audits to ensure that claim for any support is justified.

Certificates of Origin are recognised throughout the European Community. This means that Maltese renewable generators may be able to trade across Europe if Malta establishes an interconnector with mainland Europe in the future (more details on how the Guarantees of Origin may be administered will be provided in Phase 3 of the study).

One important distinction between support measures is whether they are targeted at large-scale generation installations supplying electricity to the grid on a commercial basis, or at small-scale autogenerators using RES primarily for their own consumption, such as households and small businesses. The different support mechanisms are discussed below taking into account their applicability to different technologies and their suitability for Malta according to the criteria described in section 2.1.

2.2.1 Tax incentives

Taxes that reflect the environmental impacts of each technology can help to 'internalise the external costs', forcing polluters to recognise the environmental and health costs of the technology they are using. This is represented by EU Directive 2003/96/EC, implementing the "polluter pays" principle to address environmental externalities by setting minimum tax rates for end users of energy products, including electricity generated with fossil fuels. A discussion of the quantified external costs of power generation is given in section 3.3.3.

Tax incentives can work to support renewable electricity generation both by imposing a pollution penalty on conventional electricity and by subsidising renewable electricity through a range of tax relief measures, each at either the level of users or generators. Both effects can act to make the full costs, including long-term environmental damage, of conventional electricity generation transparent, and to level the playing field between renewable and conventional generation.

Penalty taxation measures for fossil fuels include:

- Taxes on coal and oil products – the latter typically with different rates on gasoline, diesel, fuel oil and natural gas. In Malta, the relevant fuels related to electricity generation are fuel oil and light distillate (diesel). Taxation levels observed within the EU are up to €0.073/litre on light fuel oil and €0.86/litre on non-commercial automotive diesel (see Appendix A). Fossil fuel taxes, such as on diesel for power generation, can increase the relative attractiveness of renewable electricity to generators. At an end-user level this measure could incentivise renewable electricity generation in the case of an autogenerating consumer (e.g. diesel generator set) switching fuels to small wind, PV or grid electricity with a percentage of renewable content.

- Taxes on electricity, levied at the level of generators, distributors, or end users. In the case of Malta, Enemalta and electricity consumers would be possible targets. Renewable electricity will typically be exempt from the tax, and may receive further subsidies from the revenues collected. In the Netherlands, an energy tax on small consumers between 2001 and 2004 of €0.0639/kWh gave a partial exemption of €0.029/kWh for renewables[1], and claimed to level the costs of green and conventional power (IEA, 2004a), significantly increasing RES uptake. This level of energy tax is in itself greater than the lowest-band electricity tariff in Malta.
- Taxes on emissions levied at the generator level, typically on carbon dioxide and sulphur dioxide. Sweden and Denmark both combine generation emission taxes on sulphur and carbon with an electricity generation tax.

Whereas electricity generators are the typical target of taxes on carbon and other emissions, taxes on conventionally generated electricity can also be levied on the end users with the same effect of giving a relative cost advantage to renewably generated power.

A combination of the above measures is demonstrated by the UK 'Climate Change Levy', which imposes an energy consumer tax in industry, commerce, agriculture and the public sector. The levy applies to gas (€0.0021/kWh), electricity (€0.0060/kWh), Liquid Petroleum Gas (LPG, €0.0134/kg) and coal (€0.0164/kg). Exemptions apply for solar and wind power (100%), energy-intensive industries committed to deliver specified energy savings (80%) and horticultural producers (50%). The levy package as a whole is designed to be broadly neutral for the manufacturing and service sectors Revenues from the levy are recycled back to businesses via a 0.3 percentage point cut in the main rate of employers' National Insurance contribution and additional support for energy efficiency measures. In 2001-2002, £50M (€70M) was available from the levy to support energy efficiency advice, promote the take-up of low-carbon technologies and to promote renewable energy projects. Some £200M (€280M) was expected to be available from the scheme in the 2001-2003 period (IEA, 2004a). The scheme is considered a successful means to increasing the relative attractiveness of renewables, which together with the renewable obligation measure in the UK has effectively incentivised renewable energy investment.

In addition to penalty taxation of conventional energy, tax relief measures to support renewables include:

- Waiving specific taxes on renewable energy, either for generation companies or end users. Among the possible taxes that can be waived are value-added tax (VAT), excise, income, property, and energy. In Belgium, France, Portugal and the UK, for example, partial or full VAT exemption is granted on various energy-efficiency and renewable equipment purchases. In Malta, the exemption of the percentage biomass component of bio-diesel from excise tax is a further example.
- Allowing an initial investment in renewables to be deducted from taxable profits – either permitting a proportion of the investment to be directly expensed, or the rate of depreciation on a renewable investment to be higher, effectively delaying taxation on company profits.
- Giving energy tax rebates for use of renewable energy, as detailed above.

A.1.1 [1] Tax levels given are those from July to December 2003. Incentive mechanism replaced by a feed-in tariff from 2005 onwards.

Apart from waived taxes on developer company profits, tax relief measures can be targeted at either end-users or at generators, as with the penalty taxation approach. The tax incentive could also be designed to incentivise renewable generation on a large or a small scale. The appropriate recipient of the support measure would depend on the technology under consideration, with large windfarms requiring a revision of corporate taxes and small wind and PV requiring a revision of household and small company taxes, for example. Additionally, the extent of tax relief normally varies with the renewable technology, being higher for those technologies further from commercial viability. In terms of market and general applicability to Malta, a tax relief mechanism would be *highly suitable,* being a flexible enough tool to apply at any level in a well-managed fiscal system.

Among the EU precedents, at least 17 of the 25 member states provide tax relief to one or more renewable energy technologies. The majority of these, totalling 11 countries, give tax relief on income or investment costs, with relief ranging between 10% (Spain) and 75% (Greece). Three countries combine this income tax relief with VAT relief. The energy tax is another popular mechanism, which generally supports renewables both by a relative advantage over conventional generation through tax exemption and by direct subsidies from the public funds raised. Few countries use only tax incentives to support renewables investments, however, indicating that this measure is useful but not sufficient to a successful promotion policy, ranked here as *moderately successful.*

The full range of tax incentives could be applied in Malta to support investment in renewable generation capacity. It is unlikely that tax incentives alone would be sufficient to make renewables investment profitable for potential project developers and autogenerators. The tax incentive measures would imply a *moderate administrative burden*, requiring legal input for revision of the tax code and education of relevant taxpayers. In the case of VAT in Malta, the Minister of Finance is empowered by the Value Added Tax Act, 1999, to amend the schedules to the act stating the items charged at the standard and concessionary rates (see section 2.3.1(ii) below). This is therefore an example of a relatively simple means to provide support to RES, through lower taxation of relevant equipment.

The tax incentive measure would be *highly flexible*, relative to other support measures considered, as it could be changed at any time at the expense of a similar level of administrative burden. Whether the tax relief measure would be publicly acceptable depends on the type of tax, particularly whether this is seen to target polluters, and is dealt with further on the basis of survey data in section 2.3.1 on tax financing. General *public acceptability* is taken here as *moderate*.

Tax relief measures can be a direct way to provide incentives via the taxation structure rather than via tariffs, which could be preferable in Malta since a rise in the electricity tariff level is politically sensitive and evidence exists of public preference for a levy earmarked for investment in renewables, rather than an increase in existing taxes (see section 2.3). The general exception to this is the case of a tax on conventional electricity generation, either on the oil-product fuel or the power generated, from which renewables would be exempt. The cost of added taxes on power would normally be passed through to the consumer via the electricity tariff. Under the fixed consumer tariff regime in Malta, this would not necessarily be the case, since higher generation costs would either necessitate a tariff review or oblige the government to increase the subsidy on domestically generated power, instead passing the tax burden on to consumers through taxation measures.

2.2.2 Investment Grants

Direct grants are a widespread form of policy intervention to incentivise increased use of renewables, by reducing the direct capital cost of the project. From an economics perspective, such direct payments are a “second best” solution compared with the tax-relief in section 2.2.1 above; since taxes

more directly implement the principle that the 'polluter pays' for the external environmental costs. In practical terms, however, such 'second best' measures may be more politically viable and just as effective as tax relief. In any case, few existing taxation schedules claim to represent the 'true' costs of pollution as they should in a 'polluter pays' framework, but instead represent a policy compromise.

Examples of grant schemes include:

- Debt guarantees, whereby the government commits to underwrite third-party loans taken by a renewable project developer, promising to repay any outstanding balance in the event that the project goes bankrupt. The observed example of this measure is in Japan, where the government guarantees up to 90% of debt capital taken by a renewable project developer.
- Subsidised interest on third-party debt financing for renewable generation investments. EU cases show soft loans with typical interest rates of 2% below market level, with a full observed range of 1-5% (IEA database). A limit e.g. 50-70% is normally imposed on the total percentage of project investment that such subsidised debt can cover.
- Capital contributions for renewable equipment purchase. In Malta since 1 January 2005, this incentive already applies to household solar energy heating systems and electric cars, which benefit from a capital rebate of 15.5%, up to Lm 50 and Lm 500 respectively.
- Making available public funding to conduct feasibility studies on potential installation sites.
- Assistance with the marketing of a renewable product, such as through public awareness creation programmes, discussed in 2.2 above.

As with tax relief measures, grants can be targeted at different stakeholders in the energy supply chain, although grants can also be directed at municipalities and community groups. Grants can provide support dependent on the type of the renewable technology and generator system size. Minimum renewable generation system sizes and a limited timeframe generally apply to grant schemes, restricting the projects eligible for support and therefore the overall cost of the measure.

European evidence suggests that investment grants for large scale commercial projects need to be part of a range of support options designed to reduce investment risk by increasing confidence in the market for the renewable power generated. Greece, Cyprus and Finland offer generous investment subsidies in the range 30-40% on windfarms, but the programs have not resulted in significant wind project developments in these countries. This lack of success is due to an absence of complementary measures to reduce investment risk such as a conducive regulatory environment that provides incentives to the network operator to provide adequate grid access. The European Wind Energy Association (EWEA) considers investment subsidies as an effective mechanism to support offshore wind in combination with other measures, such as a guaranteed tariff or obligation (see 2.2.3 and 2.2.4 below) to guarantee investors that a market exists for the electricity generated (EWEA, 2003).

Investment subsidies may be appropriate for small-scale autogeneration units, however, where power is largely used on-site and investor confidence of outside power demand is not the central concern. Germany's '250MW' promotion of small-scale wind turbines from 1989 to 1998 assisted the installation of 1,560 units, with average capacity 2kW, exceeding the program target. The '250MW' program offered either €100 per kW installed, or a premium of € 0.04 per kWh for electricity fed into the public grid. The investment grant component was limited to 60% of total investment, up to a maximum of €50,000 and for installations below 0.5MW capacity.

Investment subsidies are also widely used to incentivise PV, with grants ranging between 30% and 70% of investment costs in the 9 members of the EU25 where this type of policy is documented (IEA,

2004). These subsidies have been most successful in Germany, where more than 70% of PV installations within the EU15 took place between 2001 and 2003. Apart from the high level of PV subsidies available in Germany, varying between 50% and 70% of capital cost for households in different successive support programs, popular support for renewable energy has been central to this success. Community enthusiasm for both PV and wind has been successfully fostered, through consultation, education and community involvement in projects. This is not typical throughout the EU, where public opposition to wind especially can be high. Overall, grant incentive measures have had *moderate previous success*, working in selected cases when strongly supported with complementary measures.

For Malta, as for other EU countries, investment grants would be most effective for small wind and PV installations, where the power generated is largely for the owners' own use and the need for supplementary support measures to guarantee a market for the electricity produced is less critical. In this case, the grant should be set at a level that allows the subsidised small-scale autogenerators both to overcome any credit constraints they face and to perceive an incentive through the grid electricity purchases saved. The grant measure has a *high degree of flexibility*, with the total funds available open to governmental revision depending on progress in the scheme and the technologies available. The administrative burden of this approach would be significant, requiring that guidelines on applying for funds are publicly advertised, eligible applications are approved on an ongoing basis, and necessary due diligence is carried out on the full range of installations given funding. The measure would therefore have *low suitability* on the administrative criteria.

Such an autogenerator grant scheme would be a publicly visible effort to promote renewable energy, with potential to satisfy the 96% of surveyed Maltese residents that agreed with the statements *"I would like some electricity to come from renewables in Malta"* and *"I would prefer Malta to develop renewable energy instead of more fossil fuel power plants"* in the RE survey. The scheme could also foster a sense of private ownership for RES expansion in Malta, contributing to the task of public education through demonstration plants. Grants are therefore expected to have a *high level of public acceptability* in Malta.

The main obstacle to such an incentive mechanism in Malta is the low level of consumer electricity tariffs, which are significantly lower than generation costs associated with the existing plants, and can be around a third the level of equivalent tariffs in mainland Europe. The low level of tariff, particularly for domestic consumers, means that all possible RES are uncompetitive to end-users, with very long payback periods even when subsidised. Medium wind has an estimated simple[2] payback period of 18 years without subsidy (see Phase 1 Volume I report). A 60% grant such as in Germany under the '250MW' program might still provide a marginal incentive to the farmstead owners who could install medium wind on their property. Even with a government grant covering 70% of capital costs, PV has a 29 year simple payback period for a 'block 2' domestic electricity consumer (see Phase 1 Volume I report). Investment grants alone are not therefore likely to successfully incentivise significant RES capacity in Malta, but are most promising for small-scale projects and when combined with some of the other measures discussed. Other measures can also help to offset the weakness of the investment grant in providing incentives to generate the maximum amount of energy, rather than simply install a low efficiency system, or maintain the system poorly once installed.

The cost-effectiveness of an investment grant measure would improve with higher end-user tariffs, both in terms of the level of subsidy required and the incentive for autogenerators to put in place an

A.1.2 [2] Not discounted to give a Net Present Value (NPV)

efficient, well-maintained RE systems that will continue to generate optimally over their projected lifetime. In terms of both power market structure and the general conditions in Malta, a grant measure would currently be of *moderate suitability*.

2.2.3 Guaranteed Generation Tariffs

By providing premium rates compared with conventional generation, guaranteed tariffs secure the income stream of the renewable energy generators necessary to make renewables commercially viable. A guaranteed tariff is another 'second best' measure, where typically, different categories and capacities of electricity generator receive a set range of rates for electricity above the market price. The cost of the guaranteed tariff system is the difference between the level of the tariff and the market price of electricity. Both the public cost and the level of support offered to renewable generators therefore changes with the electricity price, which can have perverse effects in liberalised power markets. Such perverse effects have been observed in the Norway and Sweden, where the power price rose above the guaranteed tariff in 2002/03, when dry weather heavily reduced the power supply available from hydroelectric plants (EWEA, 2003). Three different types of guaranteed generation tariff are considered in this review:

- Commercial feed-in tariffs
- Tendering out Power Purchase Agreements (PPAs)
- Net metering for end users

These alternatives are respectively discussed in sections (i), (ii) and (iii) below.

(i) Commercial feed-in tariffs

As applied to large-scale commercial installations, the guaranteed tariff generally takes the form of a "feed-in tariff" (FIT) offered to all potential generators, which helps reduce the project risk faced by investors. IEA (2004a) and EC (2004) reviews document feed-in tariff rates for onshore wind power ranging from €0.06/kWh to 0.084/kWh, and for commercial solar plants from €0.062/kWh to 0.60/kWh.

This measure is widely considered a central component to RE policy, and has enjoyed significant previous success. Statements from the "International Feed-in Cooperation" (2005) indicate that the feed-in incentive schemes adopted by Spain and Germany result in prices per kWh that are cheaper than in countries with other methods of support, such as quotas (see section 2.2.4). Sixteen of the 25 EU Member States already had such feed-in tariffs for renewables in 2004. Within the scope of this study for Malta, onshore and offshore large wind installations would be the relevant focus for FITs. The EWEA (2004) give the opinion that *"FIT systems have been highly effective at attracting wind power investments in Denmark, Spain and Germany"*. Where the EWEA state they have been less effective it is due to planning barriers, such as in Greece and France.

Currently, large wind installations in Malta would have to satisfy the provisions of the Electricity Regulations 2004 (LN 511/04), issued pursuant to the Malta Resources Authority Act 2000, to gain planning permission. Under these regulations, MRA authorisation to build new generation capacity rests on defined criteria including the developer's financial capacity and technical skills; ancillary services to ensure the stable and secure operation of the electricity system; and the satisfaction of safety and environmental permitting requirements. Connection to the grid is made through an application to Enemalta, as specified in the Enemalta Act. Connections offered under the Enemalta

Act expire by the 31st December 2010, and another mechanism would be required to ensure the long term grid connection status of new generation plant. For a full consideration of legislative issues surrounding new generation capacity in Malta, refer to Volume 1 of this study, Annex E.

Assuming planning and grid connection barriers are removed, the extent of FIT effectiveness depends on the tariff level. The support level given by the FIT should allow generation investments to be profitable, factoring the risk of changing electricity market prices, interest rates and inflation rates. This could include a commitment by Government to raise the feed-in tariff level – for example if interest rates rise and increase the cost of debt capital to project developers, or if inflation rates rise and reduce the relative value of tariff revenues in making debt repayments. Given stable market conditions and an appropriate FIT level, this measure has the potential to be *highly effective* for large scale installations.

Placing a RES feed-in tariff obligation on Enemalta would have a *high level of compatibility with the power market structure* in Malta, since this measure does not require a liberalised energy market. Administration of the scheme would require monitoring of the installations benefiting from the FIT, to ensure the power being fed into the grid is renewable and at the same levels as claimed. As the number of large-scale wind installations feasible in Malta would be limited (see Volume 1 of the study), this would entail a *low (highly suitable) administrative burden*. The *public acceptability* of the measure is likely to rest on the means of raising funds to cover these power costs, rather than the mechanism in itself (taken here as *moderate*). Although costs are typically shared among electricity consumers, financing could also be raised through an 'eco-tax', as dealt with in section 2.3.1 below. The potential weakness of this measure is that, to be effective, it relies on a credible long-term commitment of price support for a given installation, limiting adaptation of the generation mix with future advances in available technology. This *low flexibility* can be somewhat mitigated by implementing the feed-in by phases, either reviewing tariff rates for each technology at periodic intervals, e.g. five years, or capping the installed capacity to which a given tariff rate applies.

A variant on the FIT price guarantee is a fixed premium, where government policy fixes a premium to be added to the market electricity price, rather than the tariff price itself. Under a flexible electricity price regime where cost rises are passed through to consumer tariffs, this would give a predictable additional cost to consumers for a given percentage of renewable electricity generation on the grid. In the case of Malta, however, where prices are set by formal decision of the Minister for Investment, Industry and Information Technology, the effect of this measure is no different from a feed-in tariff.

A FIT obligation on Enemalta would be a blanket measure, most appropriate to a number of large-scale RES generators. In the event that only one or two large-scale installations stand to benefit, a FIT could be insufficiently targeted to the needs of national energy policy, compared with potential sites or permitting applications being dealt with on a case-by-case basis. Assuming a small number of large-scale installations, the FIT would be only *moderately* appropriate to Malta, therefore.

(ii) Tendering out PPAs

A competitive tender for a limited number of power-purchase agreements may be an effective means to set a tariff rate for large scale generators, balancing the incentive provided to the project developer against the additional power costs incurred versus conventional generation. The mechanism is simple, with developers invited to bid for a certain capacity of plant before a fixed deadline. The developer that bids to supply electricity at the lowest cost wins the contract, typically for a 15-year PPA term. The difference between this winning bid price and the cost of conventional generation is therefore the subsidy on renewable power. This bid price has the advantage to investors that it is enforced under

civil law, and is therefore commercially low risk, and the advantage to the public that the price set by the market rather than the best-guess of a policymaker, so is politically low risk. This measure would most reasonably apply to the onshore and offshore windfarm possibilities within Malta.

A call for tenders for large scale renewables can be either site or technology specific or a combination of both.

Site-specific tender process: In this case the tender scheme is designed to include a 'specific site' element. Potential developers are provided with areas designated by the government, and are invited to submit their bids. The land offered will be either public land or land that the government has expropriated for this purpose. As discussed in Annex E of Phase 1 Report, (section E.4.4), the latter option is likely to be more complex and contentious. The designated areas may be exactly specified in terms of longitudes and latitudes, or flexible to proposed amendments by the developers, to be assessed by an appropriate body on a case-by-case basis. In each case, upper and/or lower limits of generating capacity, number of units or other constraints may be applicable, depending on the characteristics of each particular site and the overall target of the scheme in terms of RE deployment (which should be consistent with National/EU targets).

This site-specific approach could minimise the risk of developers failing to gain planning permission, which was one of the main reasons why many contracts under the earlier UK NFFO rounds, discussed below, failed to materialise. Some preliminary work could be carried out in terms of ensuring that the designated sites fulfil some basic planning criteria, which can be assessed for example by carrying out a Strategic Environmental Assessment (SEA), while leaving the potential developer to carry our a project specific Environmental Impact Assessment and assemble the remaining consents as necessary.

Such a site-specific tendering scheme is currently being implemented in the UK for new offshore windfarms. The Crown Estate, as landowner of the seabed out to the 12 nautical mile territorial limit, is leasing areas of the seabed for placing wind turbines. The criteria used by the Crown Estate in assessing bids include the financial standing of the candidates, their offshore development expertise and their wind turbine expertise in particular. Tendering of the construction site is independent in the UK from the grid access and power sale contracts. In the case of Malta, the two processes could be combined to simplify the development process for the limited number of sites available. A tender could therefore be on the basis of price in addition to those criteria already outlined.

Technology-specific tender process: The scheme can be constructed to allow for a number of technology specific tendering processes or 'technology tranches', if more than one large-scale RES installation type is envisaged. Contracts are awarded to the most price-competitive schemes within each technology tranche. This approach must be considered as an essential element of the overall scheme as it allows only similar technologies to compete with each other, and ensures that each technology progresses at an appropriate pace since it is receiving the appropriate level of support.

Site-specific and technology-specific tender processes are not mutually exclusive, and a combination of the two could be devised should it serve the purposes of the overall National strategy. In the case of offshore and onshore wind, despite being characterised by different financial, technical and other[3] properties, in the case of a site-specific tender, they would be included within the same technology band as they will obviously not compete against each other. On the other hand, in the case of a non-

A.1.3 [3] For example, offshore and onshore wind face different development obstacles; potential onshore windfarms will face the land availability as well as visual impact issues, while potential offshore developments' main concerns may be impacts on marine life, fishing and naval activity considerations.

site specific tender, offshore and onshore wind should be in separate technology bands as the increased capital costs of offshore wind will effectively prohibit such developments to compete with onshore windfarms on offered prices.

The main advantage of a site-specific option would be that it favours development of RE projects in sites where National strategic planning may indicate as more appropriate but it restricts development to government land or areas that may be expropriated by government. This approach may serve the dual purpose of developing large-scale RES in areas where both environmental consequences and the potential developer's planning risk are minimised while also reducing the average project completion time. In the case of Malta, it could be used to promote public site, large-scale developments such as offshore wind. In the event that the most suitable sites are located on private land, (this may be the case for onshore wind), a technology specific tender may be the most appropriate process.

As discussed in Annex E of the Phase 1 Report, a tendering procedure is catered for in Malta's power sector regulations 2004, (Legal Notice 511/04 which transposes EU Directive 2003/54). More broadly, the applicable law with respect to public procurement in Malta must also be considered, currently the Public Procurement Regulations, 2003. This set of regulations is in the process of being substituted, however, by the Public Contracts Regulations, 2005; and the Public Procurement of Entities operating in Water, Energy, Transport and Postal Services Sectors Regulations, 2005. These latter regulations allow for a number of flexible tendering procedures, fully implementing the EU consolidated directives on procurement, as established by directives 2004/17 and 2004/18. The 'competitive dialogue procedure', applicable *"in the case of particularly complex contracts"* and awarded to the most 'economically advantageous' tender, might most appropriately apply to a PPA. A detailed analysis of the appropriate procurement procedure would be required in the case that this option was taken forward.

Tendering PPAs for windfarms has been implemented in Ireland, France and the UK. The UK's poor experience with its non-fossil fuel obligation (NFFO) has reduced enthusiasm for this approach, however. Under the NFFO, developers could win bids at unrealistically low prices, on the assumption that prices for wind technology would fall. This meant that projects were developed very late or not at all. The EWEA (2003) recommends a deadline for project development and "meaningful penalties for failing to meet the contract", in order to combat these potential problems.

Compared with a blanket feed-in tariff for windfarms, bidding out a limited number of PPA agreements can reduce the offered cost of power and therefore the total subsidy a country offers to new wind investment projects. In the case of Malta, where the number of viable sites for onshore and offshore large wind is highly restricted, a tender could provide a more direct and simple approach than a feed-in tariff, with many of the same advantages. The differences compared with the feed-in tariff are a *moderate level of previous success* and a *high degree of applicability to Malta*, where the limited number of potential sites makes a blanket policy redundant. This is likely to imply a reduction in administrative burden – as the upfront commitment of managing the tender process is less complex than enacting reform of power purchasing regulations and the follow-up processing of FIT applications.

A further possible barrier highlighted by the competitive tender approach is a lack of potential developers involved in the bidding process, which is a common potential barrier for islands, as identified in section 1.2 above. This carries with it the risk that only high and collusive bids will be submitted, which would not give a cost-effective result compared with a FIT. A cap to the bid price is one possible approach to mitigate this risk, although a 'negotiated procedure', which screens potential

bidders before the formal tender is issued, is likely to be better perceived by potential project developers.

A tender process could be a good option for Malta, provided that a sufficient number of potential developers are involved in the bidding process, and that steps were taken to mitigate the risks of high prices and delayed projects.

Malta's electricity regulations (LN511/04) indicate that as well as being able to call for new capacity through a tender process, new generation can enter the market via the authorisation procedure with MRA being responsible for granting or refusing authorisations. This means that it is legally possible for one-off large-scale renewable developments to take place outside of any tender process or RE scheme that may organised by MRA. In this event, new projects would not compete directly with other technologies already supported via a tender process and they would have to be analysed and considered on a case-by-case basis. The specific development would need to be analysed based on its merits, using criteria such as its potential role in Malta's energy policy, its impact on the electricity system, its ability to compete with other renewables and the likely level of support and financial burden it may require. If the project is deemed appropriate, then a suitable Feed-In Tariff could be determined to support the scheme (See section 2.2.3(i)). Additionally, a reserve fund for technologies not explicitly covered by the set of support measures chosen could be created and applications for RES support made on a case-by-case basis.

(iii) Net metering for end users

Net metering is measurement of the power that small-scale self-generating end users spill to the grid when generating more than they use. The associated support measure is purchase of this spilt power by the utility, typically at the same price as it sells to the self-generating end user. This provides the same incentive as a feed-in tariff for large-scale generators, but with the subsidised tariff rate being specified to adequately incentivise investment in RES by the relevant power consumer, rather than by the relative competitiveness of the technology. The net metering tariff is likely to vary with social perceptions towards RE technology, therefore, rather than being a purely financial variable as in the case of a commercial FIT. Net metering could, for example, help to promote micro-wind and small PV installations on household or commercial properties.

Net metering implies a *high administrative burden* compared with a commercial-scale feed-in tariff or tendered PPA for equivalent capacity, since a large number of end-users are involved rather than a single large generating company, as for investment grants to small-scale users. This will be the case particularly for monitoring of the scheme by the designated regulator, to ensure that all beneficiaries are using renewables and are not tampering with the metering process. With proper design, however, the supplementary activities can be coordinated with standard meter monitoring conducted by the electricity distributor, so as to minimise the supplementary burden. Although two-way meters need to be installed, the costs of these are small compared with the PV or micro-wind autogeneration equipment. The large number of end users that can potentially be involved means that a net metering measure could be *highly applicable to Malta*, providing that the small scale generation technologies enjoy public acceptance. In other respects, net metering has the same advantages and disadvantages as a commercial feed-in tariff.

A number of European countries offer a specific net metering type incentive for small-scale PV, varying from approximately €0.07/kWh in mainland Greece to €0.60/kWh in Austria, at 2003 tariff levels. Looking specifically at Cyprus, a tariff of approximately €0.21/kWh is given to grid-connected PV systems smaller than 5kWp, equating to a subsidy of €0.14/kWh. This tariff is coupled with an

investment grant varying between 40% of capital cost for enterprises and 55% for non-profit premises (households, schools etc) up to a maximum of €12,200 and €16,600 respectively. These subsidy conditions would equate to a 13 year payback period for the 3kWp PV system introduced in phase 1 of this study. Such a combination of incentives giving a low payback period is generally effective at increasing small-scale RES penetration.

2.2.4 Quotas and Green Certificates

In quota systems, the government sets a minimum level of renewable energy that should be produced and purchased by consumers. In a competitive electricity market, it is then up to market forces to determine the price, as in the case of a competitive tender (see section 2.2.3(ii)).

Renewable electricity obligations on generators, suppliers, grid operators or end consumers are generally implemented through a requirement for the purchase of green certificates, which are associated with renewably generated power. This market trading system has the potential to deliver an increase in renewable generation more efficiently and cost-effectively than direct targeted subsidies, by utilising private sector competition. In many of the examples encountered however, which represent as yet immature systems, including Austria, Belgium and Sweden, certificate prices are either regulated or constrained by a ceiling and floor.

To be effective, a green certification measure relies on a competitive electricity supply market, with a range of both renewable suppliers and electricity distributors. This competitive supply market is not present in Malta. Further, EWEA's 2004 Position Paper does not yet find evidence that certification schemes are effective, whereas feed-in tariffs and premiums are already shown to perform effectively. This measure is not considered further, therefore.

2.2.5 Strengths and Weaknesses of Support Measures

Table 2-1 below highlights the comparative suitability to Malta of the support measures reviewed in sections 2.2.1 through 2.2.4 above, using the criteria defined in section 2.1. The applicability of each measure to large- or small-scale generation technologies is also indicated.

Table 2-1 Relative suitability of surveyed support measures against defined criteria

Support Measure	Public Acceptability	Fit with market in Malta	Administration (Highly suitable if Low cost)	Flexibility	Appropriate to Malta	Success of precedents	Small- /Large-Scale Applicability
Tax Relief	*Moderate*	*High*	*Moderate*	*High*	*High*	*Moderate*	*Small- & Large-scale*
Investment Grants	*High*	*Moderate*	*Low*	*High*	*Moderate*	*Moderate*	*Small scale*
FIT	*Moderate*	*High*	*High*	*Low*	*Moderate*	*High*	*Large scale*
Tendering out PPAs	*Moderate*	*High*	*High*	*Low*	*High*	*Moderate*	*Large scale*
Net metering	*Moderate*	*High*	*Low*	*Low*	*High*	*Moderate*	*Small scale*
Quotas & Green Certificates	*Moderate*	*Low*	*Low*	*Moderate*	*Low*	*Moderate*	*Large-scale*

The short list of measures defined as most applicable to Malta for small-scale generation are:

- investment grants
- tax relief
- net metering.

Such measures work to improve the economic attractiveness of an investment in autogenerating technology, such as Solar PV. For large-scale generation, the short list is comprised of:

- guaranteed tariffs, either FIT or tendered PPA
- ongoing tax relief.

Upfront tax relief measures are unlikely to be of central importance for supporting large-scale developments due to the large amount of investment required for commercial installations and because they would not help to reduce commercial developer's credit constraints. The measures best suited to Malta are therefore guaranteed tariffs, either FIT or tendered PPA, and possibly ongoing tax relief.

The relative key advantages and disadvantages of the short list of most suitable measures are summarised in Table 2-2.

Table 2-2: Key Advantages and Disadvantages of Support Measures

Support Measures for Small-Scale Renewable Generation	
Strengths	**Weaknesses**
• **Investment grants and tax-relief on the purchase**: these are an up-front incentive to invest, helping to overcome any credit constraints faced by the electricity user. • **Ongoing tax relief and net metering**: these measures provide ongoing incentive that can help to ensure initially subsidised RE equipment remain in operation, and does not fall into disrepair.	• **Investment grants and tax-relief on the purchase**: they do not incentivise maintenance. • **All measures** need monitoring to ensure that there is no abuse. Measures that provide on-going support (ongoing tax relief and net metering) will have a greater administrative burden because monitoring will have to take place as long as the support measure is in place. This will involve auditing all RE autogenerators electricity production to combat scope for abuse.
Support Measures for Large-Scale Renewable Generation	
Strengths	**Weaknesses**
• **FIT** has a proven track record of increasing RE generation within Europe, particularly in Spain and Germany. • **Tender**: can provide more competitive power prices than FIT, since the bids submitted by project developers may reveal the commercial costs of construction more fully than the public review used to set a FIT rate. This only applies if a competitive bidding contest is achieved, however, including particularly a lack of collusive coordination by project developers.	• **FIT:** in the context of Malta it will entail a new legislative framework that may not be cost-effective to implement for what may be a single large-scale development. • **Tender:** precedents, such as the UK NFFO, have been insufficiently rigorous. While the track record on cost is good, previous performance on project implementation has been weaker than for FITs.

Each specific support option as framed above targets specific RES, and does not necessarily create an incentive to employ more innovative renewable technologies, or greater numbers of installations than the government target. To effectively promote RES in a broader sense, the legislation to remove planning, permitting, grid connection and other potential barriers identified in Phase 1 of this study would need to be broad and robust. Additionally, as already mentioned, a reserve fund for technologies not explicitly covered by the set of support measures chosen could be created, and applications for RES support made on a case-by-case basis.

2.3 Financing Mechanisms

The support policies considered in section 2.2 above will each have an associated cost, discussed in more detail in section 3.3.2 below. Any given combination of support policies for RES in Malta will therefore require a dedicated government fund. On the assumption that existing governmental resources are not diverted to such a fund, this study analyses a broad range of financing mechanisms that could provide the required resources. The analysis draws on international experience on how RES is funded and on Maltese evidence available, which is currently limited in the area of public acceptability to the RE survey. Our screening process and subsequent selection of promising mechanisms in section 4 should be considered as indicative of the range of options that may be open to the Maltese Government and of the quantities of money that may be required. These findings apply pending the findings of broader stakeholder consultation.

Two main approaches to financing renewable energy promotion in Malta are considered in this study, which are widely employed worldwide:

- taxation
- electricity tariffs

The first would entail a change in Malta's current taxation schedule and the second a rise in electricity tariff rates. In addition, EU financing channels are a possible supplement to these approaches.

One theme common to both tax and tariff financing is the substantial public support in Malta for an 'earmarked' renewables funding mechanism; with 83% of those interviewed in the RE survey agreeing with the statement *"I would prefer to pay something that I know is directly supporting the development of renewables"*. Such an earmarked payment could be implemented through either a tax or through a supplementary electricity tariff, applied as a percentage of power consumption costs. A tax could be seen as more clearly distinct from existing payments, however, and according to the survey, enjoys more support than a tariff increase (see 2.3.1 below).

The RE survey presents conflicting evidence regarding the public acceptability of tax and tariff measures, suggesting that the public surveyed might not fully understand the distinctions between different financing measures. The results of the survey should therefore be treated with caution and the conclusions on public preferences presented here verified with businesses, consumer associations and local councils before any financing measures are implemented. Implementation would ideally be coordinated with public education on the specific purpose of raising finance, i.e. how it will support RES, and on the rationale for the chosen financing mechanism.

All the tax and tariff measures considered are similar in terms of flexibility, fit with existing market structures and applicability to Malta. Under current conditions, all tax and tariff amendments would require regulatory reform, either an act of parliament or legal notice, to change the financing available

to support RES, so that each is taken as only *moderately flexible*. Changing either taxes or tariffs is taken as of *moderate general suitability to Malta*, with only the suitability of power market conditions varying with the different financing measures Public acceptability, suitability to market conditions, administrative burden, and success of precedents are thus the main criteria considered in sections 2.3.1 and 2.3.2 below. These latter criteria are compared for each financing measure, along with an indication of the party directly responsible for the financing burden under each case, in Table 2-3 below.

For the financing measures, success is examined more closely within the context of Malta than for the support measures. This is done because a track record on similar taxation measures does exist within the country and because the success of a taxation or tariff measure, providing it meets public acceptance and is cost-effective to administer, is largely a function of institutional capacity within the country. Success of EU precedents is also discussed where relevant, such as in the case of a tourist 'eco tax'.

2.3.1 Taxes

According to the results of the RE Survey, tax rises are a more popular means of financing renewables than electricity tariff rises. Responding to the question *"If you could suggest a way to pay for supporting the development of renewables what would it be?"* 28% of respondents volunteered tax rises versus 12% suggesting electricity bill rises. Of the responses advocating tax rises, 25% specifically suggested a tax focussing on polluters.

The different taxes considered have very different 'distributional' implications from a welfare economics perspective, allocating the responsibility for supporting RES differently between the various stakeholder groups in Maltese society. For example, VAT increases will apply to all consumers in Malta, whereas a tourist 'eco tax' will directly affect only visitors to Malta, and income tax rises could be focussed at different businesses or income bands of individuals.

The taxation mechanisms discussed in sections (i) to (iv) below are:

- Fossil fuel and emissions taxes
- VAT
- Income tax
- Tourist 'eco tax'

(i) Fossil fuel and emissions taxes

Taxes on coal, oil products, electricity and carbon emissions can be implemented according to the 'polluter pays' principle to address environmental externalities, as discussed in section 2.2.1 above. These measures would act to increase the cost of polluting activities generally, although only those within the power market would affect the relative cost of RES alternatives. There are substantial EU precedents for this kind of tax, with directive 2003/96/EC specifying minimum taxation rates for energy products on end users. Household energy taxes documented by IEA (2004b) for the third quarter of 2004 across 19 members of the EU are up to €340/t on coal, up to €0.86/l on automotive diesel, and up to €0.13/kWh on electricity (see Appendix A). Carbon emission taxes, applied at the generator and industry level where monitoring takes place, are less common within the EU as this climate change policy instrument competes with emissions trading, as now embodied in the EU

through the Emissions Trading Scheme (EU ETS). The IEA database (2004a) on renewable energy support policies indicates that Denmark and Sweden had carbon emissions taxes in place during 2004, with the level in Sweden set at €58.3/tCO_2. This high level, around 3.8 times the maximum EU ETS trading price of €15.38 tCO_2 (as of 01/04/05 on Point Carbon index) is possible due to Sweden's low reliance on fossil fuels and through exemptions for energy-intensive export industries.

The 'polluter pays' taxation principle does enjoy fairly high public support according to the RE survey, with 70% of respondents agreeing with the statement *"tax increases should focus on polluting goods and services"*. In this survey, the examples of pollutants given included cigarettes as well as the fossil fuel based energy goods discussed above. Although this is not the definition of pollutant generally applied by this study, it is possible that a rise in tax on cigarettes could be used to finance RES support measures. Such a measure could have high public support, reducing the adverse health effects of smoking by dissuading people from buying cigarettes, while funding cleaner sources of electricity. This would not, however, be a sufficient long-term financing measure, since if the tax were successful in reducing cigarette purchases, then the funding available to renewables support measures would be reduced. Although the direct question on whether the polluter should pay gave a 70% positive response, it is also true that only 7% volunteered this response independently when asked how RES support should be funded, as referred to in the introduction to section 2.3.1 above. This combination of evidence suggests that a substantial public education drive would have to accompany a change in taxation to implement the 'polluter pays' principle, to ensure that the Maltese public understand the rationale and purpose of the measure.

If the tax to be implemented were a new measure, such as an emissions tax, this would entail a *moderate additional administrative burden* on the government, in this case both the tax authorities and MEPA if charged with monitoring emissions. An increase in existing duties and taxes, such as automotive fuels and tobacco products, however, would entail a relatively *low additional administrative burden*. Under this latter category would fall any products that could be included by legal notice under the current eco-contribution act, Act XII of 2004. These would then be collected by the Commissioner for Value Added Tax, as with VAT in section 2.3.1(ii) below.

As there is no precedent of a carbon emissions tax in Malta, the success of this measure in Denmark and Sweden is considered – these are judged *moderately successful* on the basis of their documented effectiveness, but lack of widespread adoption. The existing taxes in Malta on automotive fuels, tobacco products and items included in the eco-contribution act are understood to operate effectively, and therefore be *highly successful* in relation to the other financing measures considered.

The 'distributional' impacts of a polluter pays taxation measure would be different depending on whether this was targeted at end users of automotive fuel, electricity, and other polluting goods, or at electricity generators, through a tax on the oil-product fuels used, the electricity generated or on carbon emissions. In the case of a tax on end-users, those that consume the most polluting goods would bear the financial burden of supporting renewable energy. Depending on what polluting goods are chosen for tax increases, the relative impact on different income bands within Malta would vary, and would need to be subjected to further study before a tax was implemented. This might however conform with existing guidelines in Malta, such as approaches followed in past fuel price revisions. For example, the 17% 'fuel surcharge' on water and electricity implemented 1 January 2005 takes into consideration distributional concerns by placing a cap of Lm 5,000 per annum on the increase in the bill of any factory or hotel.

In the case of a tax on the power generator, this would signify an increase cost to Enemalta. In the event that these costs are not internalised by Enemalta, the increased costs could be passed through to

the general public via a rise in consumer electricity tariffs, or through rises in other taxes. It is worth noting that the former action of raising consumer tariffs is more in line with the 'polluter pays' principle that underpins this tax, but carrying this out rests on the whether public acceptability of this principle outweighs distaste for consumer tariff rises. In either case, a tax on the electricity generator would either reduce Enemalta's profit or require passing through to consumers. If the costs are recovered by Enemalta through a rise in electricity tariffs, taxing the generator would not be an independently viable measure.

(ii) VAT

An increase in the current standard VAT rate of 18% (or 5% for reduced items[4]) would impact on all consumers of goods covered by VAT, as dictated by EU and Maltese legislation. A rise in VAT would be consistent with EU legislation but require an act of parliament to implement in Malta.

The evidence from the RE survey is ambiguous on how publicly acceptable a VAT rise would be. In response to a direct question, whether *"tax increases should be adjusted on all prices (on all goods & services e.g. through increase in VAT)"*, 70% of respondents disagreed. This demonstrates a lack of support for a rise in VAT when compared with a 'polluter pays' tax on specific polluting goods or a tax on specific sectors, such as hotels and other commercial activities. By contrast, however, the majority of respondents (55%) also expressed a preference for a broad sweep of price increases compared with a larger increase "in the cost of particular things". This is confirmed by a similar question where 63% of respondents were opposed to the latter. By imposing a duty on all non-essential goods, VAT would fulfil this preference better than any of the other possible financing measures that change product prices, such as electricity tariff or fuel tax rises. Taken together the evidence suggests, albeit weakly, an overall public opposition to financing RES support measures through specific product price rises, with the exception of polluting goods.

A VAT rate increase would have a disproportionate distributional effect impact on domestic consumers in Malta as businesses can pass through much of their obligation. There would also be an inflationary effect, likely to be small, which would be expected to evenly affect all sections of Maltese society. Further evidence of public opposition to this measure is therefore shown by a 77% disagreement with the statement *"all should pay an equal amount"* in the RE survey.

The additional *administrative burden* of this financing measure would be comparatively *low*, entailing re-education of those subject to the tax, but not requiring new administrative capacity within the government. VAT is well established and *highly successful* means of raising public funds throughout the EU and in Malta, in the latter case accounting for around 22% of total tax revenues[5].

(iii) Income tax

An income taxation measure could focus on a range of stakeholders, including hotels, industrial and commercial businesses, and individuals of different income tax bands. The distributional effects and

A.1.4 [4] Including medical accessories, printed matter, accommodation, confectionary, works of art, and items for the exclusive use of the disabled (VAT department, Malta)

A.1.5 [5] 2003 data from NSO News Release 231/2004

the public acceptability of an increase in income tax would therefore depend heavily on the chosen target.

As referred to in the discussion of VAT in subsection (ii) above, 77% of respondents in the RE survey were against the principle that all should contribute equally. This precludes the concept of a general income tax rise. Instead, the survey shows evidence of public preference for targeting hotels and other businesses. A 76% majority of respondents agreed with the statement *"hotels should pay more than me"* and a 77% majority with the statement *"industrial and commercial businesses should pay more than me"*. The RE survey was only applied to households, however, and does not adequately represent the views of these businesses. The results may also represent further support for the 'polluter pays' approach discussed in subsection (i), with the public surveyed identifying businesses as more intensive power users than households, and therefore more heavily responsible for financing renewable alternatives. In the case that broad public support does exist for taxing the income of businesses to support renewables, perhaps in specific sectors associated with polluting activities, the distributional effect will be to transfer resources from the private sector to public funds.

Income Tax in Malta is regulated by the Income Tax Act 1949 as amended from time to time and by the Income Tax Management Act 1994, also as amended from time to time. The latter act specifies the Commissioner of Inland Revenue as responsible for administering income tax.

All income tax changes would be expected to entail a *low additional administrative burden*, as with VAT. The targeted group would require re-educating on the changes relevant to them, but no new administrative capacity would be required within the government. As with VAT, income tax is well established and *highly successful* means of raising public funds throughout the EU and in Malta.

(iv) Tourist 'eco tax'

A tax on visitors to Malta designed to raise revenue for environmental projects can be seen as another form of 'polluter pays' taxation measure, aiming to mitigate the environmental impacts of tourism. An EU precedent for this type of 'eco-tax' on tourists exists in the Balearic Islands, which placed a levy of €1/night on all those staying in registered hotels and guest houses, between May 1st 2002 and October 1st 2003. The measure was ended following a change in the ruling coalition.

The available evidence suggests that, while controversial, the eco-tax in the Balearics was broadly successful, raising approximately €36 million per year without affecting tourism numbers relative to similar destinations such as the Canary Islands. Arrivals of tourists by air to the Balearics fell between 2001 and 2002 by 6.6% and rose between 2002 and 2003 by 2.8%.[6] By contrast, tourist arrivals to the Canary Islands fell between 2001 and 2002 by 11.8% and fell between 2002 and 2003 by 2.7%, without the imposition of an eco-tax.[7] Commenting on the Balearic taxation measure, Dr Raoul Bianchi, senior research planner in tourism, development and culture at London Metropolitan University, states "the Mallorca experiment… hasn't hurt tourism, and is not too costly to implement". Similarly supportive, the organisation Tourism Concern called the tax "an innovative and effective way of pursuing more sustainable tourism development".[8]

A.1.6 [6] "El Turisme a les Illes Balears: Resumen 2004", Ministry of Tourism of the Balearic Autonomous Government

A.1.7 [7] "Tourism Facts 2003", Gran Canaria Tourist Board

A.1.8 [8] Observer articles, T. Templeton, May 11th 2003 and June 8th 2003

Those in opposition to the tax included the 'Spanish Association of Hotel Chains' and the 'Association of British Travel Agents' (Abta), which raised concerns about a reduction in tourist numbers and the increased cost to 'families on a budget'. Under the scheme, a family of four with children over 12 years old would pay €56 over a two week holiday. For comparison purposes on an average basis, however, it is interesting to note that a similar tax in Malta of €1/night, would amount to 1% of average tourist spending in 2003.[9] To finance the RES policy options considered in section 3.3 below, an estimated tax of up to 0.4% of average tourist spending would instead be required (see Appendix C).

A comment made of the Balearic eco-tax by a spokesman for Abta in May 2003 gave the opinion that: "If other areas are considering a similar tax they should learn from the Balearics' mistakes by giving the industry enough notice of their intentions and making the spending of the revenue wholly transparent". Building on the experience of the Balearics, therefore, such a measure should be implemented in consultation with hoteliers and with sufficient notice to tour operators, to mitigate criticism from these sectors and from the media. Further internal criticism from the Majorca Tourism Board centred on the way the Balearics eco-tax was implemented through hotels. This approach imposed a significant administrative burden on hoteliers and ignored the 25 per cent of tourists who stay in unlicensed apartments and villas, or with property-owning family and friends.[10] Instead of implementing the tax through hotels on a *per diem* basis a similar eco-tax in Malta might more effectively be levied on a per person basis, on visitors arriving or departing the country through Luqa airport or the international ports.

Public opinion in Malta, as represented by the RE survey, is evenly divided on the proposition of a tourist eco-tax to help fund RES, with 48% in favour and 46% against. To build a common consensus on this issue, public education and explanation of evidence from the Balearics precedent would be needed, based around reputable studies, to demonstrate that the measure would not impact adversely on tourism in Malta.

If this measure were implemented, tourist perception of both the results and the transparency could be improved by making a feature of the RES installations supported. This could take the form of promotional material left at hotels and tourist attractions, explaining the rationale of RES for islands, and activities such as trips to a viewing platform on any large onshore wind turbine towers, which would give panoramic views of the Maltese archipelago.

Although the evidence from the Balearics suggest that the eco-tax is cost effective, it is likely to entail a *high additional administrative burden* in Malta relative to the other financing measures considered. New institutional capacity would be required to administer the tax and those responsible for collecting the revenue from tourists would need to be consulted and trained, a group which might potentially include every hotelier on the archipelago. Due to the controversy of the precedent in the Balearics, significant attention would also need to be paid to the public image of the taxation measure – dealing with the media, tour operators and other stakeholders at all stages in the process. Based on the experience in the Balearics, an eco-tax is judged a *moderately successful means of raising funds* for environmental purposes. The major benefit of the eco-tax measure is that it places the responsibility for funding RES outside of the Maltese public body. Providing it could be established that the

A.1.9 [9] Based on tourist nights spent (Economic Review, Ministry of Finance, Sept 2004) and total tourist expenditure in Malta (NSO, News Release 168/2004)

A.1.10 [10] GREENBUDGETNEWS 5 – 11/2003, European Newsletter on Environmental Fiscal Reform

measure would not significantly reduce tourist numbers or spending, the funding of RES would not affect tourist industry profits and therefore would place no added burden on the Maltese economy.

2.3.2 Public Electricity Tariffs

Reform of consumer electricity tariffs is understood to be a historically controversial issue in Malta, with restoration of low (subsidised) tariff levels widely considered to have contributed to the successful election campaign of the Nationalist Party in September 1998. Arguments in favour of this measure, however, include the fact that supporting RES will be more costly while conventional generation is still subsidised, discussed below in section 3, and that higher tariffs are a direct means of implementing the 'polluter pays' principle, for which high public support is noted in 2.3.1(i) above. Public opinion as expressed in the RE survey, however, remains in favour of tax rises, with 28% in favour of taxes to finance RES support measures versus 12% in favour of increased electricity tariffs (see section 2.3.1).

Although 63% of respondents consider the current electricity price too high, 73% also state that they would *"accept an electricity price rise if Malta produced a proportion of electricity from cleaner renewable sources"*. Of those that responded they would accept a rise, 57% chose an amount option of up to Lm2 per 4-month cycle (equivalent to €14/year), which was the lowest option given in the survey. This evidence indicates that an electricity tariff rise, although unpopular in general, might be considered more publicly acceptable if substantially focussed at supporting renewable energy. This is corroborated by the 83% agreement with the statement *"I would prefer to pay something that I know is directly supporting the development of renewables"*, as noted in section 2.3. It is interesting to note that the most expensive of the policy options considered in section 3.3 below could be fully financed by a tariff rise of €14.75/year for all power users (individuals not households). This measure could therefore be a viable possibility, providing that the 73% of RE survey respondents who expressed willingness to pay are representative of individual Maltese public opinion.

Since increasing consumer electricity tariffs would have the same effects as a tax on end-users of electricity, the comments on public support for 'polluter pays' taxation made in section 2.3.1(i) above should apply to electricity tariff rises also. It is also worth noting that although tax rises are more popular than tariff rises, as referred to at the beginning of this section, this is a blurred distinction when the tax measure is applied to electricity consumption. Overcoming public distaste for a tariff rise could be partly achieved by managing the public perception of the nature of the measure, therefore. For example, the rise in electricity prices could be branded as an 'eco-tax' and be accompanied by a drive to raise public awareness that this constitutes a direct 'polluter pays' measure.

The ability to raise financing through consumer tariff increases relies on the fact that the electricity market in Malta is not liberalised and that tariffs can be set by the Minister of Investment, Industry and Information Technology, so that tariff increases are *highly suitable to the market conditions in Malta*. Electricity tariffs could also be increased through the six-monthly revision of the 'fuel surcharge', implemented 1 January 2005 and currently standing at 17%.

The previous difficulty in raising electricity tariffs directly, as evidenced by the importance of this issue in the 1998 election and the implementation of a separate fuel surcharge in 2005 to reflect rising generation costs, rather than simply raise the tariff, means that this measure has had *low precedent success*.

2.3.3 Strengths and Weaknesses of Financing Measures

Table 2-3 below highlights the comparative suitability to Malta of the financing measures reviewed in sections 2.3.1 and 2.3.2 above, using the relevant criteria defined in section 2.1. The consumer or taxpayer that bears the direct burden of the measure is also indicated.

Table 2-3 Relative suitability of surveyed financing measures against defined criteria

Financing Measure	Public Acceptability	Fit with market in Malta	Administration (Highly suitable if Low cost)	Success of precedents*	Direct Taxpayer
Tax on automotive fuels	*High*	*Moderate*	*High*	*High*	Maltese Individuals
Tax on tobacco products	*High*	*Moderate*	*High*	*High*	Maltese Individuals
Carbon emission tax	*High*	*Moderate*	*Moderate*	*Moderate*	Maltese Business
VAT	*Low*	*Moderate*	*High*	*High*	Malta
Personal Income tax	*Low*	*Moderate*	*High*	*High*	Maltese Individuals
Corporate Income tax	*High*	*Moderate*	*High*	*High*	Maltese Business
Tourist 'eco tax'	*Moderate*	*Moderate*	*Low*	*Moderate*	Tourists
Rise in residential electricity tariffs	*Moderate*	*High*	*High*	*Low*	Maltese Individuals
Rise in commercial & industrial electricity tariffs	*High*	*High*	*High*	*Low*	Maltese Business

* Except for the Tourist Eco-tax and Carbon emissions tax, this criteria applies to tax/ tariff precedents only within Malta

The key advantages and disadvantages of the financing options are summarised in Table 2-4.

Table 2-4: Key Advantages and Disadvantages of Financing Measures

Strengths	Weaknesses
• **Taxes on automotive fuels, carbon emissions and tobacco products and electricity tariff rises**: these embody a polluter pays principle which has public support as stated in the RE Survey. • **Tourist eco-tax:** this spreads the financing burden over a wider range of individuals, with potentially negligible impact on the Maltese economy. • **Taxes** would require less administrative burden in revenue collection than other measures because there is already a tax system in Malta. • **Taxes** have a successful track record for raising revenue in Malta.	• **Tourist eco-tax:** previous controversy in the Balearics and potentially high administrative burden of collecting the revenue if done at hotels etc. • **Corporate Income tax** appears more popular on the basis of the RE survey results than it is likely to following a broader stakeholder consultation. • **Electricity tariff** rises have a weak track record on the basis of historical controversy, although this could be mitigated by branding the measure differently from a tariff rise, as with the current fuel surcharge.

Based on the discussion above, the most suitable financing options for Malta are as follows:

- tax on polluting goods, particularly fuel
- income tax on business
- increase in tariffs.

Further discussion of this short list of financing options is undertaken in section 4.

2.3.4 EU financing

Four possible financing channels could be applicable to Malta's renewable energy support program. These are the EU Structural Funds, ALTENER, TEN-E and FEMIP (Facility for Euro-Mediterranean Investment and Partnership) programs, the former three implemented by the European Commission and the latter by the European Investment Bank (EIB).

(i) EU Structural Funds and Cohesion Fund

Four types of Structural Fund exist within the EU to support the harmonisation of European economies. These Funds contribute to three common 'Objectives' which define different areas of support. Of the four Structural Funds, the European Regional Development Fund (ERDF), specifically 'Objective 1', would be the appropriate channel for funding RE projects in Malta. 'Objective 1' refers to the development and structural adjustment of regions whose average per capita GDP is less than 75% of the European Union average, and projects under this objective attracted € 135.9 billion for the period 2000-06, comprising 69.7% of the total EU Structural Fund allocation.

Under all four types of Structural Fund, the European Commission currently contributes to the development of Malta by co-financing an Objective 1 programme for the 2004-06 period. The overall EU objective is to strengthen the competitiveness of Malta's economy and to better equip the country to face its economic and social challenges, whilst also ensuring environmental sustainability. Malta's own national objectives agree particularly with this last area, with environmental sustainability and optimising use of country's resources being prominent national goals as reported by EU online resources[9]. The Structural Funds will provide €63.2 million out of a total budget of €86.5 million for all of the relevant projects.

The ERDF programme specifically has four priorities, the first of which is titled 'Strategic Investments and Strengthening Competitiveness', and includes Renewable Energy. The vast majority of the ERDF's contribution in Malta for the period 2004-06 will be committed towards projects under the above priority (€39.5 million, which is 62.5% of total EU Structural funds). A further €1.4 million will be made available for technical assistance[11].

A separate, fifth fund is the Cohesion Fund, which provides another possible source of funding, subject to certain eligibility conditions. An initiative cannot receive assistance from both the Cohesion Fund and a Structural Fund concurrently, however. The Cohesion Fund contributes between 80% and

A.1.11 [11] www.europa.eu.int

85% of public or equivalent expenditure on projects, although this rate may be reduced to take into account potential profitability of the project and any application of the "polluter pays" principle.

The Cohesion Fund also contributes to preliminary studies related to such projects and their implementation, as well as technical support measures such as comparative studies, impact studies, monitoring and publicity and information campaigns. As an indicative figure, the total resources available under the Cohesion Fund for commitments during 2000-06 (EU-wide) were set at €18 billion (1999 prices).

Assistance from the Cohesion Fund, the Structural Funds and other Community aid may not exceed 90% of the total expenditure on a project.

(ii) ALTENER

The main precedent for EU support of renewables initiatives is the ALTENER programme phases I and II (1992-2002), which provided support to Cyprus and the Central European accession countries. In particular, the programme's following areas of support apply to Malta:

- measures intended to develop information, education and training structures; measures to encourage the exchange of experience
- targeted actions facilitating the market penetration of renewable energy sources and relevant know-how and encouraging investment.

The aims and scope of the ALTENER programme are currently continued under the same name as part of the "Intelligent Energy – Europe" (EIE) programme (2003-2006). Of the RES technologies under consideration in Malta, EIE's December 2004 'Call for Proposals' prioritises small-scale solar PV. The ALTENER component finances studies, workshops, feasibility studies and seminars, but not the construction of plants (materials and infrastructure).

The EIE programme has a total budget of € 52 million, where the amount granted to a single proposal is up to 50% of the total eligible costs of the operation, not exceeding € 40,000 for support of events. The EU has also announced that "using major Community financing instruments: from 2004 onwards, the Commission intends to place special emphasis on the deployment of renewable energy and energy efficiency by using the EU's structural and cohesion funds".

In summary, the limited funds available through the EIE programme are essentially to support public awareness creation and knowledge transfer, but not directly to support renewable project developments in member countries.

(iii) EU Trans-European Energy Networks (TEN-E)

The European Union's TEN-E programme finances electricity and gas transmission infrastructure projects which strengthen the internal market of electricity and gas, with an annual budget of €25 million which is spent mainly on feasibility studies (there is also a 10% ceiling on contributions to the development stage of a project which may be extended to 20% for priority projects). As a result of the internal market focus, most projects that have qualified for support in the past relate to cross national borders (e.g. interconnectors) or can be shown to contribute to the overall stability and efficiency of the European network. The Commission has put forward a number of focus areas, including a 10%

interconnection target for electricity and the priority for TEN-E funding to certain projects identified as being 'Priority Projects of European Interest'.

Given that the electricity network of Malta is not connected to any of the continental systems, it may seem unlikely that it would be eligible for financial support under the TEN-E scheme. However, it may even be considered as a 'Priority Project' (specifically a 'Priority Project of Common Interest') under the 2001 amendment of Decision No 1254/96/EC article 4, which states as priorities (among others):

- the connection of renewable energy production
- the establishment of energy networks in insular, isolated, peripheral and ultra-peripheral regions while promoting the diversification of energy sources and the use of renewable energy sources, together with the connection of those networks, where necessary.

A number of precedents where funding has been provided for the connection of wind farms exist, such as:

- new wind energy connections in Italy and Portugal
- connections in the North–East and West of Spain, in particular to connect to the network wind-power generation capacities
- new offshore wind energy connections in Belgium.

(iv) FEMIP

The Technical Assistance (TA) FEMIP Support Fund utilises funds granted by the European Commission under the MEDA regulation in support of the EIB's investment activities in the Mediterranean Partner Countries and Turkey. The Fund supports beneficiaries during different stages of the project cycle such as project identification, preparation and implementation. Over the period 2003 – 2006, up to € 105 million will be allocated for technical assistance activities.

In the energy sector the scope of the TA Support Fund includes:

- increasing energy efficiency
- promotion of renewable energy
- technical studies
- project management services and training.

Although Malta is defined as a Mediterranean country under EIB categorisations, it is not apparent from the available documentation that Malta is currently registered as a 'Partner Country' in this particular investment program. It is not therefore likely that FEMIP funds would be available in the current program phase up to 2006.

3 Support Options

The aim of this section is to generate a range of policy options based on the short list of support measures selected in section 2.2 to calculate the costs to the Maltese Government of integrating the technology scenarios developed in Phase 1 of study. These technology scenarios are summarised below:

- Scenario B1: One Large Onshore Windfarm
  - develop one 15 MW large onshore windfarm on mainland Malta before 2010
  - install PV units at a rate of 40 rooftops per year from 2008 to 2020
  - install 60kW wind turbines at a rate of 5 units per year from 2008 to 2020.
- Scenario B2: No Large Onshore Wind
  - install PV units at a rate of 80 rooftops per year from 2008 to 2020
  - install 60kW wind turbines at a rate of 5 units per year from 2008 to 2020.
- Scenario C3: One Offshore Windfarm
  - install PV units at a rate of 80 rooftops per year from 2008 to 2020
  - install 60kW wind turbines at a rate of 5 units per year from 2008 to 2020
  - develop one 27MW offshore windfarm in 2015.

The present analysis is centred around these technology scenarios because they represent the most appropriate technology mix for Malta taking into account the exploitable resource available and reasonable penetration rates. It is possible that other schemes may apply for authorisation (and support) outside of the scenarios considered. As already mentioned, for a one-off large-scale development a FIT is likely to be the most appropriate support and for small-scale schemes, capital grants combined with net metering. The level of the support and its cost to the government would be dictated by the cost of the specific project. This would have to be determined on a case by case basis.

This discussion separates support mechanisms into those more appropriate for small- and large-scale generation. Alternative 'policy options' are defined using different combinations of viable measures, and cost estimates are made for each of these policy options with respect to the main technology scenarios.

One common issue facing both small- and large-scale generation is that the cost of support policies will be greater while subsidies to conventional electricity generation remain in place. The relative economic performance of renewables and conventional generation is a central factor to developers or end-users interested in investing in renewable equipment. The higher the subsidies to conventional generation, the higher the investment required to make renewable alternatives attractive in comparison. This position is put forward by the OECD (1998), which claims that long term subsidies to conventional energy generation undermine environmental improvement measures. In the case of subsidies for renewables, by contrast, the OECD argues *"that support may be justified if it lowers the long-term marginal costs to society as a whole… this may be the case with support to 'infant industries', such as producers of renewable energy."* (OECD, 1998). Coordinating the elimination of subsidies on conventional electricity generation with renewable support policies will thus be critical for Malta to minimise the public cost of promoting RES.

3.1 Small Scale Generation

As seen in Table 2-1, of the measures discussed in sections 2.2.1 through 2.2.4 above, direct capital subsidies and rewarding spill with net metering are considered most appropriate to support small-scale renewable projects, taken here to include medium wind, micro-wind and solar PV. Both net metering and capital subsidies act to improve the attractiveness of an investment in renewable electricity generation equipment to current power consumers, either domestic or commercial. In the technology scenarios proposed in Phase 1 of the study and summarised above, (Scenarios B1, B2 and C3) micro-wind is not considered, so that the policy options in section 3.3 focus only on PV and medium wind. The support level required for micro-wind is considered in this section in case planning barriers are reduced and this technology becomes a viable addition to the scenarios.

Net metering for these technologies ensures that households or businesses investing in a small-scale system gain some benefit from the power they generate when not using it themselves. Because power spilled to the grid is bought at a predefined rate, generally the same as the consumer's tariff rate, all the renewably generated power has a 'value' to the equipment owner. This 'value' will depend on the level of the tariff. If the electricity tariff is low, the incentive to invest in a small-scale renewable system is reduced. Tariffs may be low because they reflect low costs of generation from the utility supplier or because they have been kept artificially low to satisfy, for example, wider macro-economic objectives.

In Malta, the basic level of electricity tariff is kept artificially low, in particular for domestic consumers under tariff 'block 2' and industrial consumers (not accounting for maximum demand charges).[12] These subsidised consumers have only a marginal incentive to invest in renewable electricity equipment even with government subsidies meeting over 90% of the capital cost.

Electricity tariffs for other domestic and commercial users are not so low. The policy options presented in section 3.3 below consider a net metering arrangement with the 'sell' rate set equal to the current tariff 'buy' rate for the non-subsidised domestic and commercial consumers. This arrangement is the most common type of net metering contract and it means that power generated from a small-scale renewable installation has the same 'value' to the owner, whether used themselves to offset purchases from the grid, or spilled to the grid when generation exceeds their needs. In this study, the mean tariff rate paid by both residential and commercial consumers is used to evaluate the subsidy cost to the government, assuming that those households and businesses installing small-scale RES are 'representative' power consumers.

Capital subsidies can be provided either through grants or tax relief, both of which can act to reduce the up-front cost to households and businesses of installing small-scale RES. Capital subsidies can provide support both by overcoming credit-constraints and through the direct effect of reducing total cost. Under the former, consumers may have limited access to credit through bank loans etc, perhaps due to a limited credit history, so that a grant increases the likelihood they will have the capital available to invest. In the latter case, the capital subsidy can also be interpreted as increasing the overall attractiveness of the investment decision, expressed here through the payback period.

This study considers that meaningful penetration rates for small-scale technologies will only be achieved when private power consumers face a payback period of less than ten years on an investment

---

A.1.12 [12] The tariffs as set by LN 99/03 for these consumers are below the €54/MWh average cost of generation derived in Phase 1 plus an estimated scale-up of 30% to cover supply infrastructure.

in small-scale renewable generation equipment. The policy options considered in section 3.3 therefore allow for either a five or ten year payback period. The payback period is calculated on a 'simple' basis, without a discount rate applied to future cashflows. Instead, the end users' high 'time preference rate', their desire to see financial returns quickly, is represented through limiting the payback period faced to five or ten years. The alternative levels of governmental capital subsidy for each technology are therefore set to provide this payback period to the power consumer. Table 3-1 below shows the levels of capital subsidy required to give the relevant payback periods on a 3kWp PV unit, a 60kW wind turbine and a 1kW micro-wind turbine, assuming a net metering tariff arrangement using the average commercial and domestic tariff rates in Malta.

Table 3-1 Capital Subsidy level required to give a 5 or 10 year payback to power consumers investing in small-scale renewable generation equipment

		5 year payback	10 year payback
Commercial tariff rates			
Subsidy level required to give stated payback period on 3kWp PV system	Cost to government (€/system)	18,500	16,500
	Proportion of cost subsidised	90.3%	80.6%
Subsidy level required to give stated payback period on 60kW Medium Wind system	Cost to government (€/system)	75,500	37,000
	Proportion of cost subsidised	66.2%	32.5%
Subsidy level required to give stated payback period on 1kW Micro-Wind system	Cost to government (€/system)	1,900	1,300
	Proportion of cost subsidised	76.1%	52.1%
Domestic tariff rates			
Subsidy level required to give stated payback period on 3kWp PV system	Cost to government (€/system)	18,800	17,100
	Proportion of cost subsidised	91.7%	83.5%
Subsidy level required to give stated payback period on 60kW Medium Wind system	Cost to government (€/system)	82,100	50,200
	Proportion of cost subsidised	72.0%	44.0%
Subsidy level required to give stated payback period on 1kW Micro-Wind system	Cost to government (€/system)	2,000	1,500
	Proportion of cost subsidised	80.4%	60.8%

Any other small scale RE development not included above may be treated in a similar way with the level of subsidy required and the cost to the government depending on the overall cost of the project in question.

The capital subsidy levels implied by the payback period criteria, up to 91.7% of capital cost for PV, are very high by EU standards due mainly to the low electricity tariffs in Malta. The maximum capital subsidy referred to in section 2.2.2 is 70% for PV and 60% for medium wind turbines, each under the German investment grant programs. This could limit the applicability of Solar PV to Malta for as long as the existing tariff regime remains in place.

The high levels of subsidy implied by the 5 or 10 year payback criteria lend themselves more naturally to support through investment grants rather than tax relief measures. Taking the full range of subsidies described in Table 3-1 above, 32.5 – 91.7%, it is unlikely that relief from tax and duties associated with the equipment would be sufficient to cover this proportion of equipment costs. Instead, a tax relief mechanism would have to operate via income tax on the private individual or company investing in renewable equipment. There are precedents for this in the EU, such as for members of wind energy cooperatives in Denmark, who are taxed at 60% the standard rate. This measure is likely to be complex to administer without the structure of cooperatives, and with a substantial incentive there is potential scope for abuse of the system.

Similarly, looking at the range of possible investment subsidies, those that focus on guaranteed debt and subsidised interest rates would not be capable of providing the level of subsidy implied by Table 3-1. Direct capital contributions to renewable generation equipment are therefore considered the most promising means to successfully incentivise investment in small-scale generation equipment by households and businesses in Malta.

One disadvantage to high upfront subsidies is that they do not provide incentives to buy high-efficiency equipment or to maintain it adequately, to ensure maximum ongoing power generation. To improve the ongoing incentive to generate, the net metering 'buy' tariff received by autogenerators for power spilt to the grid could be increased beyond the 'sell' rate at which they purchase their power. The upfront grant could be reduced to keep the autogenerator's payback period and the total available subsidy approximately constant, while improving generation incentives for the RES generation capacity installed. An alternative approach simply to ensure that high-efficiency equipment is installed, although not to ensure its maintenance, is to mandate a set of minimum equipment standards necessary to qualify for investment grant support. The appropriate balance of upfront and ongoing incentives should be assessed as part of the consultation following this report.

3.2 Large Scale Generation

Large-scale windfarms, either onshore or offshore, are the only large-scale renewable generation technology considered by this study. As discussed in section 2.2.3, the central measure necessary for supporting large-scale commercial wind generation projects is a reliable market for the power generated, which can be provided by guaranteed generation tariffs.

Statements from the "International Feed-in Cooperation" (2005) lead by Germany and Spain, referred to in section 2.2.3(i) above, indicate that the FIT incentive schemes adopted in these two countries result in prices per kWh that are cheaper than in countries with other methods of support, such as quotas. The European Commission as quoted in IEA (2004) also notes that significant penetration has been achieved through FITs in examples where administrative requirements were simple and the program cap sufficiently high. European Commission analysis further suggests that the guaranteed tariff level and FIT period should be set to allow repayment of the initial investment within 10 to 12 years.

IEA (2004) and EWEA (2004) both suggest that other measures are needed to reinforce a feed-in tariff if it is to be successful in renewables promotion. This reinforces the statements already made by this study – that public awareness creation, dialogue with affected communities and removal of planning and grid connection barriers would be necessary components of a small- or large-scale renewable generation support strategy in Malta.

An alternative to the FIT for large-scale installations is a tendering process to set a guaranteed PPA tariff, as discussed in section 2.2.3(ii). In the case of Malta, where a limited number of sites would be eligible for windfarm installations, a tendering process for PPAs on specific large-turbine sites could be a more targeted means to achieve national RES targets than a blanket tariff open to all developers. A tender process also has the potential to expose a more competitive power price than a FIT, as argued in section 2.2.5, providing that developers are not able to collude. The weakness of the tender process is a poor track record on project implementation compared with FITs.

In either case, the overall tariff rate for wind-generated power will vary depending on the certainty of the legislative framework facing developers and the speed of the planning process. This study considers two possible tariff rates in section 3.3 below, which are the maximum and minimum rates predicted by the cost-minimisation model developed in Phase 1. For the onshore case this takes the 'high' and 'low' capital, operational and turbine sizing costs at Marfa ridge and for offshore wind the tariffs are based on the generic 'high' and 'low' capital and operational costs for offshore windfarms around Malta.

3.3 Alternative Policy Options

Bringing together the discussion in 3.1 and 3.2 above, a number of promising support measures exist that can be used to define 'policy options' for RES support in Malta. Within these measures there are a range of possible subsidy levels, the optimal balance of which would require further surveys and consultation with Maltese stakeholders to determine. Within the support measures discussed above, this study has identified the following variables:

(a) Whether governmental subsidies to PV and medium wind systems are intended to give end users investing in equipment either a five (5) or ten (10) year simple payback period.

(b) Whether net metering for PV and medium wind is offered based on either domestic (D) or commercial (C) electricity tariffs.

(c) Whether the guaranteed tariff offered to large wind turbines is based on the high (H) or low (L) end of the predicted range of generation costs.

Taking these variables into consideration, this study defines eight 'policy options' (POs) to allow evaluation of the estimated total cost of providing support to RES in Malta through the various measures described. These are defined in Table 3-2 below.

Table 3-2 Definition of Policy Options for supporting RES in Malta

***P**olicy **O**ption Number*	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
User payback period on distributed generation (years)	5	5	5	5	10	10	10	10
***C**ommercial or **D**omestic tariff for net metering*	C	C	D	D	C	C	D	D
***H**igh or **L**ow FIT/tender rate on large wind*	H	L	H	L	H	L	H	L

These policy options focus on the key variables within the short list of policy measures, which limits to eight the number of alternatives considered for costing. This limited set of alternatives allows the

current analysis to highlight the main interrelationships and differences in cost between technology scenarios and policy measures. The policy options are not intended to be prescriptive, however. Other variants on the suggested measures, such as a net metering arrangement with a spill tariff different to the buy tariff, may have merit as discussed below. The analysis of total cost, to support each policy option, makes the following assumptions:

- Capital and operational costs for PV and 60kW wind use the 'medium' case, as defined in Volume 1, Annex F.
- The lifetime of all renewable technologies considered is 15 years. The support measures detailed are assumed to continue up to 2020. Tariff support commitments therefore continue up to the end of 2034 for installations in 2019.
- Governmental capital grants or tax relief measures act to subsidise PV and 60kW wind in order to reduce the simple payback period to an attractive level, either 5 or 10 years. Governmental support is all provided in the year of installation. Whether these subsidies are implemented mainly via income tax relief or via investment grants is not specified and assumed here to be a revenue-neutral decision.
- Both PV and medium wind are operated on a net metering arrangement, with power spilled to the grid bought back by Enemalta at the same tariff rate at which it is sold to the relevant consumer. The consumer tariff rates applied are averages based on turnover data for 2003 for each of the domestic and commercial categories (Enemalta, 2004). This study also uses the average cost of conventional generation over twelve months prior to November 2004, based on data supplied by Enemalta and applied in Volume 1 of this study, of €54/MWh. The policy option cost analysis assumes that generation cost and consumer tariff rates will stay constant in real terms at the specified levels until 2020. This implies that the 'fuel surcharge' currently in place is considered a short term measure only. The commercial tariff rate could represent a case where the domestic tariffs are changed to come in line with commercial rates, however.
- The penetration rate for PV and medium wind are as specified in the relevant Scenarios B1, B2 and C3, namely 40 or 80 rooftops of 3kWp per year for PV, and 5 installations of 60kW per year for medium wind.
- Large wind is incentivised using a feed-in tariff (FIT) or tendered PPA. The cost of power applied under this approach is either the best or worst case considered in Volume 1. For onshore wind the low cost case uses 850kW turbines, 'low' capital costs and 'low' operational costs, whereas the high cost case uses 2MW turbines, 'high' capital costs and 'high' operational costs. For offshore wind only the 3MW turbines were considered, so that the high cost case is 'high' operational and capital costs and vice versa for the low cost case. The respective costs derived from the analysis conducted in Volume 1are summarised in Table 3-3 below:

Table 3-3: Costs of Large Wind

Modelled generation costs	'Low'	'Medium'	'High'
Onshore large wind (€/MWh)	37. 8	51.4	60.0
Offshore large wind (€/MWh)	58.2	72.7	87.3
Conventional plant (€/MWh)	-	54.0	-

- The costs of public awareness creation, administering a means of raising finance through taxes or tariffs, or the legislative process to remove planning barriers, are not included in the options analysis.
- Cashflows from yearly expenditure are discounted by 3%, as in Volume 1 of this study, to give the present value of each policy option. The present value of each option is then divided by the 12 year period of support policy from 2008 up to 2020, to give a mean annual expenditure. The present value therefore includes obligations under each support program to 2034, so that ongoing commitment to tariffs beyond 2020 is represented in the mean yearly expenditure figure. This implies that the sum raised through financing measures up to 2020 will be sufficient to finance the completion of the support program commitments.

3.3.1 Disaggregated Lifetime RES Support Costs, by Technology

Under the policy option conditions outlined in the above discussion, the disaggregated lifetime cost of supporting each relevant RE technology are shown in 'net present value' terms in Table 3-4 and

Table 3-5 below:

Table 3-4 Lifetime small-scale RES support costs

	5 year payback	10 year payback
Commercial tariff rates		
3kWp PV support cost (€ per MWh generated)	288	260
60kW Wind support cost (€ per MWh generated)	75	51
Domestic tariff rates		
3kWp PV support cost (€ per MWh generated)	282	258
60kW Wind support cost (€ per MWh generated)	69	48

Table 3-5 Lifetime large-scale RES support costs

	'Low' Modelled Generation Costs	'High' Modelled Generation Costs
Onshore Large Wind (€ per MWh generated)	-12.9	4.8
Offshore Large Wind (€ per MWh generated)	3.3	26.5

3.3.2 Aggregated Annual Average Support Costs, by Policy Option and Scenario

Under the discussed conditions, the cost of each policy option for the technology scenarios considered in this study is shown in Figure 3-1 below, with the full results data included in Appendix B. The following features of this cost analysis are of particular interest:

(a) The most cost-effective scenario under all policy options is Scenario B1. The 'cost' of subsidising large wind is actually negative in the 'low' onshore cost case (see Table 3-5), reflecting the fact that a 'low' cost windfarm would be less expensive than the existing heavy fuel oil and diesel plant, at 2003/04 oil product prices. The cost of subsidising PV and medium wind in Scenario B1 exceeds this negative 'low' onshore wind cost, however, so that net cost remains positive for all policy options. The results graphed in Figure 3-1 include the benefit of this decreased cost of generation – on the assumption that the cost saving accrues to the Maltese government to offset current subsidies on conventional generation, rather than accruing to Enemalta as the electricity distributor buying the power.

(b) The most significant determinant of policy option cost in Scenarios B1 and C3 is whether the 'high' or 'low' tariff levels are applied to the large windfarms, with total policy option cost increasing by a factor of between 1.7 and 2.5 between 'low' to 'high' generation costs/tariffs.

(c) The policy option costs for scenario B2 do not vary with the tariff level for large wind because this scenario does not include large windfarms. This reduces the policy options under this scenario to four as the following pairs: PO1 and PO2, PO3 and PO4, PO5 and PO6, and PO7 and PO8, are the same.

(d) The cost of supporting a five-year payback period for small-scale autogeneration at commercial tariffs (PO 1 & PO 2) and domestic tariffs (PO 3 & PO 4) in Scenario B2 are similar, varying by 4% in the weighted combination of PV and 60kW wind used in the scenario. This is also true for a ten-year payback period (PO 5 & PO 6 compared with PO 7 & PO 8), with cost varying by 1%. For both payback periods, the policy options based on commercial tariffs are more costly than those based on domestic tariffs, as can be seen clearly in Table 3-4 above. This is because the total subsidy cost under this combination of measures rises gradually with increasing tariffs, since the price of spill has been assumed to be equal to the price of electricity.

(e) Given that the subsidy to PV and 60kW wind autogenerators rises with the electricity tariff under the current policy option definition, the subsidy level would rise for autogenerators should consumer tariff rates rise. It is possible that this would create more of an incentive than is necessary in the future. Scope should therefore be left in the net metering measure for offering a different rate for spill than for power bought from the grid.

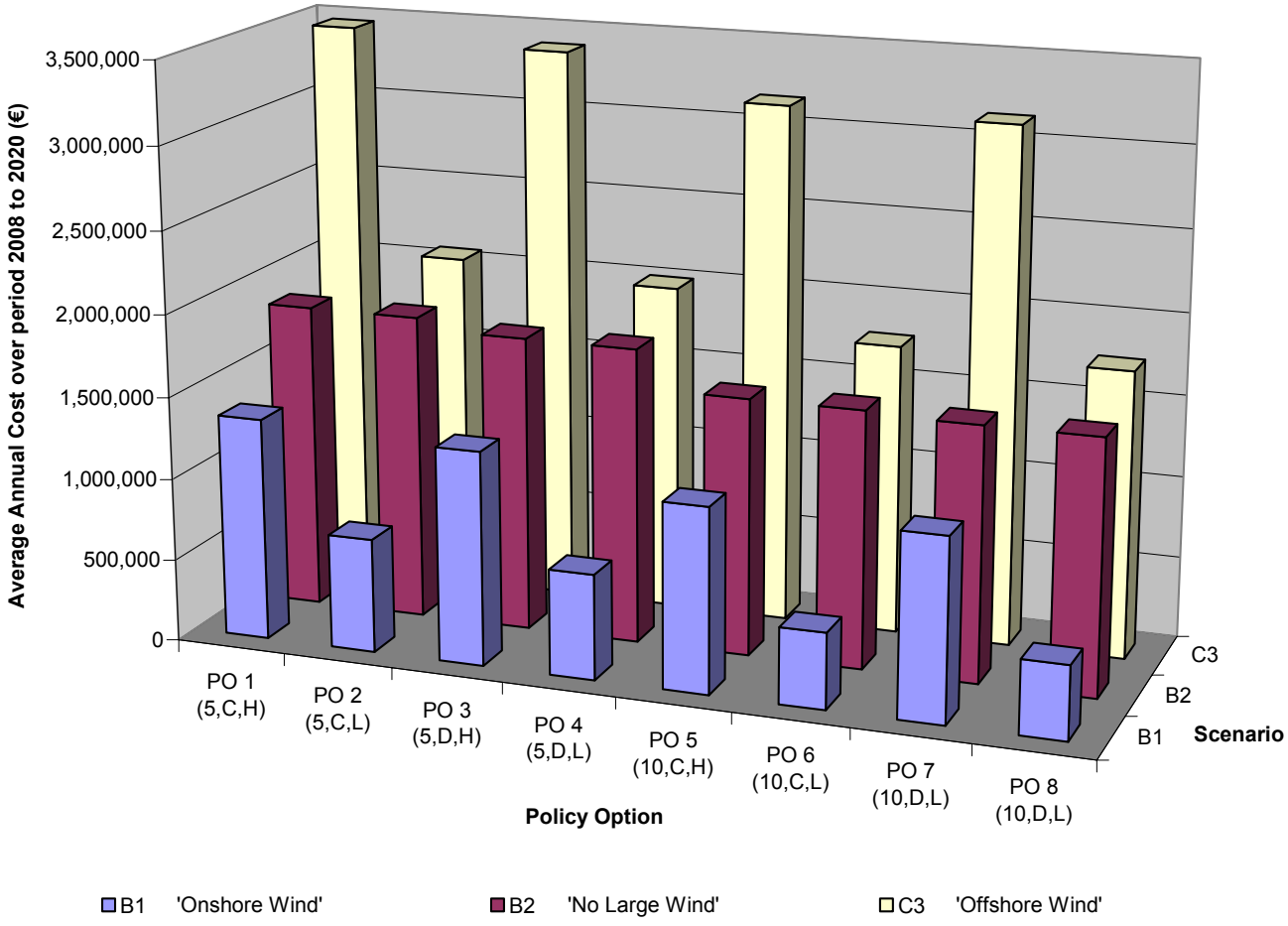
(f) The combination of net metering and capital subsidy measures for small-scale PV autogenerators, both at the domestic or commercial tariff rates, effectively subsidises close to the full capital value of the PV system.

(g) The absolute level of costs shown for policy options supporting scenario B2 represent the estimated cost to successfully incentivise small-scale generation, without any large wind capacity. It is interesting to note that by 2020 scenario B2 would give an installed capacity of 7.02 MW compared with 20.46 MW from scenario B1. This means that to install approximately one third of the generation capacity is on average three times the cost across the policy options – indicating that support of small-scale solutions alone under the assumptions made is nine times as expensive per MW installed as a mixed RES portfolio.

(h) For each policy option, scenario C3 is more than 2.5 times the cost of scenario B1. The primary contribution to this increased cost is the extra expense of supporting offshore versus onshore large windfarms. The contribution of doubling the rate of PV penetration in C3 compared with B1 is also significant, however, as can be seen from the technology specific results in Table 3-4 above.

(i) For all scenarios, PO 1 is the most expensive option because it considers government subsidy for small-scale renewables up to a level where users face a 5 year payback period, it assumes commercial consumer tariffs and high costs for large-scale wind. In turn, PO 8 is the least expensive option as it considers longer payback periods for the support of small-scale generation, domestic tariffs and the low cost assumptions for large scale wind.

Figure 3-1 Comparison of Policy Option Costs for Scenarios B1, B2 and C3



3.3.3 External Costs of Oil Based Generation Relative to RES

The external environmental and health costs of thermal generation at Marsa and Delimara relative to Wind or Solar PV can be considered in the context of the support costs for RES, to demonstrate how far the outlined policy options internalise the externality of pollution from electricity generation. The

widely quoted ExternE (External Costs of Energy) research project of the European Commission[13] offers a useful resource to help assess the external costs of power generation from an oil, wind or PV fuel cycle.

The ExternE project uses two alternative statistical representations of the damage caused by pollution, 'Value of Statisical Life' (VSL) and 'Years of Life Lost' (YOLL), each based on a range of expressed and demonstrated willingness-to-pay assessment methods. Both of these statistics for valuing human health damage and lost life are controversial. Within the framework of a WTP analysis, each statistic has advantages and disadvantages. VSL, for example, may overestimate damages by failing to account for other long-term factors contributing to death, while YOLL often fails to genuinely represent WTP since individuals do not necessarily reduce their expenditure on life-prolonging measures with advancing years. More broadly, it can also be argued that monetarisation of lost life is not a meaningful activity, and not therefore a reasonable basis for policy decisions.

The project methodology annex states that VSL is "one of the key parameters in this study because, at the assumed value [of life]… mortality impacts dominate all else". While the YOLL statistic additionally takes into account the number of years of life lost, the annex states that the YOLL valuation has not been applied to the majority of the fuel cycle studies within ExternE. Given the ambiguity this statement introduces concerning the YOLL data presented, the VSL data is deemed to be more transparent and robust in this case, and has been used in the analysis below to estimate energy generation damages for Malta.

(i) Oil fuel cycle

Both the heavy fuel oil and gas oil / diesel used for power generation in Malta are treated by ExternE as a generic oil fuel cycle. The reference oil fuel cycle considers a combined cycle oil-fired power station, suitable for base load operation, with a gross electrical capacity of 527.9 MW. The plant reflects the standards required by European and national legislation. In VSL terms, the external costs of generation in this case are estimated to be in the range of €64-285/MWh (originally given in units of mECU/kWh, where the ECU is taken to have 1:1 parity with the Euro). This range is based on the full set of results reported by those five countries among the EU15 using significant amounts of oil fired plant, namely France, Germany, Greece, Italy and the UK (Spadaro & Rabl, 1998; IER, 1997; LIEE, 1997; FEEM, 1997; Berry et al, 1998). In the case of Greece "most of these plants are located in autonomous systems such as islands, which are not interconnected with the mainland grid" (LIEE, 1997). Taking the 'upper midrange'[14] value in Greece as most representative of operating conditions in Malta on this basis, we have a VSL of €70.5/MWh.

In the case that either of the power plants in Malta do not currently meet "the standards required by European and national legislation", this VSL value is likely to be an underestimate.

A.1.13 [13] Refer to online resources at "http://externe.jrc.es/infosys.html"

A.1.14 [14] The 'upper midrange' figure applies a 3% discount rate on human life. All VSL data is based on January 1995 prices, with VSL for an individual of 3.1 million Euro in these prices, assumed here to be valid in today's terms.

(ii) Wind Fuel Cycle

Based on the full range of results reported by those six of the EU15 using significant amounts of wind plant, namely Denmark, Germany, Greece, the Netherlands, Spain and the UK, external costs for wind generation in VSL terms are €0.59-5.7/MWh (Schleisner & Nielson, 1997; IER, 1997; LIEE, 1997; IVM, 1997; CIEMAT; 1997; Berry et al, 1998). Again, the Greece case examines island generation, using a 1.6 MW wind farm (average turbine size 230kW) located in Andros island as the basis for the VSL assessment (LIEE, 1997). The 'upper midrange' external cost value for Greece is €4.9/MWh.

Assuming that we could directly substitute one megawatt-hour of thermal generation with wind generation, this would therefore internalise €58-284 of external costs in Malta.[15] Comparing upper midrange values for island generation plant in Greece, the external costs offset would be € 65.6/MWh.

(iii) PV Fuel Cycle

The only country under the ExternE program to declare a significant amount of Solar PV generation is Germany, where the external costs are estimated at €1.4-3.3/MWh, based on a lifecycle analysis of two sites (IER, 1997). The median external cost value for PV is therefore €2.4/MWh.

Substituting one megawatt-hour of thermal generation with solar PV generation could therefore internalise €61-283 of external costs in Malta. Using upper midrange values for thermal (oil fuel cycle) island generation plant in Greece, the external costs offset would be € 68.1/MWh.

(iv) Support costs as proportion of External costs

Based on the offset external costs in subsections (i), (ii) and (iii) above, the possible range of support costs relative to the external costs of each technology can be estimated, as presented in Table 3-6 below:

Table 3-6 Support cost as proportion of offset external cost (NPV)

	Low Estimate	High Estimate
Small-scale: Solar PV	91%	470%
Small-scale: 60kW Wind	17%	130%
Large-scale: Onshore Wind	-5%	8%
Large-scale: Offshore Wind	1%	46%

The above analysis can be interpreted as an economic analysis of benefits versus costs of offsetting thermal generation with RES. In this case, the offset external costs are the societal benefit of a policy intervention to support RES. The support costs for large- and small-scale wind power in Table 3-6 above are generally lower than the environmental and health benefits of substituting thermal

A.1.15 [15] This approach of directly substituting thermal power for wind power on a 1:1 basis does not take into account the environmental impact of intermittency and the need to hold potentially polluting spinning reserve.

generation (i.e. a benefit-cost ratio greater than one). The support costs for Solar PV are generally greater than the benefits of substituting thermal plant with this type of generation in Malta, which does not recommend investment in PV generation capacity on the basis of offsetting external costs. The results of this section are subject to the externality valuation methods used by ExternE, however, and are subject to the reservations expressed in section 3.3.3 above.

4 Financing Options

The range of Policy Options and scenarios described in section 3.3 above each carry a price-tag that has different cost implications to the Maltese government. The aim of this section is to explore the way the short list of financing mechanisms selected in section 2.3 could be used to raise the dedicated fund that the Government of Malta would need to create to support the policy options discussed. The analysis provided in this section should be considered indicative and exploratory and the validity of the results pending the findings of broader stakeholder consultation.

This section allows a comparison of the different possible financing measures and analyses the cost implications to consumers and taxpayers of a set of 'financing options'. Particularly promising financing options are highlighted in subsection 4.2.

4.1 Financing Measures

This section provides a brief summary of the discussion on financing options in preceding sections.

4.1.1 Consumption Taxes

Summarising the discussion in sections 2.3.1(i) and 2.3.1(ii) on polluter pays and VAT measures, the only form of consumption tax that would be recommended is on polluting goods, specifically on automotive fuels and other end-user petroleum goods. This conclusion is reached based primarily on the balance of public opinion in the RE survey, which expresses disapproval of direct taxation on goods and services, including through VAT, unless targeted at polluting goods.

Within the category of polluter pays taxation measures, taxes on tobacco goods, electricity and fuel for power production are discounted for the following reasons:

- Taxes on tobacco goods would not be a sufficient long-term financing measure for RES up to 2020 if the increase in product price were effective in reducing consumption of this 'non-essential good'.
- A tax on consumption of conventionally-generated power is practically equivalent to a consumer tariff rise, which is discussed below.
- Taxation either on fuel use or carbon emissions by Enemalta is not a sufficient measure due to the lack of a liberalised market to allow generation cost changes to pass through to power consumers.

An increase in tax on automotive fuels and other end user petroleum goods, which could be branded as an 'environmental', or 'eco' tax if appropriate, is therefore considered the most promising form of consumption tax for financing RES support policies in Malta.

4.1.2 Income Tax

Although section 2.3.1 notes that tax rises are more popular than tariff rises as a means of financing RES support policies, the RE survey does not show evidence that this sentiment extends to personal income tax. Instead, section 2.3.1(iii) shows public opinion in favour of passing the income tax burden on to businesses, at least on the basis of the RE survey sample.

Assuming competitive market conditions, such a tax on businesses would result in a small inflationary impact giving higher retail prices for consumers – Maltese residents and tourists – which would indirectly spread the financial burden. Further uncertainty on the state of public opinion is the mixed evidence on the acceptability of price increases on all goods and services, as noted in section 2.3.1(ii).

Assessment of public opinion on income taxation is one area that would benefit particularly from a broader consultation process than that carried out in the RE survey, including discussions with business lobby groups and consumer associations. On the basis of the information available, however, this option is given particular consideration in section 4.2 below.

4.1.3 Tourist eco-tax

Among the full set of financing options considered in this analysis, a tourist eco-tax has the benefit of placing the smallest cost burden on each individual taxpayer (see Figure 4-2 below), due to the fact that annual tourist visits exceed the population of Malta by a factor of three [16] and the impact can be spread more widely. The discussion in section 2.3.1(iv) also suggests that taxation of tourists can be a cost-effective approach, providing the issue does not become sufficiently controversial to put off tourists from visiting Malta. The average cost to each tourist is moderate, estimated at up to 0.4% of spending – and therefore likely to be significantly lower than the cost variation of tourism across island destinations.

One possibility to mitigate the potential controversy associated with this approach, in the context of the moderate burden actually entailed, is to indirectly increase in the cost of tourism via 'sustainability' taxes on hotel income, or through raising airport duties. If suitably managed, such an approach might avoid the controversy faced by the direct tourist eco-tax in the Balearics (2002/03) while having a similar distributional effect. As with taxes on businesses, the evidence on taxing of tourists in the RE survey is mixed, and this study would recommend a broader consultation procedure to decide the appropriate course of action if this financing option is to be further considered.

4.1.4 Consumer Electricity Tariffs

Strong arguments in favour of tariff rises as an appropriate financing measure are firstly that increased prices for conventionally generated power reflect the polluter pays principle, for which there is evidence of firm public support, and secondly that price rises increase the relative incentive to use renewably generated power.

A possible means to mitigate the historical controversy and public distaste for power tariff rises is through dedicating the increased revenues to a fund for development of RES. Due to the lack of obvious consistency on this issue in RE survey responses and to the need for transparency, the success of such an approach is likely to depend on public education, to improve understanding of the polluter pays principle and raise awareness on the use of the funds raised. Branding the tariff rise as an eco-tax could be one effective way to foster such public understanding.

Given there are only two 'large' emitters in Malta under the definition of EU Directive 2003/87/EC, the Marsa and Delimara power stations operated by Enemalta, a tax on large emitters would effectively

A.1.16 [16] Based on tourist departures and Maltese population data for 2003 given in 'Economic Survey: January – September 2004 (Ministry of Finance, November 2004)

tax power generation. Assuming these increased costs of generation could be passed through to power consumers by tariff schedule rises, this financing measure also represents the result of a carbon tax on large emitters.

If tariffs were raised or electricity consumption were equivalently taxed to wholly support the policy options outlined in section 3.3, power consumers would pay an average supplement of between €1.91 and €14.75 per annum. The 'All Electricity tariffs' option in Figure 4-2 below shows the average value in this range compared with other financing options.

4.2 Alternative Financing Options

On the basis of the analysis presented above and in section 2.2.5, the following three financing options are considered the short list of the most promising from the range of possibilities considered:

- Increased tax on automotive fuel
- Increased income tax on businesses – passed on to all consumers (Maltese and tourists)
- Electricity tariff rises – appropriately branded

Any of these financing options could be branded as an eco-tax, to reflect the purpose of the funds raised and to foster awareness of sustainability issues among the Maltese public. The RE survey indicates that this approach would be particularly important for electricity tariff rises, due to their historical unpopularity. Increased taxes on particular businesses, such as hotels, would allow an indirect tax targeted at tourist that might attract less controversy than a direct eco-tax measure.

The sections below present how the short list of financing options could be use to raise the funds to cover policy option costs for Scenarios B1, B2 and C3.

4.2.1 Financing Impact Calculations

The assumptions and references used to derive the data presented in section 4.2.2 are given with the full data set in Appendix C. In this appendix, each data point represents the case where all required funds for a given support policy option and scenario are raised through one financing mechanism alone.

The source data for the calculations performed has been drawn from a number of government reports, which typically provide data for 2003 or projections for 2005. Calculations were performed using consistent combinations of data for one relevant year. The results of this study are constrained by the quality and specificity of the data that was available, particularly in terms of income taxation. Due to this analysis' necessary reliance on historical data and projections for the current year, the estimates given up to 2020 are projections that would require revision over the duration of the support policy.

The separation of costs by individual financing mechanisms in this analysis is for illustrative purposes only, and is not intended to discount the possibility of a combination of different financing mechanisms operating simultaneously, as discussed further in section 4.2.2 below.

4.2.2 Financing Impact Results

Table 4-1 below shows the individual cost implications of the promising three financing options, looking at the full range of policy option costs considered in section 3.3 above.

Table 4-1 Implications of selected Financing Options – range over all Policy Options for Scenarios B1, B2 and C3

	Tax on Petrol, Unleaded and Diesel		Corporate Income Tax		Tariff rise for all Power Consumers	
Current average percentage tax level	42.86%*		10.80%**		N/A	
Unit†	litre		company		kWh	
Scenario B1	*Low*	*High*	*Low*	*High*	*Low*	*High*
Extra cost per unit†	€0.00156	€0.00472	€50.9	€154.1	€0.00020	€0.00061
New average percentage tax level	43.11%	43.63%	10.82%	10.87%	N/A	N/A
Scenario B2	*Low*	*High*	*Low*	*High*	*Low*	*High*
Extra cost per unit†	€0.00540	€0.00650	€176.1	€212.1	€0.00069	€0.00084
New average percentage tax level	43.74%	43.92%	10.88%	10.90%	N/A	N/A
Scenario C3	*Low*	*High*	*Low*	*High*	*Low*	*High*
Extra cost per unit†	€0.00609	€0.01205	€198.8	€392.9	€0.00076	€0.00155
New average percentage tax level	43.85%	44.82%	10.90%	10.99%	N/A	N/A

* Fuel specific tax component only (without 18% VAT), based on data for 2003 quoted in NSO News Release 94/2004

** Based on data for 2003 given in NSO News Release 231/2004 and the Economic Review (Ministry of Finance, 2004). Figure presented is total revenue from corporate income tax divided by 'Gross Operating Surplus and Mixed Income' component of Gross National Income.

† Unit here refers to unit of taxation, rather than RE generation technologies

The assumptions and references used to derive the data presented in Table 4-1 are given with the full data set in Appendix C. As discussed in section 4.2.1 above, each data point represents the case where all required funds for a given support policy option and scenario are raised through one financing mechanism alone. To illustrate this fact, Figure 4-1 shows that the total cost of the most expensive policy option for RES support (Scenario C3, PO 1) can be met by a rise in corporate income tax equivalent to 0.2% of average profits *or* a rise in tax on automotive fuels equivalent to 2.0% of average purchase price.

The promising financing options shown in Table 4-1 are also presented below in Figure 4-1, which shows the percentage point increase in each tax or tariff. This information is given for the full range of policy option costs in Scenarios B1, B2 and C3, as in Table 4-1 above. The maximum increase corresponds to the most expensive Policy Option (PO 1) and the minimum cost to the least expensive policy option (PO 8). The remainder of the policy options lie in between these values.

Figure 4-1 Implications of selected Financing Options – range over all Policy Options for Scenarios B1, B2 and C3

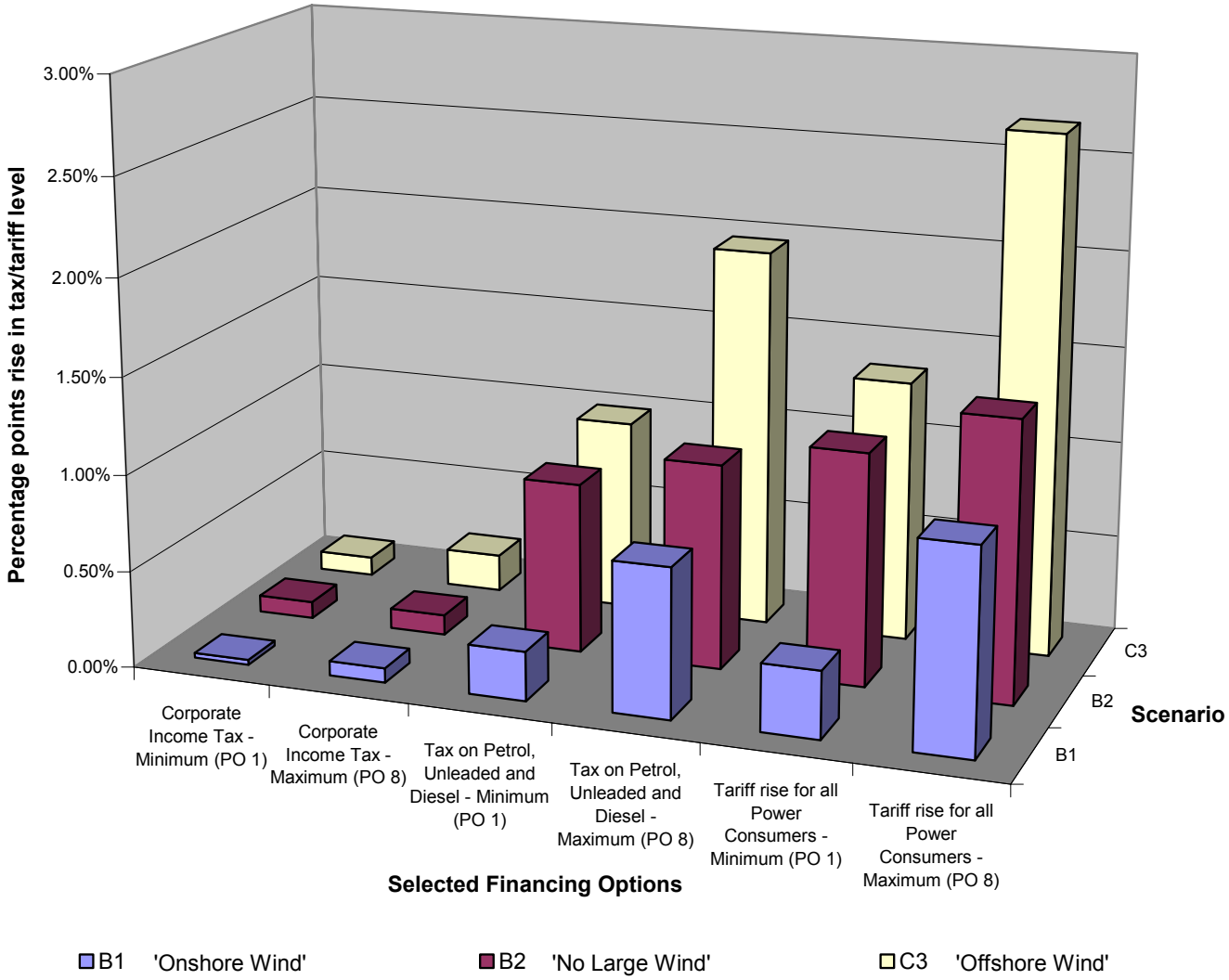


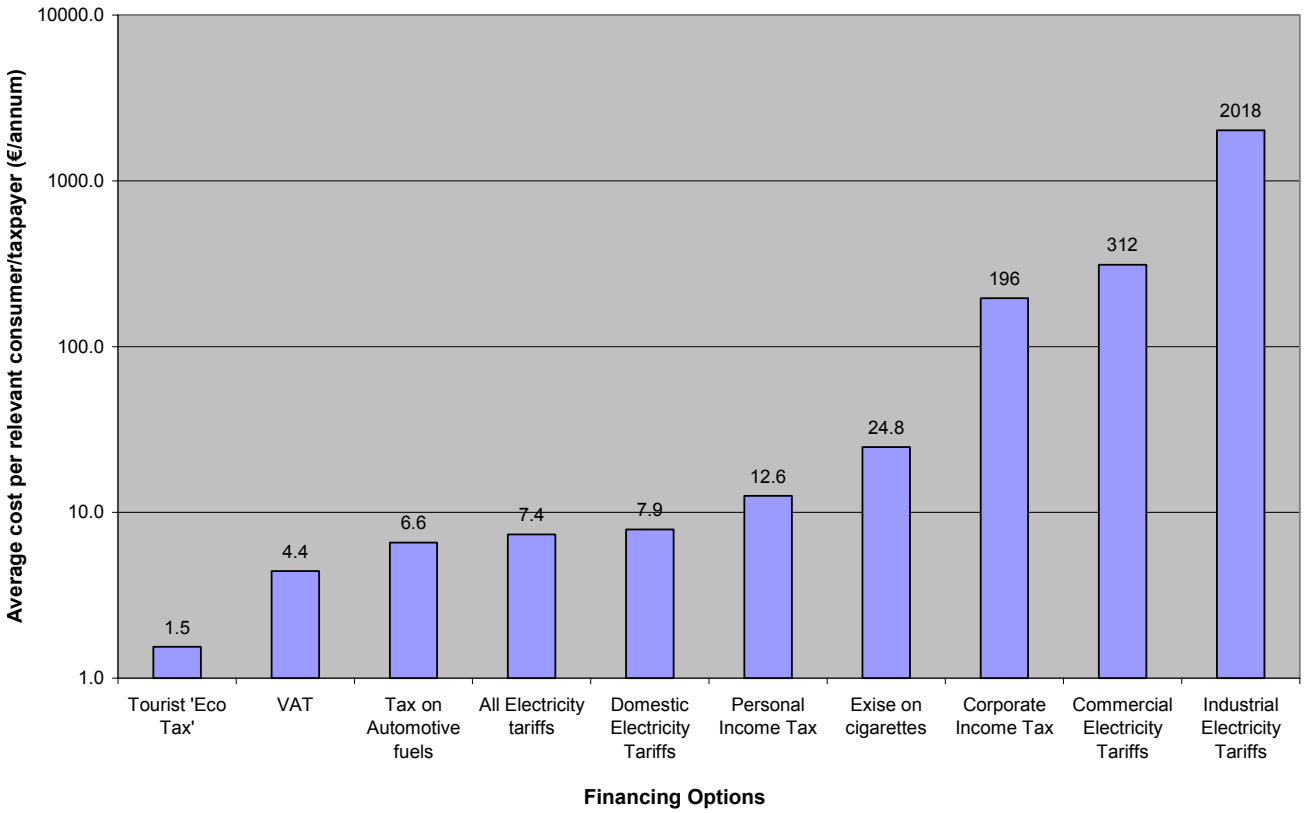
Figure 4-1, together with Table 4-1 and Figure 4-2 below, describe the distributional impacts of the promising financing options as follows:

- The maximum percentage point rise in tax/tariff level within the three promising financing options is 2.7%, which applies to consumer electricity tariffs under the most expensive support policy (Scenario C3, PO 1). This means that financing the scenarios developed in Phase 1 and particularly if more than one financing option was chosen, would not have a significant burden on tax payers or consumers.
- Financing RES support policies through corporate income tax implies a relatively *small* percentage point increase in taxation of business income, suggesting that businesses could be in a good position to absorb the direct burden. This conclusion holds despite the fact that the level of payments per consumer/taxpayer are large for businesses at an average € 196.2 per annum, taken over all scenarios and policy options.

- Of the promising financing options considered, electricity tariffs require the highest percentage point rise to cover the cost of each policy option. This result is dominated by the fact that electricity tariffs are held artificially low in Malta. The average cost of increased electricity tariffs, taken across all policy options and scenarios, is € 7.4 per consumer annually. As noted in section 2.3.2 above, this is within the amount of € 14 annually that 73% of the RE survey sample expressed willingness to pay.
- A tax increase on automotive fuels implies a similar burden per consumer as power tariff rises, at an estimated € 6.6 per person annually – affecting an equivalent number of consumers. The percentage point increase in automotive fuel taxes is lower than for consumer tariffs, due to a more significant current tax/tariff level.

In addition to the selected financing options presented above, it is useful to present the full range of financing options for understanding of the wider possibilities analysed. The full range of options are compared by their implied cost to individual consumers or taxpayers in Figure 4-2 below, which uses a log scale on the cost axis for ease of presentation.

Figure 4-2 Comparison of burden implied by Financing Options by average cost per affected consumer or taxpayer – presented on a logarithmic scale



The data presented is based on the average cost taken across all policy options and scenarios presented in Figure 3-1 above.

This graph shows the breadth of distribution of the policy option costs over the relevant number of consumers/taxpayers. An eco-tax on tourists has a small impact on a large number of consumers, therefore, while a rise in industrial electricity tariffs alone has a large impact on a limited number of consumers. This information acts as a guide to the weight of direct financial burden on individual consumers/taxpayers, but does not include consideration of indirect effects, such as businesses passing on their costs through product price rises. The above information must also be combined with the

consumer/taxpayers ability and willingness to pay, which may relate to the current tax level as illustrated in Figure 4-1 for the three financing options selected as most promising.

One peculiar feature of Figure 4-2 is that a commercial electricity tariff rise has a different distributional impact to corporate income taxation. The reason for this is that in the data applied (see Appendix C), a substantial proportion of businesses, described as small, were included in the domestic rather than commercial consumer tariff category.

An example combination of financing mechanisms, to divide the burden of funding RES support policies, is using both tariff rises for all power consumers and an eco-tax on automotive fuels. This simultaneous combination of measures would imply an average annual cost of €3.3 per vehicle driver and €3.7 per power consumer annually.

5 Conclusions

5.1 Conclusions

5.1.1 General

Addressing the potential barriers to RES generation in Malta discussed in Volume 1 of this study should form the foundation of any policy support measures. These potential barriers include planning constraints, grid connection, wheeling charges and lack of public awareness.

5.1.2 Support Measures

For small-scale generation, namely Solar PV, 60kW medium wind turbines and micro-wind, the following applies:

- A combination of net metering and capital grants would be most effective to support small-scale generation in Malta, according to the criteria defined by this study.
- Assuming a net metering arrangement using the average commercial or domestic tariffs, Table 1-1 summarises the level of capital grant required to obtain a 5 or 10 year payback period on small-scale RES equipment.

Table 5-1 Capital Subsidy Required

		5 year payback	10 year payback
*Subsidy level required to give stated payback period on **3kWp PV system***	Proportion of cost subsidised	90.3-91.7%	80.6-83.5%
*Subsidy level required to give stated payback period on **60kW Medium Wind** system*	Proportion of cost subsidised	66.2-72.0%	32.5-44.0%
*Subsidy level required to give stated payback period on **1kW Micro-Wind** system*	Proportion of cost subsidised	76.1-80.4%	52.1-60.8%

The ranges in the table correspond to the support measures based on either domestic or commercial electricity tariffs

- Incentives for individuals to invest in autogenerating RE equipment improve with rising electricity tariffs.
- For a fifteen year support period assumed for the life-span of the equipment, and a spill tariff set to equal the buy tariff, the total subsidy value with net metering rises with the electricity price. An electricity price rise could cross-subsidise autogenerators supported by this arrangement at the expense of other electricity consumers. To minimise this effect, the net metering arrangement may be set at spill levels below the buy tariff.
- Grants and net metering will require monitoring as long as the support measures are in place to combat scope for abuse. This monitoring would be consistent with EU guidelines for 'Guarantees of Origin' as required by Directive 2001/77/EC.

For large-scale generation, namely onshore and offshore wind turbines, the main conclusions regarding support measures are as follows:

- Either a feed-in tariff (FIT) or tendered power-purchase agreement (PPA) would be most applicable measure to support large-scale generation in Malta, according to the criteria defined by this study.
- The level of the guaranteed tariff (either a FIT or a tendered-PPA) is very sensitive to the costs assumed for the large-scale development. In this context, a tendered-PPA has the advantage over a FIT that it can result in more competitive power prices since the bids submitted by project developers may reveal the commercial costs of construction more fully than the public review used to set a FIT rate.

The costs of supporting the key scenarios developed in Phase 1 of this study are summarised in Table 1-2.

Table 5-2: Summary of Level for Support Measures

Scenarios	Costs - annual average over period 2008 to 2020 (€/annum)
Scenario B1	448,100-1,356,300
Scenario B2	1550,200-1,866,900
Scenario C3	1,749,600-3,459,000

Scenario B1: one 15 MW large onshore windfarm, 120 PV units & 15 x 60kW by 2010, Scenario B2: 240 PV units & 15 x 60kW wind turbines by 2010, Scenario C3: 240 PV units, 15 x 60kW wind turbines by 2010 & one 27MW offshore windfarm in 2015.

The ranges in table represent the different policy options suggested in this study and covering user payback period set to 5 or 10 years, the level of net metering based on commercial or domestic electricity tariffs and low or high costs assumed for large scale development.

For other large scale developments outside the scenarios considered in this study (i.e. a large PV farm), applications should be considered on a case by case basis using criteria developed by MRA with support provided if deemed appropriate via a feed-in tariff set at a level suitable to the specific development.

5.1.3 Financing Options

The Maltese Government will need to create a fund to support renewables. This study examines ways in which such a fund may be created to raise sufficient support for the technology scenarios developed in Phase 1.The most promising financing options considered applicable for Malta are:

- increased tax on automotive fuel
- increased income tax on businesses – passed on to all consumers (Maltese and tourists)
- electricity tariff rises – appropriately branded.

Assuming that the scenarios developed in Phase 1 are financed solely by each of the preferred options in turn, Table 1-3 provides a summary of the rises in the level of tax or tariff that would be necessary. The ranges in the table represent the different policy options explored in this study.

Table 5-3: Percentage Increase in Tariff/Tax in Selected Financing Options

Financing Option	Percentage Rise*		
	B1	B2	C3
Corporate Income Tax**	0.02-0.08	0.09-010	0.10-0.19
Tax on Petrol, Unleaded and Diesel	0.25-0.77	0.88-1.06	0.99-1.97
Tariff rise for all Power Consumers	0.35-1.05	1.20-1.45	1.35-2.68

* Percentage difference in the value of tax or tariff as a result of supporting RES

** Based on data for 2003 given in NSO News Release 231/2004 and the Economic Review (Ministry of Finance, 2004). Figure presented is total revenue from corporate income tax divided by 'Gross Operating Surplus and Mixed Income' component of Gross National Income. Operating surplus is the surplus (or deficit) on production activities before account has been taken of the interest, rents or charges paid or received for the use of assets. Mixed income is the remuneration for the work carried out by the owner (or by members of his family) of an unincorporated enterprise. This is referred to as 'mixed income' since it cannot be distinguished from the entrepreneurial profit of the owner.

Table 1-3 indicates that the maximum percentage rise in tax/tariff level within the three promising financing options is 2.7%, which applies to the most expensive scenario and policy option (Scenario C3, with a 5 year payback period based on consumer tariffs for small-scale RES systems and taking the high cost assumptions for large scale offshore wind). This means that financing the scenarios developed in Phase 1 and particularly if more than one financing option was chosen, would not have a significant burden on tax payers or consumers.

Among the range of measures considered for financing RES support policies, an increase in consumer electricity tariffs is a particularly strong candidate option. Points in favour of this financing option include:

- the fact that this measure directly implements the polluter pays principle, which enjoys public support on the basis of the RE survey
- the average cost of increased electricity tariffs, taken across all policy options and scenarios, is € 6.5 per consumer annually. This is within the amount of € 14 annually that 73% of the RE survey sample expressed willingness to pay
- improved incentives to use RE auto-generating equipment at a household or business level.

5.2 Recommendations

The recommendations as a result of the present analysis are as follows:

- To use of a combination of capital grants and net metering to support medium-small scale RES in Malta.
- To employ a tendered-PPA system to support the introduction of large scale wind developments, both onshore and offshore.
- To finance RES through the electricity tariff branded as an eco-tax, to reflect the purpose of the funds raised and to foster awareness of sustainability issues among the Maltese public.
- To carry out a broader consultation than that undertaken in the RE Survey, including discussions with businesses, lobby groups and consumer associations, to assess the possibility of using the income tax system as a means to fund RES.

- To assess as part of the above consultation procedure the extent to which ongoing incentives would be required to successfully promote optimal generation from small-scale autogenerators.
- To carry out a broader consultation on the suitability of a touristy eco-tax to decide the appropriate course of action if this financing option is to be further considered.
- To undertake a programme of public awareness to ensure that RES support is welcomed within Malta.
- To cater for any developments not explicitly covered by the set of support measures chosen, to develop a reserve fund and to consider proving support via Feed-in Tariffs for large scale schemes and net metering and capital grants for small scale schemes on a case-by-case basis.

6 Selected References

Berry, J. E., Holland, M. R., Watkiss, P. R., Boyd, R., Stephensen, R., 1998, "Power Generation and the Environment – a UK perspective, Volume 1", AEAT, Culham, England

Boxer, K., 2001, "The Development of Sustainable energy projects on the island of Gotland", Gotlands Energy Agency, Sweden

CIEMAT (Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas), 1997, "ExternE National Implementation – Spain", Madrid, Spain

Jägar-Waldau, A., Ossenbrink, H., Scholz, H., Bloem, H., and Werring, L., 2004, *"EU Directives, National Regulations and Incentives for Photovoltaic Solar Energy"*, European Commission, Brussels, Belgium

Enemalta Corporation, 2004, "*Annual Report 2004: & financial statements 2003"*, Enemalta Corporation, Marsa, Malta

European Wind Energy Association (EWEA), 2003, *"Wind Energy – The Facts"*, EWEA, Brussels, Belgium

FED, 2001, "Renewable Energy on Small Islands - Second Edition", FED, Denmark

FEEM (Fondazione Eni Enrico Mattei), 1997, "ExternE National Implementation – Italy", Milan, Italy

IEA, 2004, "Renewable Energy: Market and Policy trends in IEA countries"; p.94; OECD/IEA, Paris, France

IEA, 2004a, "Policies and Measures Database" (http://www.iea.org/), accessed 01/02/2005

IEA, 2004b, "Energy Prices and Taxes, Quarterly Statistics, Third Quarter 2004", Paris, France

IER (Institut für Energiewirtschaft und Rationelle Energieanwendung), 1997, "ExternE National Implementation", University of Stuttgart, Germany

IVM (Institute for Environmental Studies), 1997, "ExternE National Implementation – The Netherlands", Amsterdam, The Netherlands

LIEE (Laboratory of Industrial and Energy Economics), 1997, "External Costs of Electricity Generation in Greece" , National Technical University of Athens, Greece.

Ministry of Finance, Malta, November 2004, *"Economic Survey: January – September 2004"*, Economic Policy division, Ministry of Finance, Marsa, Malta

OECD, 1998, "Improving the Environment through Reducing Subsidies", Paris, France

Schleisner, L., Nielsen, P. S., 1997, "ExternE National Implementation – Denmark", Risø National Laboratory, Roskilde, Denmark

Spadaro, J. V., and Rabl, A., 1998, "External Costs of Energy: Application of the ExternE method in France", Centre d'Energetique, Paris, France

Appendix A EU energy taxation data – Diesel, Coal and Electricity

Table A-1 EU energy taxation data – Diesel, Coal and Electricity

Country	Currency	Exchange rate (xe.com, 9/3/05)	Household electricity taxes (currency/kWh)*	Household electricity taxes (€/kWh)	Household Steam Coal taxes (currency/t)*	Household Steam Coal taxes (€/t)	Non-Commercial Automotive Diesel taxes (currency/l)*	Non-Commercial Automotive Diesel taxes (€/l)
Austria	EUR	1.00	0.0447	0.0447	65.31	65.31	0.445	0.445
Belgium	EUR	1.00	0.0263	0.0263	33.55	33.55	0.478	0.478
Czech Republic	CZK	29.37	0.43	0.0146	202	6.88	13.92	0.474
Denmark	DKK	7.45	1	0.1342	2529	339.46	4.041	0.542
Finland	FIM	5.95	0.0252	0.0042	N/A	N/A	0.467	0.078
France	EUR	1.00	0.0279	0.0279	44.99	44.99	0.563	0.563
Germany	EUR	1.00	0.0198	0.0198	43.41	43.41	0.598	0.598
Greece	EUR	1.00	0.0064	0.0064	N/A	N/A	0.357	0.357
Hungary	HUF	241.73	5.43	0.0225	2993	12.38	127.13	0.526
Ireland	EUR	1.00	0.0155	0.0155	27.12	27.12	0.515	0.515
Italy	EUR	1.00	0.055	0.0550	N/A	N/A	0.561	0.561
Luxembourg	EUR	1.00	0.0071	0.0071	35.01	35.01	0.341	0.341
Netherlands	EUR	1.00	0.0763	0.0763	N/A	N/A	0.489	0.489
Poland	PLN	3.29	0.0868	0.0264	83.27	25.31	1.662	0.505
Portugal	EUR	1.00	0.0067	0.0067	N/A	N/A	0.431	0.431
Slovak Republic	SIT	239.43	0.72	0.0030	N/A	N/A	19.78	0.083
Spain	EUR	1.00	0.0218	0.0218	N/A	N/A	0.399	0.399
Sweden	SEK	9.05	0.281	0.0310	N/A	N/A	5.017	0.554
UK	GBP	0.69	0.0036	0.0052	7.56	10.96	0.592	0.858

*Source: IEA (2004b)

For comparison, household electricity taxes in Malta are an average of €0.0125/kWh (17% of average domestic tariff) and non-commercial automotive diesel taxes are €0.345/l.

Appendix B Policy Option costs

Table B-1 Comparison of Policy Option Costs for Scenarios B1, B2 and C3

	Total Policy Option Costs - annual average over period 2008 to 2020 (€/annum)							
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
Scenario B1	1,356,300	693,600	1,303,900	641,200	1,125,000	462,300	1,110,800	448,100
Scenario B2	1,866,900	1,866,900	1,800,700	1,800,700	1,568,100	1,568,100	1,550,200	1,550,200
Scenario C3	3,459,000	2,066,300	3,392,900	2,000,200	3,160,300	1,767,600	3,142,300	1,749,600

Appendix C Financing Option costs

Table C-1 Cost Implications of Financing Options for each PO in Scenario B1

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
Tax on Petrol, Unleaded and Diesel								
Extra tax per unit of product (€/litre) [1]	0.00472	0.00242	0.00454	0.00223	0.00392	0.00161	0.00387	0.00156
Current Percentage tax level (average, exc. VAT) [2]	42.86%	42.86%	42.86%	42.86%	42.86%	42.86%	42.86%	42.86%
New Percentage tax level (average, exc. VAT)	43.63%	43.25%	43.60%	43.22%	43.50%	43.12%	43.49%	43.11%
Estimated extra average cost per driver (€/annum) [3]	5.16	2.64	4.96	2.44	4.28	1.76	4.22	1.70
VAT on petrol, unleaded and diesel								
Extra tax per unit of product (€/litre) [1]	0.00472	0.00242	0.00454	0.00223	0.00392	0.00161	0.00387	0.00156
Current Percentage tax level [2]	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%
New Percentage tax level	18.78%	18.40%	18.75%	18.37%	18.64%	18.26%	18.64%	18.26%
Estimated extra average cost per driver (€/annum) [3]	5.16	2.64	4.96	2.44	4.28	1.76	4.22	1.70
Excise duty on machine-made cigarettes								
Extra tax per unit of product (€/packet) [4]	0.065	0.033	0.062	0.031	0.054	0.022	0.053	0.021
Current Percentage tax level (estimate) [5]	233%	233%	233%	233%	233%	233%	233%	233%
New Percentage tax level (estimate)	240%	237%	240%	236%	239%	236%	239%	235%
Estimated extra average cost per smoker (€/annum) [6]	19.5	10.0	18.7	9.2	16.2	6.6	16.0	6.4
Total VAT								
Extra tax per unit of product (€)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Current Percentage tax level	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%
New Percentage tax level [7]	18.06%	18.03%	18.06%	18.03%	18.05%	18.02%	18.05%	18.02%
Extra tax per head of population (€) [8]	3.48	1.78	3.34	1.64	2.88	1.18	2.85	1.15
Personal Income Tax								
Extra average tax per eligible individual (€) [9]	9.88	5.05	9.50	4.67	8.20	3.37	8.09	3.26
Current Percentage tax level (average) [10]	13.85%	13.85%	13.85%	13.85%	13.85%	13.85%	13.85%	13.85%

New Percentage tax level (average)	13.92%	13.88%	13.92%	13.88%	13.91%	13.87%	13.91%	13.87%
Corporate Income Tax								
Estimated extra average tax per eligible company (€) [11]	154.07	78.79	148.12	72.84	127.80	52.52	126.18	50.90
Current Percentage tax level (average) [12]	10.80%	10.80%	10.80%	10.80%	10.80%	10.80%	10.80%	10.80%
New Percentage tax level (average)	10.87%	10.84%	10.87%	10.83%	10.86%	10.82%	10.86%	10.82%
Tourist 'Eco Tax'								
Tax per visitor to Malta (€) [13]	1.21	0.62	1.17	0.57	1.01	0.41	0.99	0.40
Current Percentage tax level (hotel and airport duties only, as proportion of total spending) [14]	1.06%	1.06%	1.06%	1.06%	1.06%	1.06%	1.06%	1.06%
New Percentage tax level (of total spending)	1.23%	1.15%	1.23%	1.14%	1.20%	1.12%	1.20%	1.12%
Domestic Electricity Tariffs								
Increase per unit of power (€/kWh) [15]	0.00217	0.00111	0.00209	0.00103	0.00180	0.00074	0.00178	0.00072
Current average power price (€¢/kWh) [15]	7.37	7.37	7.37	7.37	7.37	7.37	7.37	7.37
New average power price (€¢/kWh)	7.59	7.48	7.58	7.48	7.55	7.45	7.55	7.44
Extra average cost per consumer (€/annum) [16]	6.18	3.16	5.94	2.92	5.13	2.11	5.06	2.04
Commercial Electricity Tariffs								
Increase per unit of power (€/kWh) [15]	0.00230	0.00117	0.00221	0.00109	0.00190	0.00078	0.00188	0.00076
Current average power price (€¢/kWh) [15]	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67
New average power price (€¢/kWh)	8.90	8.78	8.89	8.78	8.86	8.75	8.86	8.74
Extra average cost per consumer (€/annum) [16]	245.1	125.4	235.7	115.9	203.3	83.6	200.8	81.0
Industrial Electricity Tariffs								
Increase per unit of power (€/kWh) [15]	0.00272	0.00139	0.00262	0.00129	0.00226	0.00093	0.00223	0.00090
Current average power price (€¢/kWh) [15]	6.41	6.41	6.41	6.41	6.41	6.41	6.41	6.41
New average power price (€¢/kWh)	6.68	6.55	6.67	6.54	6.64	6.50	6.63	6.50
Extra average cost per consumer (€/annum) [16]	1584.5	810.3	1523.2	749.1	1314.3	540.1	1297.7	523.5
GHG emissions / All Power Consumers								
Tax per unit of pollution (€/tCO_2) [17]	0.68	0.35	0.65	0.32	0.56	0.23	0.56	0.22
Tax per unit of power (€/kWh) [15]	0.00061	0.00031	0.00058	0.00029	0.00050	0.00021	0.00050	0.00020
Extra average tax per power user (€/annum) [16]	5.78	2.96	5.56	2.73	4.80	1.97	4.74	1.91

Table C-2 Cost Implications of Financing Options for each PO in Scenario B2

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
Tax on Petrol, Unleaded and Diesel								
Extra tax per unit of product (€/litre) [1]	0.00650	0.00650	0.00627	0.00627	0.00546	0.00546	0.00540	0.00540
Current Percentage tax level (average, exc. VAT) [2]	42.86%	42.86%	42.86%	42.86%	42.86%	42.86%	42.86%	42.86%
New Percentage tax level (average, exc. VAT)	43.92%	43.92%	43.88%	43.88%	43.75%	43.75%	43.74%	43.74%
Estimated extra average cost per driver (€/annum) [3]	7.10	7.10	6.85	6.85	5.96	5.96	5.89	5.89
VAT on petrol, unleaded and diesel								
Extra tax per unit of product (€/litre) [1]	0.00650	0.00650	0.00627	0.00627	0.00546	0.00546	0.00540	0.00540
Current Percentage tax level [2]	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%
New Percentage tax level	19.07%	19.07%	19.03%	19.03%	18.90%	18.90%	18.89%	18.89%
Estimated extra average cost per driver (€/annum) [3]	7.10	7.10	6.85	6.85	5.96	5.96	5.89	5.89
Excise duty on machine-made cigarettes								
Extra tax per unit of product (€/packet) [4]	0.089	0.089	0.086	0.086	0.075	0.075	0.074	0.074
Current Percentage tax level [5]	233%	233%	233%	233%	233%	233%	233%	233%
New Percentage tax level	242%	242%	242%	242%	241%	241%	241%	241%
Estimated extra average cost per smoker (€/annum) [6]	26.8	26.8	25.9	25.9	22.5	22.5	22.3	22.3
Total VAT								
Extra tax per unit of product (€)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Current Percentage tax level	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%
New Percentage tax level [7]	18.09%	18.09%	18.08%	18.08%	18.07%	18.07%	18.07%	18.07%
Extra tax per head of population (€)[8]	4.78	4.78	4.61	4.61	4.02	4.02	3.97	3.97
Personal Income Tax								
Extra average tax per eligible individual (€) [9]	13.60	13.60	13.12	13.12	11.42	11.42	11.29	11.29
Current Percentage tax level (average) [10]	13.85%	13.85%	13.85%	13.85%	13.85%	13.85%	13.85%	13.85%
New Percentage tax level (average)	13.94%	13.94%	13.94%	13.94%	13.93%	13.93%	13.93%	13.93%

Corporate Income Tax								
Estimated extra average tax per eligible company (€) [11]	212.08	212.08	204.56	204.56	178.13	178.13	176.10	176.10
Current Percentage tax level (average) [12]	10.80%	10.80%	10.80%	10.80%	10.80%	10.80%	10.80%	10.80%
New Percentage tax level (average)	10.90%	10.90%	10.90%	10.90%	10.89%	10.89%	10.88%	10.88%
Tourist 'Eco Tax'								
Tax per visitor to Malta (€) [13]	1.67	1.67	1.61	1.61	1.40	1.40	1.39	1.39
Current Percentage tax level (hotel and airport duties only, as proportion of total spending) [14]	1.06%	1.06%	1.06%	1.06%	1.06%	1.06%	1.06%	1.06%
New Percentage tax level (of total spending)	1.30%	1.30%	1.29%	1.29%	1.26%	1.26%	1.26%	1.26%
Domestic Electricity Tariffs								
Increase per unit of power (€/kWh) [15]	0.00299	0.00299	0.00289	0.00289	0.00251	0.00251	0.00249	0.00249
Current average power price (€¢/kWh) [15]	7.37	7.37	7.37	7.37	7.37	7.37	7.37	7.37
New average power price (€¢/kWh)	7.67	7.67	7.66	7.66	7.62	7.62	7.62	7.62
Extra average cost per consumer (€/annum) [16]	8.51	8.51	8.21	8.21	7.15	7.15	7.07	7.07
Commercial Electricity Tariffs								
Increase per unit of power (€/kWh) [15]	0.00316	0.00316	0.00305	0.00305	0.00265	0.00265	0.00262	0.00262
Current average power price (€¢/kWh) [15]	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67
New average power price (€¢/kWh)	8.98	8.98	8.97	8.97	8.93	8.93	8.93	8.93
Extra average cost per consumer (€/annum) [16]	337.4	337.4	325.4	325.4	283.4	283.4	280.2	280.2
Industrial Electricity Tariffs								
Increase per unit of power (€/kWh) [15]	0.00375	0.00375	0.00361	0.00361	0.00315	0.00315	0.00311	0.00311
Current average power price (€¢/kWh) [15]	6.41	6.41	6.41	6.41	6.41	6.41	6.41	6.41
New average power price (€¢/kWh)	6.79	6.79	6.77	6.77	6.73	6.73	6.72	6.72
Extra average cost per consumer (€/annum) [16]	2181.0	2181.0	2103.6	2103.6	1831.9	1831.9	1811.0	1811.0
GHG emissions / All Power Consumers								
Tax per unit of pollution (€/tCO_2) [17]	0.94	0.94	0.90	0.90	0.79	0.79	0.78	0.78
Tax per unit of power (€/kWh) [15]	0.00084	0.00084	0.00081	0.00081	0.00070	0.00070	0.00069	0.00069
Extra average tax per power user (€/annum) [16]	7.96	7.96	7.68	7.68	6.69	6.69	6.61	6.61

Table C-3 Cost Implications of Financing Options for each PO in Scenario C3

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
Tax on Petrol, Unleaded and Diesel								
Extra tax per unit of product (€/litre) [1]	0.01205	0.00720	0.01182	0.00697	0.01101	0.00616	0.01094	0.00609
Current Percentage tax level (average, exc. VAT) [2]	42.86%	42.86%	42.86%	42.86%	42.86%	42.86%	42.86%	42.86%
New Percentage tax level (average, exc. VAT)	44.82%	44.03%	44.79%	43.99%	44.65%	43.86%	44.64%	43.85%
Estimated extra average cost per driver (€/annum) [3]	13.15	7.86	12.90	7.60	12.02	6.72	11.95	6.65
VAT on petrol, unleaded and diesel								
Extra tax per unit of product (€/litre) [1]	0.01205	0.00720	0.01182	0.00697	0.01101	0.00616	0.01094	0.00609
Current Percentage tax level [2]	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%
New Percentage tax level	19.98%	19.18%	19.94%	19.14%	19.81%	19.01%	19.80%	19.00%
Estimated extra average cost per driver (€/annum) [3]	13.15	7.86	12.90	7.60	12.02	6.72	11.95	6.65
Excise duty on machine-made cigarettes								
Extra tax per unit of product (€/packet) [4]	0.165	0.099	0.162	0.095	0.151	0.084	0.150	0.083
Current Percentage tax level [5]	233%	233%	233%	233%	233%	233%	233%	233%
New Percentage tax level	250%	243%	250%	243%	248%	242%	248%	242%
Estimated extra average cost per smoker (€/annum) [6]	49.7	29.7	48.8	28.8	45.4	25.4	45.2	25.1
Total VAT								
Extra tax per unit of product (€)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Current Percentage tax level	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%
New Percentage tax level [7]	18.16%	18.10%	18.16%	18.09%	18.15%	18.08%	18.15%	18.08%
Extra tax per head of population (€)[8]	8.86	5.29	8.69	5.12	8.10	4.53	8.05	4.48
Personal Income Tax								
Extra average tax per eligible individual (€) [9]	25.20	15.05	24.72	14.57	23.02	12.88	22.89	12.75
Current Percentage tax level (average) [10]	13.85%	13.85%	13.85%	13.85%	13.85%	13.85%	13.85%	13.85%
New Percentage tax level (average)	14.02%	13.95%	14.02%	13.95%	14.01%	13.94%	14.01%	13.94%
Corporate Income Tax								

Estimated extra average tax per eligible company (€) [11]	392.9	234.7	385.4	227.2	359.0	200.8	357.0	198.8
Current Percentage tax level (average) [12]	10.80%	10.80%	10.80%	10.80%	10.80%	10.80%	10.80%	10.80%
New Percentage tax level (average)	10.99%	10.91%	10.99%	10.91%	10.97%	10.90%	10.97%	10.90%
Tourist 'Eco Tax'								
Tax per visitor to Malta (€) [13]	3.09	1.85	3.03	1.79	2.83	1.58	2.81	1.56
Current Percentage tax level (hotel and airport duties only, as proportion of total spending) [14]	1.06%	1.06%	1.06%	1.06%	1.06%	1.06%	1.06%	1.06%
New Percentage tax level (of total spending)	1.49%	1.32%	1.48%	1.31%	1.46%	1.28%	1.45%	1.28%
Domestic Electricity Tariffs								
Increase per unit of power (€/kWh) [15]	0.00555	0.00331	0.00544	0.00321	0.00507	0.00283	0.00504	0.00281
Current average power price (€¢/kWh) [15]	7.37	7.37	7.37	7.37	7.37	7.37	7.37	7.37
New average power price (€¢/kWh)	7.93	7.70	7.92	7.69	7.88	7.66	7.88	7.65
Extra average cost per consumer (€/annum) [16]	15.77	9.42	15.47	9.12	14.41	8.06	14.32	7.98
Commercial Electricity Tariffs								
Increase per unit of power (€/kWh) [15]	0.00586	0.00350	0.00574	0.00339	0.00535	0.00299	0.00532	0.00296
Current average power price (€¢/kWh) [15]	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67
New average power price (€¢/kWh)	9.25	9.02	9.24	9.01	9.20	8.97	9.20	8.96
Extra average cost per consumer (€/annum) [16]	625.2	373.5	613.2	361.5	571.2	319.5	567.9	316.2
Industrial Electricity Tariffs								
Increase per unit of power (€/kWh) [15]	0.00694	0.00415	0.00681	0.00401	0.00634	0.00355	0.00630	0.00351
Current average power price (€¢/kWh) [15]	6.41	6.41	6.41	6.41	6.41	6.41	6.41	6.41
New average power price (€¢/kWh)	7.10	6.83	7.09	6.81	7.05	6.77	7.04	6.76
Extra average cost per consumer (€/annum) [16]	4040.9	2413.9	3963.7	2336.7	3691.9	2065.0	3670.9	2043.9
GHG emissions / All Power Consumers								
Tax per unit of pollution (€/tCO_2) [17]	1.73	1.04	1.70	1.00	1.58	0.89	1.57	0.88
Tax per unit of power (€/kWh) [15]	0.00155	0.00092	0.00152	0.00089	0.00141	0.00079	0.00141	0.00078
Extra average tax per power user (€/annum) [16]	14.75	8.81	14.47	8.53	13.48	7.54	13.40	7.46

1 Import data for 2003, quoted in NSO News Release No. 94/2004

2 Price and Tax data from 05/04/2004 Enemalta statistics, quoted in NSO News Release No. 94/2004

3 'Drivers' defined as members of Maltese population with a motor vehicle licence, data quoted in the 'Economic Survey: January – September 2004 (Ministry of Finance, November 2004)

4 Based on total imports by HS Division 2402 for 2003, including cigars; cigarillos; cigarettes; etc; of tobacco or tobacco substitutes (NSO web resources)

5 Based on 2003 taxation revenue on machine-made cigarettes, given in 2005 Governmental Financial Estimates, combined with 2003 taxation data as above

6 Number of smokers estimated using the statistic that 23.34% of those over 16 years of age are regular smokers of cigarettes (HIS, Dept. of Health, March 2003) and 22.5% of the Maltese population are estimated as under 16 (Ministry of Health, 2000).

7 Based on total estimated revenue from VAT for 2005, quoted in 2005 Governmental Financial Estimates

8 Population data for 2004 given in the 'Economic Survey: January – September 2004 (Ministry of Finance, November 2004)

9 Based on number of 'Gainfully employed persons', given in the 'Economic Survey: January – September 2004 (Ministry of Finance, November 2004)

10 Based on total revenues from personal income taxation for 2003, quoted in NSO News Release No. 231/2004, and Compensation of Employees for 2003, from Gross National Income statistics (Economic Survey, Ministry of Finance, November 2004)

11 Approximated from commercial and industrial power users (govt not included) plus an assumption of 5,000 small power users charged in the domestic category. Estimation necessary due to lack of readily available disaggregated information on income taxpayers.

12 Based on data for 2003 given in NSO News Release 231/2004 and the Economic Review (Ministry of Finance, 2004). Figure presented is total revenue from corporate income tax divided by 'Gross Operating Surplus and Mixed Income' component of Gross National Income (Economic Survey, Ministry of Finance, November 2004).

13 Based on number of tourist departures for 2003, as given in 'Economic Survey: January – September 2004 (Ministry of Finance, November 2004)

14 Current tourist taxation is based on VAT at tourist establishments NACE Codes 5510, 5511, 5512 (hotels and airports) - for return due dates in 2004 (VAT department response to request from MRA). Total tourist spending is based on data for 2003 (NSO 168/2004).

15 Based on 2003 turnover (power and revenue) by consumer category, quoted in 2004 Enemalta Annual Report

16 Based on total number of consumers in each category up to financial year 2001/2002 (Enemalta/NSO)

17 Based on total emissions from 'large' installations, as designated in the Malta National Allocation Plan (NAP) under the EU ETS, submitted to the EU Commission 18th October, 2004. The 2 relevant installations in Malta are the power stations at Marsa and Delimara operated by Enemalta. This analysis assumes for presentation purposes that any increase in costs to Enemalta will be passed on evenly to all electricity consumers.